NOZZLE BLOCKAGE IN CONTINUOUS CASTING OF AL-KILLED SAE 1006 AND SAE 1008 STEEL GRADES IN ISKENDERUN IRON AND STEEL WORKS

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES
OF
THE MIDDLE EAST TECHNICAL UNIVERSITY

BY

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IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF SCIENCE

IN

THE DEPARTMENT OF METALLURGICAL AND MATERIALS ENGINEERING

APRIL 2004

Approval of The Graduate School of Natural and Applied Sciences

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ABSTRACT

NOZZLE BLOCKAGE IN CONTINUOUS CASTING OF AL-KILLED SAE 1006 AND SAE 1008 STEEL GRADES IN ISKENDERUN IRON AND STEEL WORKS

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April 2004, 99 pages

In this work, nozzle clogging in the submerged entry nozzle in continuous casting of Al killed steels has been studied. The study has been based on low silicon Al killed SAE 1006 (1.2006) and SAE 1008 (1.2008) grades. In this study, castabilities of 75 heats for 1.2006 steel grades and 75 heats for 1.2008 steel grades have been investigated. Castabilities of the experimental heats have been found to be affected by Al content in oxide form (Al_{oxy}) and Ca content of the liquid steel. Castabilities have been found to decrease with increase in Al_{oxy} and to increase with increase in Ca content and Ca/Al_{oxy} ratio. Reoxidation has been found not to affect the castability appreciably.

Keywords: nozzle, clogging, Al-killed steels, casting, CaSi treatment, SAE 1006, SAE 1008.

ÖZ

İSKENDERUN DEMİR VE ÇELİK İŞLETMELERİNDE ALÜMİNYUMLA DEOKSİDE EDİLMİŞ SAE 1006 VE SAE 1008 KALİTE ÇELİKLERİN SÜREKLİ DÖKÜMÜNDE NOZUL TIKANMASI

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Nisan 2004, 99 sayfa

Bu tez çalışmasında, alüminyumla deokside edilmiş çeliklerin sürekli dökümünde daldırma nozulu tıkanması araştırıldı. Çalışma düşük silisli Al ile deokside edilmiş SAE 1006 (1.2006) ve SAE 1008 (1.2008) çeliklerini içermektedir. Bu çalışmada 75 Adet 1.2006 ve 75 adet 1.2008 kalite çeliğin dökülebilirlikleri incelendi. Dökülebilirliklerinin sıvı çelikte bulunan kalsiyumdan ve oksit haldeki alüminyumdan etkilendiği görüldü. Oksit haldeki Al miktarı arttıkça dökülebilirliğin azaldığı, Ca ve Ca/Al_{oksit} miktarı arttıkça da arttığı bulundu. Reoksidasyonun dökülebilirlik üzerine kayda değer bir etki göstermediği görüldü.

Anahtar Kelimeler: nozul, tıkanma, alüminyumla deokside edilmiş çelikler, döküm, CaSi, SAE 1006, SAE 1008.

To my dear parents;

Necla and Adnan SAKALLI

ACKNOWLEDGEMENTS

First, it is a pleasure to thank my supervisor Prof. Dr. Naci SEVİNÇ, for his helpful guidance, criticism, encouragement throughout the every stage of this study.

I wish to express my appreciation to my examining committee members Prof. Dr. Naci SEVİNÇ, Prof. Dr. Yavuz TOPKAYA, Prof. Dr. İshak KARAKAYA, Prof. Dr. Haluk ATALA, Dr. Abdi AYDOĞDU for their regards and valuable recommendations.

I wish to express my gratitute to my mother, my father and my sister and brother for their complimentary love and unshakable faith in me during my life.

Thanks are also extended to my company, ISDEMIR. Thanks to ladle metallurgy engineer Mr.Alper KURTOĞLU, ladle metallurgy chief engineer Mr.Kemal ÖZGÜN, converter chief engineer Mr.Sinan ERDOĞAN and our quality manager Mr.Bengü ATEŞLİ.

Finally, special thanks to my sweety cat.

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CHAPTER 1

INTRODUCTION

Tundish nozzle and submerged entry nozzle clogging are commonly associated with the casting of aluminum-killed steel.

For low carbon Al-killed steel grades nozzle clogging can be a production problem. Nozzle clogging can lead to disturbed mould flow, which causes decreased bloom surface quality. In the worst case clogging can interrupt the whole casting sequence. There are also cases when alumina accumulated on the nozzle must be pumped off with the stopper rod to maintain adequate flow to the mould. The advantage is that disengaged alumina deposits usually get into the mold, which causes inner bloom defects and surface defects in further treatments.

The experienced steelmaker knows that strongly deoxidized steels do not flow well and tend to block nozzles. Until strand casting became popular, this difficulty was simply accepted as part of steel making. Usually, it was alleviated by reaming out of the nozzle with an oxygen lance. For steelmakers using billet casting machines equipped with unstoppered metering nozzles, the nozzle blockage problem outweighs the advantage of aluminum as a grain refiner. As a result, the strand casting of aluminum-deoxidized steels into billets is avoided, if possible.

Isdemir was designed to produce crude steel with the capacity of 1,100,000 tons/year in 1970 and also by some investments other facilities were completed and introduced into operation individually from 1970 to 1975. In 1984, the crude steel capacity caught up with the aimed target of 2,200,000 tons/year.

Among the other integrated steel works in Turkey, Isdemir stands the third in view of chronological order, yet it is the leading one when national output of long products are considered.

It produces blooms, billets and coils. It produces construction steels, high carbon steels and steels for angle iron, profile and electrode production. Some of the steels it produces are aluminum deoxidized and nozzle blockage is encountered in the production of such steels. The two important such steel grades are Al-killed SAE 1006 (1.2006) and SAE 1008 (1.2008). These steel grades are suitable for thin wire drawing.

The study was undertaken with the objective of determining the reasons behind nozzle blockage in the casting of low silicon Al-killed SAE 1006 (1.2006) and SAE 1008 (1.2008) steels and finding remedies.

CHAPTER 2

THEORY

2.1 GENERAL

Continuous casting of steel is schematically shown in Figure 2.1. The flow of liquid steel from ladle to tundish, from tundish to mould should be steady for successful casting. If this flow is not proper castability problem occurs. The main reason that affects the proper flow and castability is nozzle clogging. Clogging can occur in submerged entry nozzle (SEN) and in nozzle between ladle and tundish. In this chapter information about nozzle clogging is given.

2.2 INCLUSION AGGLOMERATION DUE TO CLOGGING DURING STEEL POURING

The formation of clogs when steels containing solid inclusions are cast can result in quite large macro-inclusion defects if the clogs are released during teaming. All solid inclusions tend to agglomerate due to surface tension effects. Clogging of pouring nozzles can be the source of large macro-inclusion defects when steels are dirty and pouring times are long. A short discussion of nozzle clogging follows:

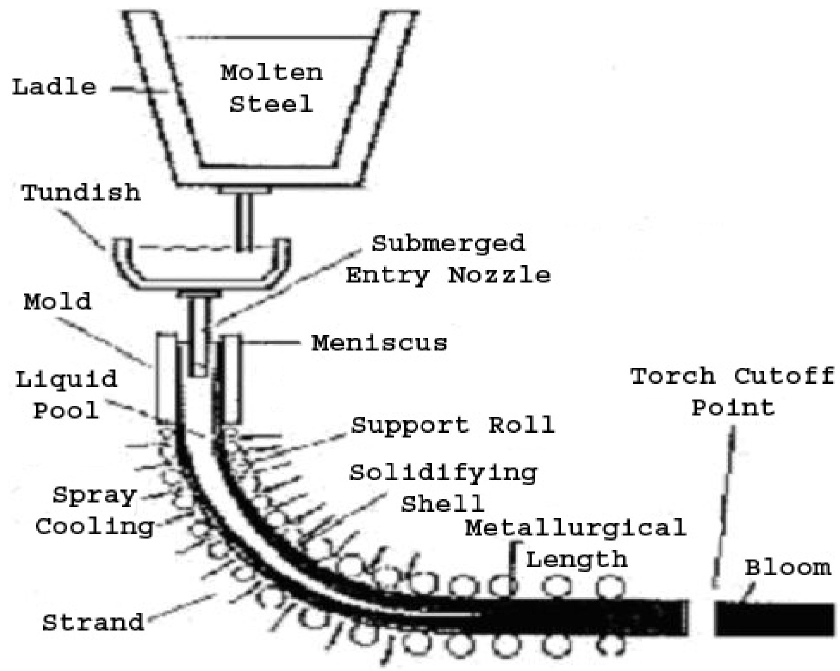

Figure 2.1 Schematic representation of the continuous casting process [1].

2.2.1 The Early Days

Snow and Shea [2] in their study of erosion mechanisms reported the occurrence of corundum (Al_{oxy})-glass tufts covering the bore surface of nozzles used to teem fine-grained ingot steels treated with aluminum. Duderstadt et. al. [3] found that nozzle blockage occurred with high levels of Al (0.0036%) and that nozzle sectioning revealed dendritic growth of alumina from the nozzle wall onto the bore. They also looked at ways to minimize heat loss in the nozzle by developing protruding nozzles and they also observed that a high preheat temperature is essential for a successful cast. Farrell and Hilty [4] studied the effects of deoxidizing elements on the flow of liquid steel through nozzles. They observed that Al, Zr, Ti and the rare earth-oxides were all refractory at steelmaking temperatures and caused clogging. However, this was not the case with Si + Mn as a deoxidizer.

2.2.2 Morphology of Alumina

Ogibayashi et. al. [5] found two different forms of alumina in the case of an Al-killed steel. One consisting of chalky alumina which is a powdery white substance and the other consisting mainly of metal containing a large number of alumina clusters. The differences in morphology were attributed to steel cleanliness. Farrell et. al. [6] found that deoxidation or indigenous inclusions form by precipitation and growth and there is an effect of cooling rate upon their size. The faster the cooling rate the smaller their size and the effect of very slow cooling rates is to increase the size of the deoxidation products until a limit is reached. In general reoxidation inclusions are larger than deoxidation types and tend to be richer in the weaker oxide-forming elements e.g. Si and Mn. Work carried out by Steinmetz and Lindberg [7] in the laboratory and work carried out by Tiekink et. al. [8] in industry found that supersaturation of Al and O in steel leads to a high speed growth of alumina. High-speed growth is characterized by dendrites and needles and occurs because the supply of reactants causes morphological instability in the growing dendrites. Hiraga et. al. [9] looked at Ti added and Al-killed steel (Ti-AK) and found that the inclusions were coarse and granular which differed from the dendritic alumina in Al-killed steel. Ikemoto et. al. [10] found an α - Al_{oxy} powdery buildup below the powder line of ZCG (ZrO_2-CaO-C) nozzles. The buildup occurred on the reaction layer, which forms on the hot face of the nozzle and is composed of two layers. The authors found that the buildup comprises of two layers with the first corresponding to a CaO-Al_{oxy} matrix and the second layer corresponding to Al_{oxy} aggregate. At the position at which buildup occurred, the portion of matrix in the reacted zone was less than when there is no buildup. In addition, holes were formed in ZC coarse grains of the interior domain. This could be attributed to the extraction of CaO by diffusion out of the refractory and also from the coarse grains of the interior. The first layer of the buildup adhered onto Fe particles in the reacted zone of the surface of the nozzle and it contained a very high percentage of Si (4-10wt.%). This Si is considered to originate from the Si component in the nozzle. This Si as before could have most likely originated from the SiC from the refractory, which oxidized to SiO_2 and subsequently reacted further.

2.2.3 Mechanisms of Clogging

Singh [11] found that alumina was a light loose powder, which was very friable and could be easily removed by the touch of a finger and proposed a boundary layer theory for the mechanism of clogging. The high contact angle of alumina in steel (134-146 degrees) will enable an inclusion to approach a refractory and attach itself in order to minimize contact with steel. Since the fluid velocity in the boundary layer (nearer the refractory wall) is zero, the alumina does not get washed away once it becomes attached. Impaction of inclusions from a turbulent flow can occur onto surfaces that are parallel to the mean flow because transverse eddy velocities acquired by an inclusion may project it onto the wall [12,13]. The high temperatures of 1530°C enable sintering of the alumina to occur. Dawson [14] found that the accumulation of inclusions usually predominated at certain preferred locations within the nozzle and suggested the existence of flow separation as a cause. The flow within the separation zone is highly turbulent and the frequent flow reversals and stalls allow eddies to carry inclusions to the nozzle wall. Separation theory explains why loosely held friable powder is not washed away by the erosion forces of high velocity steel. Nakamura et. al. [15] and Ichikawa et. al. [16] established the effects of surface roughness on alumina refractories and found that the sample with coarse powder had greater quantities of alumina deposited in comparison to the fine powder sample.

Work carried out by Schwerdtfeger and Schrewe [17] and Saxena et. al. [18] suggested that the silica in the nozzle material reacts with the excess Al in the steel and forms alumina. Poirer et. al. [19] found a deposit forming on alumina-graphite samples when low carbon steel was used (40-60ppm) and not when high carbon steel was used. They also found that clogging occurred with all types of C-refractories but it didn't with non C-refractories. The mechanism of formation of alumina was caused by reduction of the silica by the graphite in the nozzle to gaseous species that then transfers to the molten steel and further reacts to form alumina. Sasai and Mizukami [20] suggested reduction of silica in the nozzle by graphite to gaseous species that reacts with Al in the steel to form alumina. They also suggested a similar mechanism for Ti-killed steel. Fukuda et. al. [21]

observed alumina deposition on the alumina graphite rods even when no Al was present in the iron melt. The suggested mechanism of formation of alumina was attributed to dissociation of the suboxide species (generated from reduction of silica by graphite) to the elemental form, which then reoxidizes to form alumina. Gao and Sorimachi [22] suggested the formation of Ti-oxide as a reaction between titanium nitride and oxygen for inclusion formation in the case of Ti-killed steel. Tsujino et. al. [23] found deposition of alumina on zirconia-lime-graphite refractories as a consequence of reducing reactions by graphite.

2.2.4 Submerged Entry Nozzle Clogging

Clogging deposit from a submerged entry nozzle has been investigated. Based on the shape of the particles, it is concluded that clogging is mainly due to reoxidation of the steel.

Clogging by aluminum oxide in submerged entry nozzles (SENs) decrease casting productivity and is a source of surface defects on the steel product. Different mechanisms for Al_{oxy} build-up have been put forward [24,25]. It is generally assumed that the clogging deposit is mainly due to the attachment of oxide particles onto the inner surface of the SEN refractory followed by sintering. Sintering of the small deposited particles would create an irregular network [24]. Since clogging requires the presence of large amounts of particles, the flow characteristics through the nozzle have been modeled in a number of studies [26-29]. Mainly the mechanisms of transport of inclusions to the walls and the flow behavior at - or nearby -- the wall were investigated. The formation of a reaction layer between the refractory material and the steel may enhance deposition. In particular if the refractory contains reducible components, e.g. silicon oxide. The in situ formed gases like CO or SiO may transport oxygen into the steel and by reacting with dissolved aluminum; aluminum oxide particles form [19-23,30,31]. Alavanja et al. [32] noticed that the aluminum oxide network morphology, found in clogging deposits is very similar to that of the clusters observed in liquid steel after deoxidation of the steel, i.e. deoxidation at high oxygen concentration. Therefore, it has been suggested that the clusters observed in the clogging deposit are formed as a result of reoxidation in the tundish. McKague et al. [33] correlated catastrophic clogging of calcium treated steel to reoxidation of the steel during tundish fill. Reoxidation resulted in additional formation of aluminum oxide, which transformed the liquid calcium aluminates into solid aluminum oxide-rich calcium aluminates particles that caused clogging. Apart from atmospheric reoxidation due to turbulence in the tundish, the tundish flux may also affect the steel cleanliness. A number of studies describe the effect of tundish fluxes with different basicity on steel reoxidation [32,34,35]. Fluxes with FeO, MnO and SiO_2 are reduced, which results in aluminum loss, and manganese and silicon pickup by the steel. Furthermore, the flux properties affect the inclusion separation and therefore the steel cleanliness. Schmidt et al. [36] were able to reduce the amount of reoxidation and clogging by better argon shielding of the ladle to shroud joint and by better use of argon in the well nozzle and the upper plate.

2.2.5 Deoxidation with Aluminum

The following reaction occurs when Al is added to steel.

$2[Al] + 3[O] = Al_2O_3\,(s)$

$\text{Log } K = -(62680/T) + 31.85$ [37]

The equilibrium between pure alumina and Al in liquid steel is well known. The amount of dissolved oxygen at different Al contents and temperature is shown in Figure 2.2. When the Al killed steel is treated with Ca the natural inclusion becomes calcium aluminate and a decrease in the soluble oxygen content of the steel results as shown in Figure 2.2.

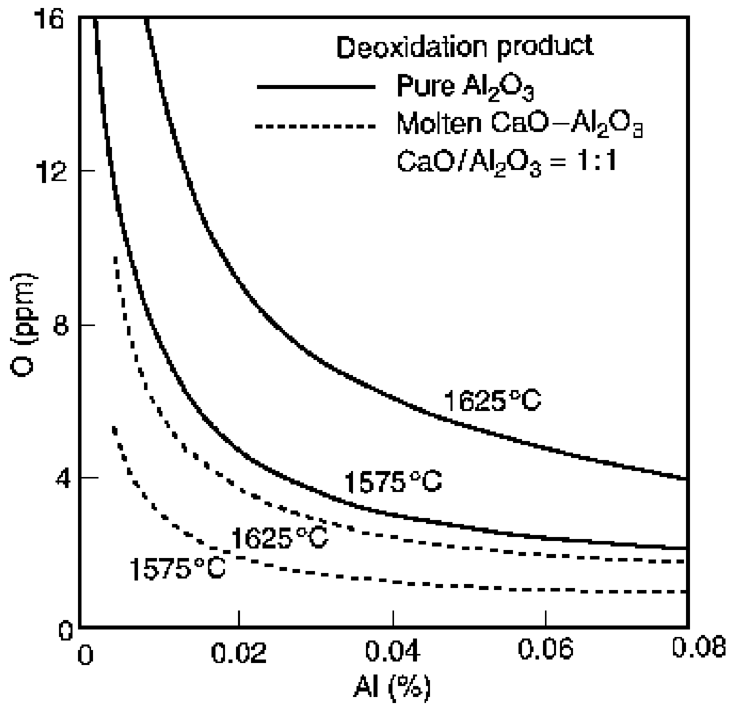

Figure 2.2. Deoxidation with aluminum in equilibrium with Al_{oxy} or molten calcium aluminate with CaO/Al_{oxy} = 1:1.

2.3 REASONS AND REMEDIES

According to a study [38] aluminum, calcium, sulfur and the percentage of CaO in aluminates in steel are strictly connected with each other. If the aluminum content of steel is 0.030%, to obtain 50% CaO, which is the objective to transform the aluminates into liquid phase, calcium content should be around 15 ppm. Then, the maximum content to avoid CaS formation can be 0.015%. If the aluminum content is 0.040% in the liquid steel, 19 ppm calcium is necessary and this leads to a maximum sulfur content as 0.009%. The sulfur contents higher than these numbers cause CaS formation. Increasing casting temperatures permit higher aluminum and sulfur contents to cast without CaS formation.

Turkdogan [39] declares that CaS is expected to form during the calcium treatment of Al-killed steels containing more than 0.01%S. An experiment mentioned in the article has a result that the alumina inclusions could not be converted to molten calcium aluminate with Ca injection in the steels containing 0.05 to 0.12% S and 0.01 to 0.04% Al. The tests taking Ca and Al into consideration say that the ratio Ca/Al >0.14 is necessary for flowability; however Turkdogan concluded that Ca/Al ratio has no physical significance as regards to castability for Al-killed steels with high sulfur containing 50 to 80 ppm total oxygen. It is the ratio Ca/O that is a meaningful measure of the steel castability. He also adds that incidents of nozzle blockage in billet casting of calcium treated grades may be reduced by a modified practice of deoxidation and calcium-aluminum addition.

There are several reasons that contribute to nozzle clogging:

- metallurgical factors: steel cleanness and aluminum content,
- hydrodynamic factors: steel flow rate and nozzle geometry,
- thermodynamic factors: cold steel and heat transfer inside the nozzle,
- nozzle material, and unpredictable disturbances and operational faults.

Clogging mechanism depends on the cleanness of steel [40]. With clean steels, the clogging consists of solidified steel, but in other cases powdered aluminum oxide dominates.

Several methods have been used in avoiding nozzle clogging [25,41,42,43]:

- calcium silicate injection,
- improving steel cleanness,
- argon injection into the nozzle, and
- nozzle material, construction and geometry.

The effects of nozzle clogging to mold level control has been studied by Dussud et al. [44] and Graig et al. [45].

2.3.1 Clean Steel

The term "clean steel" is commonly used to describe steels that have low levels of the solute elements sulfur, phosphorus, nitrogen, oxygen and hydrogen; controlled levels of the residual elements copper, lead, zinc, nickel, chromium, bismuth, tin, antimony and magnesium; and, a low frequency of product defects that can be related to the presence of oxides created during the act of steelmaking, ladle metallurgy, casting and rolling. This last definition causes extreme problems to the steel manufacturer as the definition of "clean" is not absolute, is based upon the product formed from the casting and the in-service use or life of the product. In addition, the definition "clean" is comparative as each customer of a steel product has the ability to buy steel from around the world and compare the performance level of a given product based upon the supplier. In this system, as steel is a commodity, the best steel producer defines the level of quality that is expected by a customer and, as steel producers are continually striving to produce "cleaner" steels, the cleanliness standard desired by the customer is continuously changing as a function of time and technological improvements. The term "clean steel" is therefore continually variable depending upon the application and the competition between steel suppliers.

Due to the variable nature of the term "clean steel" it is more accurate to talk about "high purity steels" as steels with low levels of solutes and "low residual steels" as steels with low levels of impurities that originate from scrap remelting and "clean steels" as those steels with a low frequency of product defects that can be related to the presence of oxides. For example, there are "high purity, low residual clean steels" such as ultra deep drawing steel sheets for automobiles which require ultra-low carbon contents (< 30 ppm), low nitrogen contents (< 30 ppm) and the absence of oxide inclusions with diameters greater than 100 microns; and "low residual clean steels", such as those used for drawn and ironed cans, which are a standard low carbon steel (1006), without particular high purity requirements, but are ultra clean with the requirement that oxide diameters must be less than 20 microns. In addition, in forging and bearing grades, there are "clean steels" that require strictly controlled inclusion size distributions.

As measurement is a key in the determination of permissible inclusion content thin products that undergo significant drawing are very susceptible to variations in inclusion size distribution, as cracks or wire breaks can be easily counted. For example, in drawn and ironed cans, it is very common to count the number of cracked flanges per million formed cans and generally a performance of less than 10 ppm would be looked upon as an excellent performance. Another application that is amenable to measurement is bearing life. It is well known that total inclusion content (as measured by total oxygen content) has traditionally correlated with bearing life and decreased total oxygen contents (below 10 ppm) have lead to significant increases in bearing life and thus the drive to very low inclusion contents in bearing steels. In addition to total oxygen content, the total length of stringer inclusions after forging correlates well with bearing life and, at low total oxygen levels, efforts to reduce inclusion clustering leads to very long fatigue life for bearings.

There is one constant in the world of high purity, low residual and clean steels and that is the continual drive to reduce solute and residual contents in all steels and to control the frequency and size distribution of the inclusions that are found in all steels. Thus this chapter will focus upon an understanding of the fundamentals of the production of high purity, low residual clean steels, emphasizing the limits in current technology and the potential for the production of high purity, low residual steels with a low frequency of inclusions with average diameters less than 5 microns.

Clean steels are steels with a low frequency of inclusions of average diameter less than 5 microns. The major problems in clean steel manufacture are incomplete separation of clustered solid inclusions (> 5 microns in diameter), the presence of sporadic larger liquid inclusions due to emulsification of covering slag and the presence of solid materials that originate from the refractories used to contain steels. The equipment used to produce clean steel varies greatly between different steel plants; however, current clean steelmaking and casting practices are based upon the following principles:

Oxygen, which is dissolved in liquid steel at the steelmaking and melting stage, must be transformed into a solid or a gas and removed before casting.

The external oxygen sources that are responsible for the reoxidation of liquid steel must be eliminated at every step in the process.

The physical entrapment of the liquid fluxes used during steel refining and casting must be eliminated.

Refractories in contact with liquid steel must be chemically stable and resistant to corrosion and erosion.

These practical principles of clean steel manufacture are based upon an understanding of the importance of maintaining chemical equilibrium between the elements dissolved in liquid steel and the slag and refractory systems which are in contact with the liquid steel, and, of controlling fluid flow to avoid conditions at liquid slag-steel interfaces which could result in the physical entrapment of the covering slag.

Clean steel manufacture is dependent upon an understanding of the fundamental steps necessary to produce clean steel:

- generation of the inclusion;
- transport of the inclusion to an interface;
- separation of the inclusion to the interface; and,
- removal of the inclusion from the interface.

2.3.2 The Role of Oxygen In Steel

The oxygen content of steel depends upon the nature of the elements present in addition to iron, the most important being carbon. Related to the composition, the oxygen content of a melt before deoxidation is between 0.01 – 0.10 %. The purpose of the deoxidation process is to decrease the amount of oxygen in the steel. This may be accomplished by adding elements with a higher affinity for oxygen than iron to the steel. The mechanism of the deoxidation, sometimes called precipitation deoxidation, results in the formation of inclusions in the steel. Oxygen affinity of different elements is given by the curves of the free energy of formation of their oxides as a function of temperature in Figure 2.3.

In principle, all elements with a free energy of oxide formation lower than FeO may act as deoxidizers. Deoxidation may occur at constant temperature when the deoxidizer is added to the melt, resulting in the formation of primary deoxidation products. Furthermore, it may also occur during cooling of steel at decreasing temperature due to the decreasing solubility of oxygen, called secondary deoxidation. By means of controlling the amount of oxygen, it is possible to produce rimming (non-deoxidized), semi-killed and fully killed steel types.

The Ellingham Diagram given in Figure 2.3 shows that aluminum is a very effective deoxidizing element.

2.3.3 Reoxidation

Reoxidation is probably the most common cause of macro inclusion formation in casting [46-48]. To understand reoxidation one must understand that liquid iron is not stable in the presence of oxygen and that the spontaneous reaction that occurs leads to the formation of iron oxide. As deoxidizers are added the steel remains unstable in the presence of oxygen as a gas but now the inclusions that form include the oxides of the deoxidants.

Some deoxidants, notably aluminum, magnesium and calcium, form very stable oxides that are more stable than some slag chemistries and some refractory chemistry. In this circumstance the steel reacts with the less stable oxides. The reoxidation can occur by reaction with:

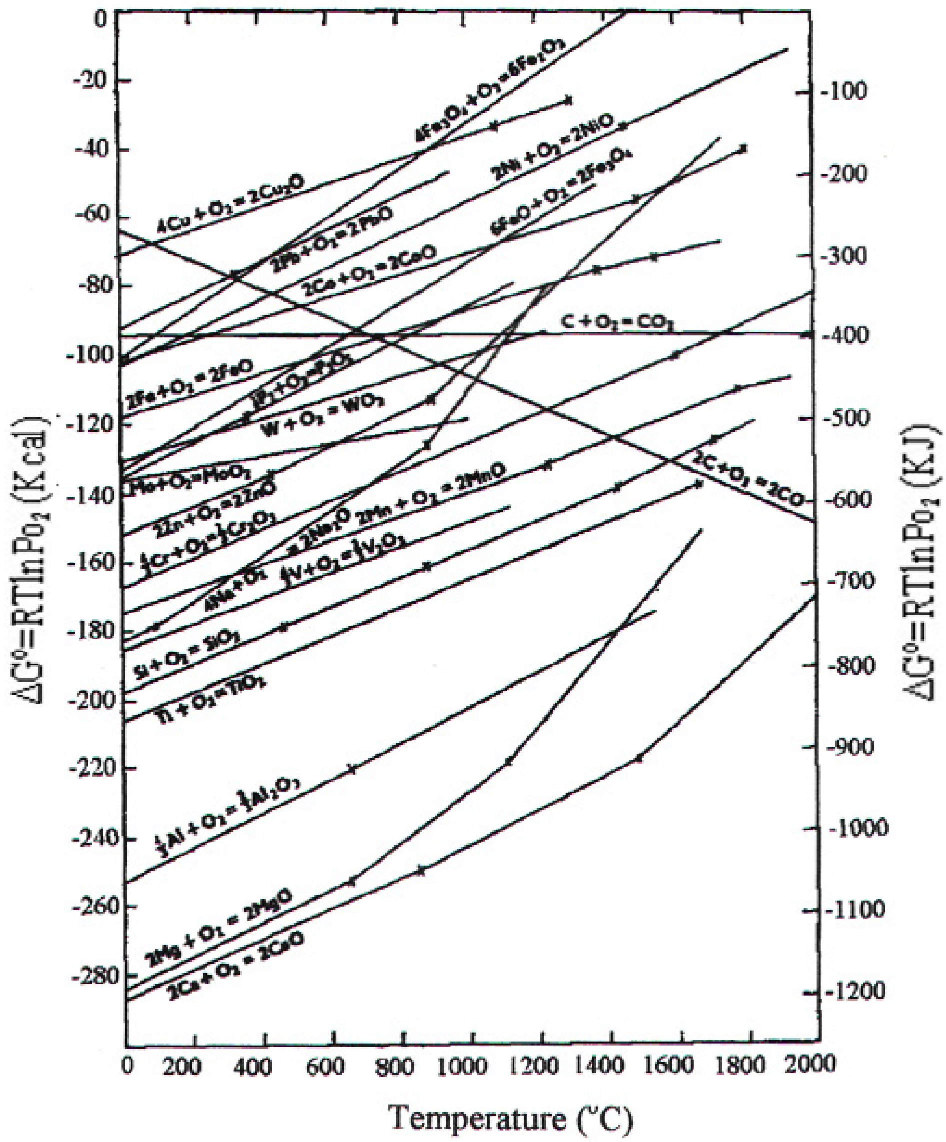

Figure 2.3 Standard free energies of formation of various oxide of the elements.

- The ambient atmosphere (air)
- The slag components less stable than the oxide of the deoxidant
- The refractories which are less stable than the oxides of the deoxidant

Table 2.1 Source of reoxidation.

Source of Reoxidation	Inclusion Type	Comments
Contact with air	Inclusion chemistry can be quite variable depending upon the mass flux of reoxidation and the residence time of the inclusion in the liquid steel after reoxidation. It is not unusual to see inclusions containing all oxidizable elements from the steel, e. g. iron oxide, manganese oxide, alumina, silica etc..	Due to the high temperatures involved in steel processing, natural convection drives oxygen transport to liquid steel from the surrounding air atmosphere. Mass flux of oxygen during reoxidation can be very high.
Contact with slags containing high levels of FeO, MnO and Silica	In aluminum killed steels reaction with slags generally causes alumina growth.	Although the reaction rates between slags and steels can be lower than that found during air reoxidation, during high levels of liquid steel turbulence, such as that found during stirring or pouring, reoxidation levels from this source can be quite high.
Reaction with Refractories	Although generally a low reaction rate, this can be a significant issue in the casting of ultra-clean steels.	In casting the water content of molds can be a significant issue, leading to high reaction rates

2.3.4 Calcium Addition

Clogging of submerged entry nozzles (SEN) significantly decreases in case of calcium treated steels. Higher casting capacities and less replacement of SENs result in increased quantities of cast steel. Moreover, there are less casting irregularities, which results in less surface defects. Calcium treatment has been introduced in the seventies and is nowadays commonly used to control the properties of inclusions [49-63]. Calcium is added by wire injection of, e.g. ferro-calcium or manganese-calcium alloys. Appropriate additions of calcium to the liquid steel react with aluminum oxide particles and result in the transformation of solid aluminum oxide inclusions into liquid calcium aluminates. The amounts of calcium reacting with aluminum oxides must be controlled within narrow ranges, because otherwise solid calcium aluminates are formed (Fig. 2.4). This is less straightforward than it seems: calcium has a very low solubility in liquid steel and therefore the efficiency of calcium additions is low. Furthermore calcium must react homogeneously with all aluminum oxides in the steel melt, because otherwise calcium poor and calcium rich aluminates are formed. Castability decreases by presence of the high melting calcium aluminate inclusions, which may be even worse than the aluminum oxides [51,57,58]. The cost, low efficiency and necessary high process control make calcium treatments difficult.

Calcium treatment does not result in lower total oxygen contents or smaller inclusions. In fact, inclusions are less easily removed from the melt. Unlike aluminum oxides, which easily form aggregates if particles encounter, liquid calcium aluminates do not coalesce. In general this is due to the preferential surface occupation by certain atoms, which subsequently results in surface charging of liquid inclusions. Despite of that, customer’s demand for calcium treated steels is growing, because calcium treatment is also applied for desulphurisation. Lower residual levels of sulphur in the liquid steel, prevent the formation of manganese sulphide that may cause centre-line segregation and heterogeneous properties of the steel after rolling. Formation of solid calcium sulphide occurs after the transformation of aluminum oxide into calcium aluminate, which is energetically preferred. Therefore the calcium treatment is more efficient if the amount of aluminum oxide inclusions is minimal. Similar results are obtained by additions of rare earth elements, which favour the formation of globular non-deformable sulphides or oxysulphides if added after calcium treatment [64].

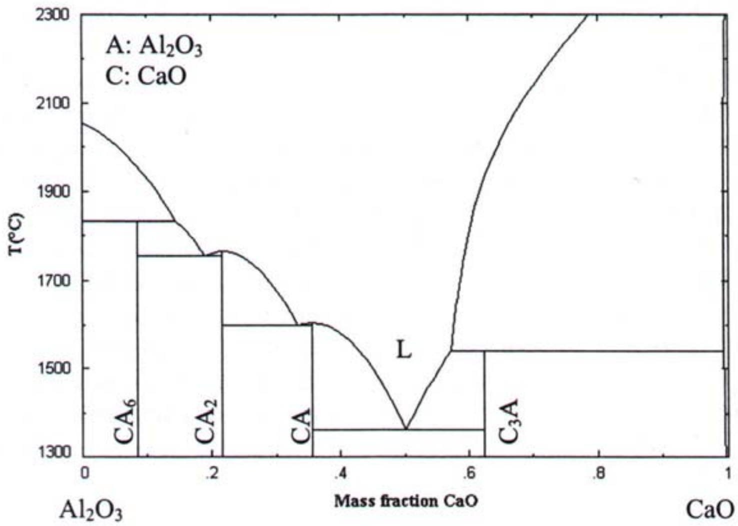

Figure 2.4 The $A1_20_3$-CaO phase diagram. There is only a narrow range (at about 1600º C) for the formation of liquid calcium aluminates.

Calcium treatment is an example of morphology control by changing the composition of the inclusions. The number and size of the calcium aluminates are closely related to the steel cleanliness prior to calcium addition, because the aluminum oxide inclusions created during the deoxidation practice are transformed. Since calcium aluminates exhibit minor tendency to separate from the steel, control of the number and the size of aluminum oxide inclusions is of paramount importance for obtaining clean steels.

From laboratory experiments, the shape of inclusions has been found to depend on the dissolved oxygen content, on the concentration gradient of oxygen and aluminum in the liquid steel, on the holding time and on the stirring method. Clusters are removed within about 15 minutes after aluminum addition. Enhancement of cluster formation during the deoxidation process, will therefore probably result in a high inclusion removal rate and a low residual O_{tot} in the steel bath.

2.3.5 Calcium Treatment to Avoid Nozzle Clogging

During the development of the continuous casting process to make tube rounds and billets, steelmakers were confronted with clogging problems of small diameter nozzles. Such clogging is induced by the deposit and sintering of solid inclusions on the wall of the nozzles. Alumina, silica, calcium sulfide, cerium oxysulfides, titanium oxides are all solid at casting temperatures and, therefore, can be responsible for nozzle clogging. Aluminum killed steels show a rapid clogging of small nozzles when the aluminum content is over 0.010%.

Nozzle clogging is solved by the introduction of pure calcium or calcium alloys into the liquid steel, preferably into the ladle just before casting. Calcium modifies the nature of inclusions at casting temperature, for example, into calcium aluminates in aluminum-killed steels, and anorthite in silicon killed steels. Adding 0.3 to 1.5 kg/T of CaSi (30% Ca) is generally used depending on the quantity of solid inclusions in the steel before treatment. Cored wire injection is the best process for this treatment because of its better yield and excellent reproducibility of results.

Calcium Treatment in Aluminum Killed Steels: Calcium is used to transform the solid alumina and silica-aluminates formed by aluminum deoxidation into calcium aluminates that are liquid at casting temperatures. In clean steels a thin layer of complex sulfides of Mn and calcium covers these aluminates.

Calcium treatment using cored wire is achieved by injecting 0.15 to 0.5 kg of Ca per ton depending on the steel grade being treated. The success of such a treatment is largely related to the amount of residual alumina inclusions in the steel at the moment of calcium injection and the following guidelines are suggested.

- deoxidation by aluminum as soon as possible (on tapping of furnace or converter) into a basic ladle

- gentle stirring of steel under a well deoxidized, basic, liquid slag to obtain good partition of alumina particles by the slag
- injection of Ca or CaSi alloys as late as possible
- good subsequent protection of the steel streams against reoxidation

With an effective calcium treatment, all inclusions in such treated steels remain globular during hot rolling if the sulfur content is sufficiently low, for instance, less that 50 ppm. Without any stringers, such steel has similar mechanical properties in the longitudinal and in the transverse directions. The steel is quasi-isotropic with outstanding properties and suitable for a wide range of applications.

2.3.6 Injection of Al and CaSi

Injection of Al and CaSi (wire or powder) has gone through a big growth in the past decade due to increase in need of clean steel. Injection techniques have the advantage of dispersing the reactant in the steel bath and providing a large reaction surface area. It also is the best way of getting large quantities of volatile reactants into the steel bath. There are two basically different types of injection techniques; wire feeding or injection via a feeding machine and powder injection system in which argon is used to transport the injected material through a lance employed to disperse the react ant in the steel bath.

When alloy additions are made to steel, quite often a steel shell forms around the alloy. The same occurs in wire injection. The formation of shell allows to be injected deep into the bath. This is especially important for Ca injection because it is very volatile. To increase the efficiency of Ca injection, CaSi powder and wire is produced because in the presence of Si, the solubility of calcium in iron increases while evaporation pressure of calcium decreases [65].

The aim of Al wire feeding is to improve the deoxidation efficiency of steel and increase the recovery of Al. Since Al concentration in steel cannot be controlled precisely when lump Al is added to the ladle in ladle furnace because of its low density and high affinity to oxygen. Good control of aluminum content at each stage of steel making is essential to ensure trouble free processing and to meet finished steel requirements.

Poor control leads to problems such as:

1. Poor desulphurization performance,
2. Increased problems of castability,
3. Inability to meet product specification requirements in terms of composition and for mechanical properties.

Al is generally added to the ladle in the form of bars during the tapping and subsequently inert gas stirring is applied. Aluminum control under these circumstances is relatively poor due to variable alloy recoveries principally as a result of losses to the slag carried over from the vessel. To improve the control of aluminum the injection of aluminum as wire can be applied. This practice gives reliable aluminum recoveries [66].

In the study of Gloria, Farrell and Hilty [67], it has been found that nozzle blockage was eliminated when Ca%/Al% ratio was increased to above 0.14. Contamination of the steel by Mg should be minimized because Mg forms $MgO.Al_2O_3$ (melting point 2130 ºC), which causes nozzle blockage also.

CHAPTER 3

EXPERIMENTAL

3.1 DESCRIPTION OF ISDEMIR IRON AND STEEL PLANT

Isdemir was designed to produce crude steel with the capacity of 1,100,000 tons/year in 1970 and also by some investments the other facilities were completed into operation individually from 1970 to 1975. In 1984, the crude steel capacity caught up with the aimed target of 2,200,000 tons/year.

On 31 January 2002, Iskenderun Iron and Steel Works Co. was privatized by Ereğli Iron and Steel Works Co. (Erdemir) and all the shares were acquired by Erdemir in accordance with the agreement between the Privatization High Council and ERDEMIR.

Among the other integrated steel works in Turkey, Isdemir stands the third in view of chronological order, yet it is the leading one when national output of long products are considered.

Iskenderun Iron & Steel Works Co. (ISDEMIR) is located in the South – Eastern part of Mediterranean, at Iskenderun bay. It is 17 km from Iskenderun and covers an area of 8.6 million m^2 as given below;

Production Facilities & Residential Area	: 5.4 million m^2
Residential Area (Flats and Social)	: 1.4 million m^2
Port Area	: 1.1 million m^2
Slag Area	: 0.3 million m^2
Others	: 0.4 million m^2
TOTAL	: 8.6 million m^2

3.2 DESCRIPTION OF STEEL PLANT

The steel plant consist of desulphurisation plant, B.O.F. plant, converters, oxygen lances, converter boilers, gas cleaning system, secondary metallurgical plant (electrical), secondary metallurgical plant (chemical), continuous casting plants, billet casting machines, bloom casting machines. Details related to these units are as follows:

3.2.1 Desulphurisation Plant

Start-up	: July 1987
Number of Station	: 2
Production Capacity	: 1,000,000 tons/year
Injection Type	: Blowing with lance (Granulated Mg)
Number of Ladles	: 24 pig ladles

3.2.2 B.O.F. Plant

Number of Mixer	: 2
Capacity of Mixers	: 1,300 tons

3.2.3 Converters

Number of Converters	: 3
Start-up	: 1977, 1984

Type of Converters	:	BOF Top Blowing
Capacity of Converters	:	117 tons/heat
Average Production Capacity	:	50 heats/day
Tap to Tap Time	:	45-52 min

3.2.4 Oxygen Lances

Number of Lances	:	2 lances/converter
Oxygen Design Flow rate	:	350 Nm^3/min
Design Pressure	:	9-10 Atm.

3.2.5 Converter Boilers

Number of Boilers	:	3
Boiler Type	:	QKR.6
Steam Production	:	0.25 Tons/ton liquid steel

3.2.6 Gas Cleaning System

Type	:	Wet
Entry Gas Quantity	:	200,000 $m^3/hour$
Stack Gas Partical Emittions		
Before washing	:	150 gr/m^3
After washing	:	70 gr/m^3

3.2.7 Secondary Metallurgical Plant (Electrical)

Start-up	:	July 1993
Heat Size	:	117 tons of liquid steel
Transformer	:	20 MVA
Primary/secondary volt.	:	34.5 kV/180 V
Secondary Current	:	36.7-38.4 kA

Pitch/electrode dia.	:	700/400 mm
Heating Rate	:	4-5 ºC/min
Taps	:	15 phase/6 i
Number of Alloying Bunkers	:	8
Injection	:	Ca-Si injection
Dedusting	:	Dry Type (box filter)

3.2.8 Secondary Metallurgical Plant (Chemical)

Start-up	:	October 1993
Type	:	IR-UT
Snorkel Dia. (inner/outer)	:	1.5 m
Heating rate	:	4.0-7.0 ºC/min
Height of Oxygen Lance	:	5.3 m
Oxygen Lance Stroke	:	6.7 m
Snorkel Weight	:	2 tons (refractory weight)
Number of Alloying Bunkers	:	4
Dedusting	:	Dry Type (box filter)

3.2.9 Continuous Casting Plants

Billet Casting Machines

Casting Type	: Curved
Number of Machines	: 2
Heat Size	: 115-118 tons/ladle
Production Capacity	: 2,000,000 tons/year
Mould Sizes	: 100x100, 110x110, 120x120, 130x130, 150x150, 160x160, 180x180 (mm x mm)
Mould Length	: 1000 mm
Casting Speed	: max 5 m/min
Tap to Tap Time	: 50 min
Tundish Capacity	: 32 tons

Tundish Liquid Steel Level	: 800 mm
Flow Control from Tundish	: Concast Nozzle Manupulator & Stopper Control
Number of Strands	: 6 /machine
Machine Radius	: 9 m
Metallurgical Length	: 26 m
Cutting Type	: Oxygen
Secondary Cooling	: Water

Bloom Casting Machines

Casting Type	: Radial
Number of Machines	: 3
Heat Size	: 117 tons/ladle
Production Capacity	: 1,100,000 ton/year
Mould Sizes	: 260x260, 260x335, 200x200
Mould Length	: 1000-700 mm
Casting Speed	: 0.7-1.0 meter/min
Tap to Tap Time	: 60 min.
Tundish Capacity	: 20 tons
Tundish Liquid Steel level	: 800 mm
Flow Control from Tundish	: Mono-block stopper
Number of strands	: 4 per machine
Machine radius	: 12 m
Metallurgical Length	: 18.84 m
Cutting Type	: Oxygen
Secondary cooling	: Water

3.3 EXPERIMENTAL PROCEDURE

In this work, nozzle clogging in continuous casting of low silicon Al killed SAE 1006 and SAE 1008 grades have been studied. Nozzle clogging is mainly encountered in the submerged entry nozzle in the casting of these steels. The study is accordingly related to nozzle clogging in the submerged entry nozzle. In this study, 75 heats for 1.2006 steel grades and 75 heats for 1.2008 steel grades have been investigated.

3.3.1 Practice for Production of Al Killed SAE 1006 And SAE 1008 Grades

Steel plant consists of 2 mixers of 1300-ton hot metal capacity and 3 converters of approximately 120 ton steel capacity. As to mention the auxiliary equipment; there are 2 ladle skimmers for Blast Furnace ladles slag skimming operation before charging into the mixers and 1 portable slag retention system for the converters.

Scrap charge is done according to the % Si, temperature of hot metal and previous heat end blow temperature where total charges as 138 tons. The hot metal filled in charge ladle is weighed, and then charged to the converters after scrap. Oxygen is blown with a 350 Nm^3/min. and 9.5 atm pressure app. 140-150 cm above the bath level. The lime added during oxygen blowing is done in the first 7-8 min. depending on the hot metal weight and silicon content. Al-killed steels is blown down to approximately 0.04 – 0.05 % C. At the end, the converter is tilted and temperature and analysis is taken. In the aluminum killed steels aluminum addition is 300-450 kg during tapping, depending on the end blow carbon (% 0.03-0.06). The only tapping addition is lime other than aluminum in these qualities.

There is one chemical heated ladle furnace and one arc heated ladle furnace.

When the ladle comes to the arc heated ladle furnace, bottom stirring starts. After 3 minutes temperature measurement is done and the first sample for chemical analysis is taken. 50 kg CaF_2 is added then. According to the result of the first sample and the sulfur content in steel 400-500 kgs CaO is added. Then FeMn is added according to the Mn content. Furthermore, the second sample is taken, and the temperature is increased up to 1615ºC. Then, if necessary Al wire injection is done. Finally, CaSi and CaFeAl wire injections are done. By decreasing the stirring rate, the final stirring is done. As a result of these operations ladle becomes ready for casting.

Data collection;

The experimental heats are of steel grades low silicon Al killed SAE 1006 and SAE 1008. The chemical compositions of these steels as given is the SAE J 403-1995 and DIN 17175 standard are given is Table 3.1 together with Isdemir specifications.

Table 3.1 The experimental heats are of steel grades low silicon Al killed SAE 1006 and SAE 1008.

SAE J 403-1995 , DIN 17175										
ISDEMIR NO	STANDARD			CHEMICAL COMPOSITION (%)						
				C	Mn	P	S	Si	Mo	Al
	Standard	Quality		max.	max.	max.	max.			
1,2006	SAE J 403	1006	Standard	0,08	0.25 - 0.40	0,040	0,050			
			Isdemir	0.03 - 0.07	0.25 - 0.40	0,025	0,025	0.04 max.		0.02 - 0.06
1,2008	SAE J 403	1008	Standard	0,10	0.30 - 0.50	0,040	0,050			
			Isdemir	0.05 - 0.09	0.30 - 0.50	0,025	0,025	0.08 max.		0.02 - 0.08

Chemical analyses were taken from spectral laboratory in quality metallurgy department. Analyses were taken from optic emission spectrometer as shown in Figure 3.1. Generally one analysis from converter, 3 from ladle furnace and 3 from tundish were taken by probes. The ladle first analysis refers to converter final.

Figure 3.1. Optic emission spectrometer.

Total Ca addition at secondary metallurgical plant (electrical) is in terms of length of CaSi (40% Ca) and CaFeAl (30% Ca) wires. The lengths were converted into weight of Ca form from the known weight per unit length (200 g/m) and the known Ca content of the wires.

Number of oxygen blowing to submerged entry nozzle (SEN) and ladle, number of nozzle changes, casting time were recorded for each heat in bloom casting machine. Nozzle (SEN) used in this study is silica type as shown in Figure 3.2.

Figure 3.2. Silica type nozzle (SEN).

CHAPTER 4

RESULTS AND DISCUSSION

4.1 GENERAL

The data consist of temperature and chemical analysis (C, Mn, S, P, Si, Cu, Ni, Cr, Al, Al_{sol}, Al_{oxy}, Ca, N), in ladle furnace and tundish, number of oxygen blowing to SEN and ladle, number of nozzle changes, casting time, amount of Ca injected. The available data were collected in the form shown in Tables 4.1 and 4.2 for each heat of this study.

4.2 CASTABILITY STUDIES

In this work, nozzle clogging in the submerged entry nozzle in continuous casting of Al killed steels has been studied. The study has been based on low silicon Al killed SAE 1006 and SAE 1008 grades. In this study, 75 heats for 1.2006 steel grades and 75 heats for 1.2008 steel grades have been investigated. During casting of these steel grades the main problem is SEN clogging. In Isdemir specifications because of high Al (up to 0.080 %Al) content in these steel grades, there is no blowhole formation and the main problem is SEN clogging during continuous casting. A photograph of steel taken out from a completely blocked SEN is shown in Figure 4.1. Clogging occurs because of the inclusions mostly alumina inclusions. Those are solid at casting temperatures and cause clogging in SEN. If clogging occurs during casting oxygen is blown to SEN to solve this problem. In this way, oxygen cleans the SEN and casting continues. Oxygen blowing results in surface defects in the bloom as shown in Figure 4.2. The section of the bloom having surface defects due to oxygen blowing should be cut. If this is not done and the bloom is rolled surface defects appear in the billets as shown in Figure 4.3. As a result, during casting of these steel grades the main problem is castability.

During the investigation, in some of these heats there have been castability problems, but on the other hand in some of them not. Castability is an essential point of these investigations. Castability in this study is based on:

- Number of oxygen blowing to nozzle,
- Number of nozzle changes,
- Casting time.

When castability decreases the number of oxygen blowing to nozzle, number of nozzle changes and casting time increases. The number of oxygen blowing to nozzle is between 0 and 16, the number of nozzle changed is between 0 and 3 and casting time is between 60 and 73 minutes in the experimental heats. Due to the range being larger in the number of oxygen blowing to nozzle this measure of castability will be used in the presentation of results although similar conclusions are obtained with the other two measures also. Castability was considered acceptable when number of oxygen blowing to nozzle was equal to or less than 2.

Data of all 1.2006 heats used in this study are given in Appendix A and data of all 1.2008 heats used in this study are given in Appendix B.

Table 4.1 Example of data configuration for each heat (1.2006 steel grade).

STEEL QUALITY 1-2006

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1572	10:30	10:25	260 X 335	10	10:45	1610	INTOCAST	32	(STAVERMA-SILICA)		17		14,24	17	2
1576	10:55	11:25		20	10:53						18		32	18	1
1576	11:00			30	11:10						19		13,35	19	2
											20		20,31	20	2

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7349	1	0,05	0,14	0,026	0,011	0,00	0,02	0,03	0,01	0,589	0,5302	0,0584	0,0009	0,0014
LADLE	7349	1	0,03	0,14	0,022	0,010	0,05	0,02	0,03	0,00	0,141	0,1289	0,0120	0,0004	0,0039
LADLE	7349	2	0,04	0,29	0,009	0,012	0,10	0,02	0,03	0,01	0,055	0,0520	0,0027	0,0019	0,0058
LADLE	7349	3	0,05	0,29	0,007	0,012	0,09	0,02	0,03	0,00	0,036	0,0341	0,0021	0,0005	0,0059
TUNDISH	7349	1	0,06	0,27	0,006	0,011	0,09	0,02	0,03	0,01	0,026	0,0231	0,0034	0,0003	0,0068
TUNDISH	7349	2	0,07	0,27	0,005	0,012	0,09	0,02	0,03	0,01	0,024	0,0206	0,0038	0,0002	0,0056
TUNDISH	7349	3	0,06	0,27	0,005	0,011	0,09	0,02	0,03	0,01	0,027	0,0194	0,0073	0,0002	0,0056

Table 4.2 Example of data configuration for each heat (1.2008 steel grade).

STEEL QUALITY														1-2008
TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN		LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED			Oxygen Blowing to Nozzle	
				meter	TIME					meter	canal	number	meter	canal	number
1580	16:23	16:20	260 X 335	10	16:41	1618	INTOCAST	32	IFGL	7	17	1	7,13,18	17	3
1561	16:46	17:30		15	16:50						18		8,19	18	2
1565	17:12			25	17:04						19			19	
										9	20	1	8,9,23	20	3
														LADLE	

CHEMICAL COMPOSITION (%)															
TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	8648	1	0,03	0,11	0,027	0,009	0,00	0,02	0,04	0,00	0,452	0,4043	0,0475	0,0001	0,0050
LADLE	8648	1	0,03	0,13	0,022	0,009	0,02	0,02	0,04	0,01	0,114	0,1002	0,0136	0,0004	0,0069
LADLE	8648	2	0,07	0,43	0,012	0,014	0,05	0,02	0,04	0,01	0,059	0,0564	0,0024	0,0022	0,0086
LADLE	8648	3	0,07	0,40	0,022	0,014	0,02	0,02	0,04	0,01	0,032	0,0291	0,0034	0,0000	0,0083
LADLE	8648	4	0,07	0,42	0,015	0,014	0,05	0,02	0,04	0,01	0,046	0,0447	0,0009	0,0023	0,0084
TUNDISH	8648	1	0,07	0,41	0,011	0,014	0,05	0,02	0,04	0,02	0,038	0,0297	0,0084	0,0005	0,0079
TUNDISH	8648	2	0,07	0,41	0,011	0,014	0,05	0,02	0,04	0,02	0,037	0,0269	0,0105	0,0005	0,0100
TUNDISH	8648	3	0,07	0,41	0,012	0,014	0,05	0,02	0,04	0,02	0,036	0,0280	0,0076	0,0005	0,0088

Figure 4.1 Steel sample taken from clogged nozzle.

Figure 4.2 Oxygen blowed bloom

Figure 4.3 Effect of oxygen blowing after hot rolling of blooms (Billet).

The effect of total Al content on castability is shown in Figures 4.4 and 4.5, respectively, for SAE 1006 and SAE 1008 grade experimental heats. Castability is expected to decrease with increase in Al content but Figures 4.4 and 4.5 indicate that castability increases with increase in total Al content. Best fitting lines have been drawn to indicate the trend only. Obviously the lines do not have any statistical significance.

Some of the aluminum in Al-deoxidized steels is in elemental (soluble) form and some in oxide (Al_{oxy}) form. Because Al is a strong deoxidizer the soluble Al content of moderately deoxidized steels is small and aluminum exists mainly as oxide. The steels investigated in this study are fully killed however and contain more than 0.01 % Al. Under these conditions, the soluble Al contents are not expected to be small. It is Al_{oxy} that causes nozzle blockage and not the total aluminum. It should accordingly be more appropriate to relate castability to Al existing in oxide form. Figures 4.6 and 4.7 clearly indicate that castability decreases with increase in Al content in oxide form.

To see the effect of both of the aluminum in oxide form and of the total aluminum, castability is plotted versus (Al_{oxy}/ Al_{tot}) ratio in Figures 4.8 and 4.9 for SAE 1006 and SAE 1008 grade experimental heats, respectively. Figures 4.8 and 4.9 indicate that castability of SAE 1006 and SAE 1008 experimental heats decrease with increase in the (Al_{oxy}/ Al_{tot}) ratio and reasonably good castabilities are obtained for (Al_{oxy}/ Al_{tot}) ratios below 0.15.

1.2006 (Al-killed SAE 1006)

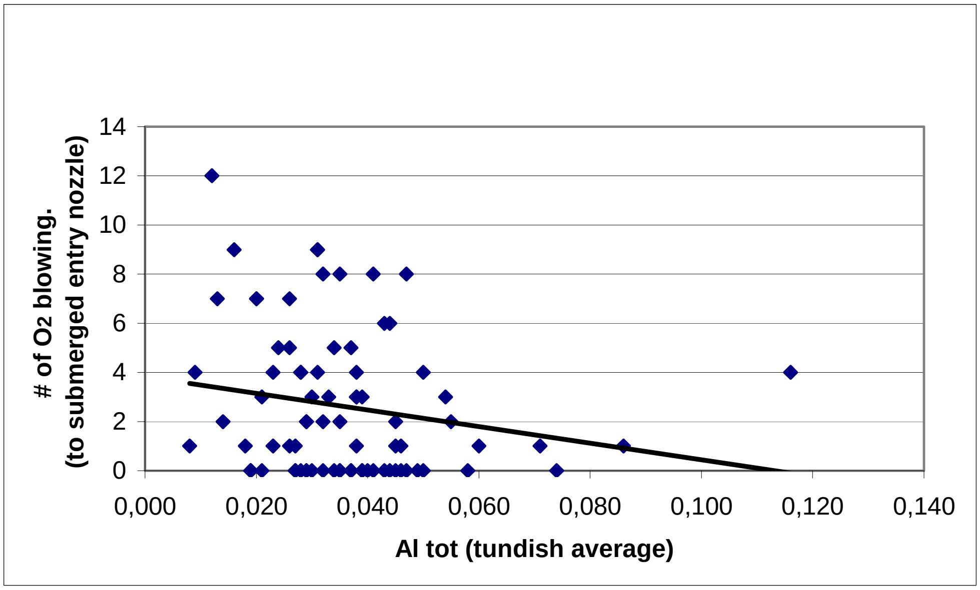

Figure 4.4 Al_{tot} (tundish average) vs. # of O_2 blowing. (to submerged entry nozzle) in 1.2006 (Al-killed SAE 1006).

1.2008 (Al-killed SAE 1008)

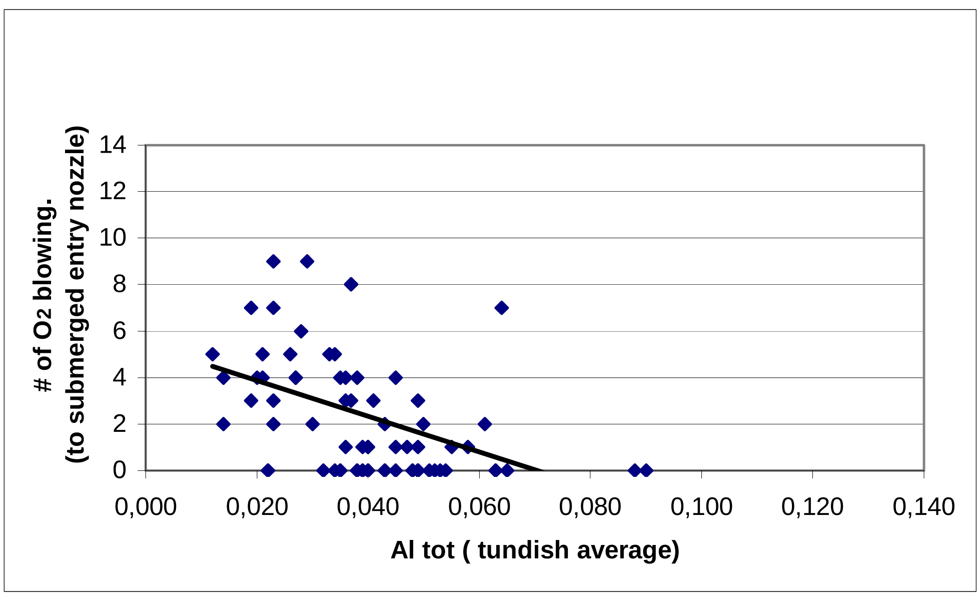

Figure 4.5 Al_{tot} (tundish average) vs. # of O_2 blowing. (to submerged entry nozzle) in 1.2008 (Al-killed SAE 1008).

1.2006 (Al-killed SAE 1006)

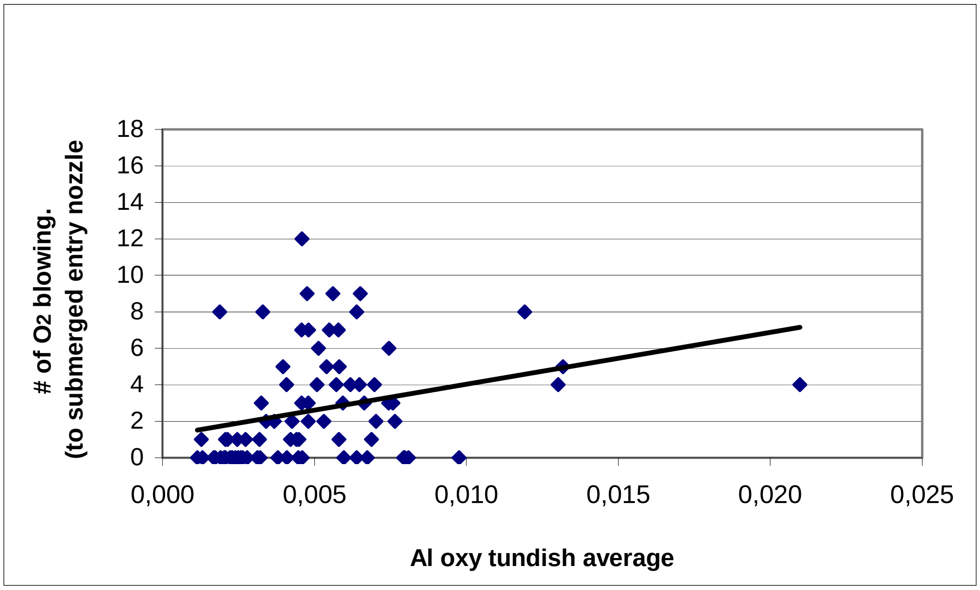

Figure 4.6 # of O_2 blowing. (to submerged entry nozzle) vs. Al_{oxy} tundish average in 1.2006 (Al-killed SAE 1006).

1.2008 (Al-killed SAE 1008)

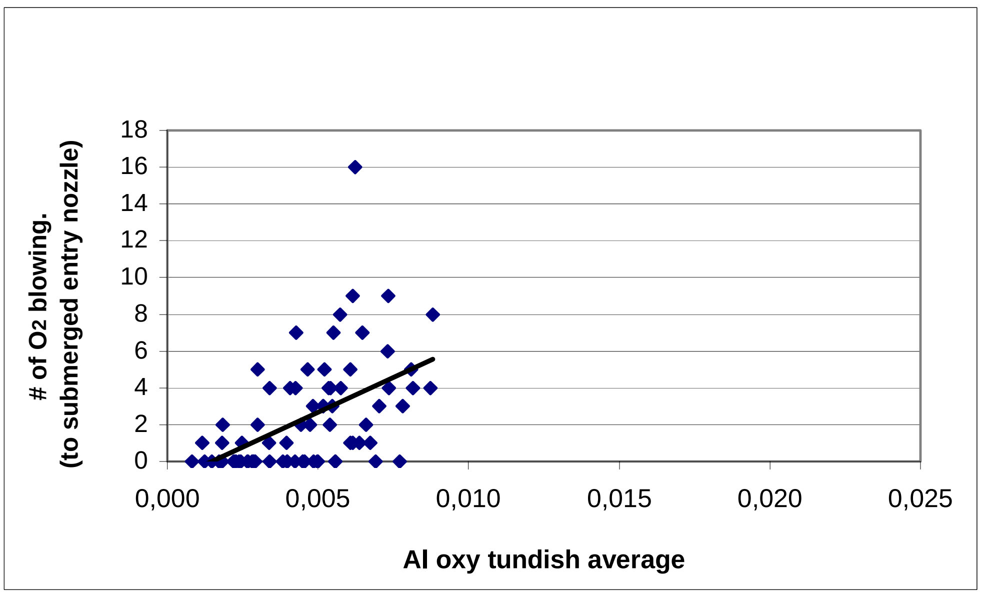

Figure 4.7 # of O_2 blowing. (to submerged entry nozzle) vs. Al_{oxy} tundish average in 1.2008 (Al-killed SAE 1008).

1.2006 (Al-killed SAE 1006)

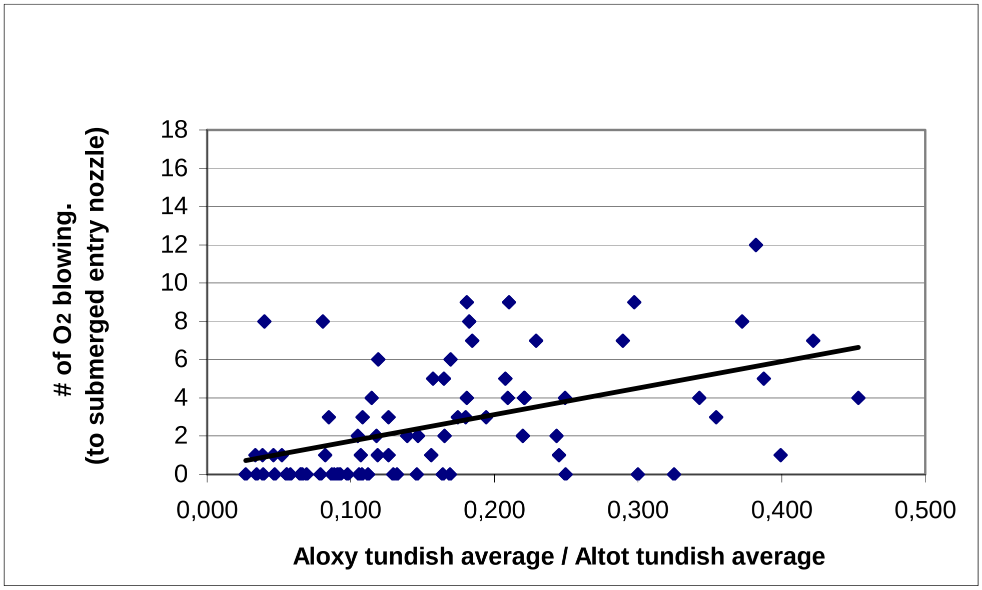

Figure 4.8 # of O_2 blowing. (to submerged entry nozzle) vs. Al_{oxy} tundish average / Al_{tot} tundish average in 1.2006 (Al-killed SAE 1006).

1.2008 (Al-killed SAE 1008)

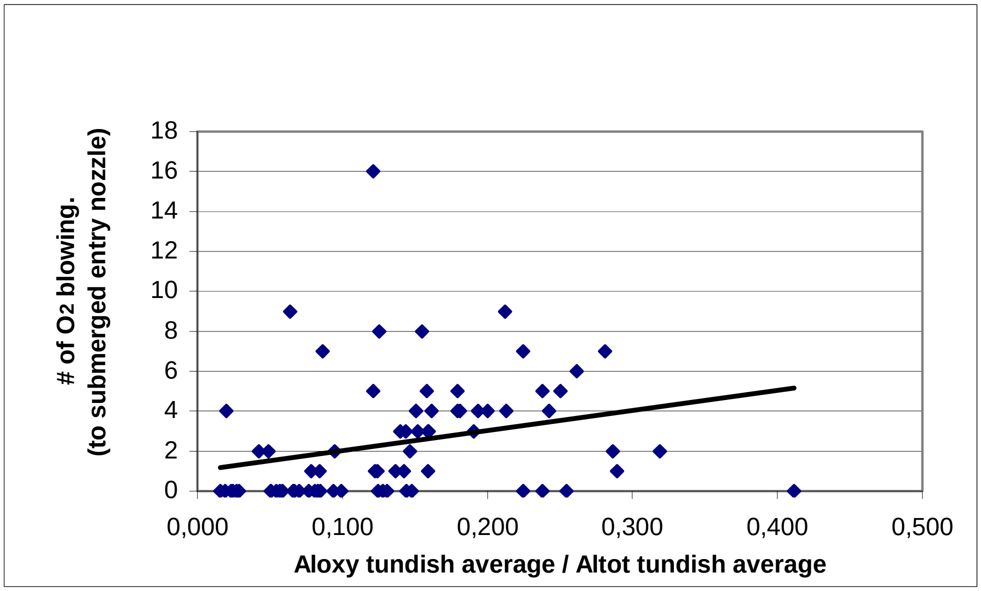

Figure 4.9 # of O_2 blowing. (to submerged entry nozzle) vs. Al_{oxy} tundish average / Al_{tot} tundish average in 1.2008 (Al-killed SAE 1008).

Al_{oxy} originates from deoxidation of steel in the ladle. Being lighter than liquid steel some of the Al_{oxy} inclusions float up and are removed from the steel. During processing of liquid steel after deoxidation some Al_{oxy} is formed with decrease in temperature some reoxidation may take place which gives rise to additional Al_{oxy} formation in Al-killed steels. Due to these reasons the total and the soluble Al contents of Al-deoxidized steels decrease with time after deoxidation whereas Al existing in oxide form may decrease or increase depending on the removal rate of inclusions by flotation and rate of reoxidation. A careful examination of data at hand clearly indicates that the total and soluble Al contents of the liquid steel in the tundish are lower than those in the ladle at the end of the ladle furnace stage just before calcium injection. The data also indicates that the Al content in oxide form of the liquid steel in the tundish is lower than that in the ladle at the end of the ladle furnace stage for some of the experimental heats and the opposite is true for the other experimental heats. The difference between the total Al content of the steel in the tundish and that in the ladle should give an indication as to how efficient the removal of Al_{oxy} inclusions is from the liquid steel. In view of this castability of steel would be expected to improve with increase in the difference between the total Al content of steel in the tundish and that in the ladle, ΔAl_{total}. The experimental data indicates exactly the opposite of what is expected as seen from Figures 4.10 and 4.11. Castability is seen to decrease with increase in ΔAl_{total}. Castability of steel is dependent on the Al content in oxide form Al_{oxy} and as shown in Figures 4.6 and 4.7 castability decreases with increase in Al_{oxy}. It may be more appropriate to use the difference between Al_{oxy} content of steel in the tundish and that in the ladle as a parameter affecting the castability.

1.2006 (Al-killed SAE 1006)

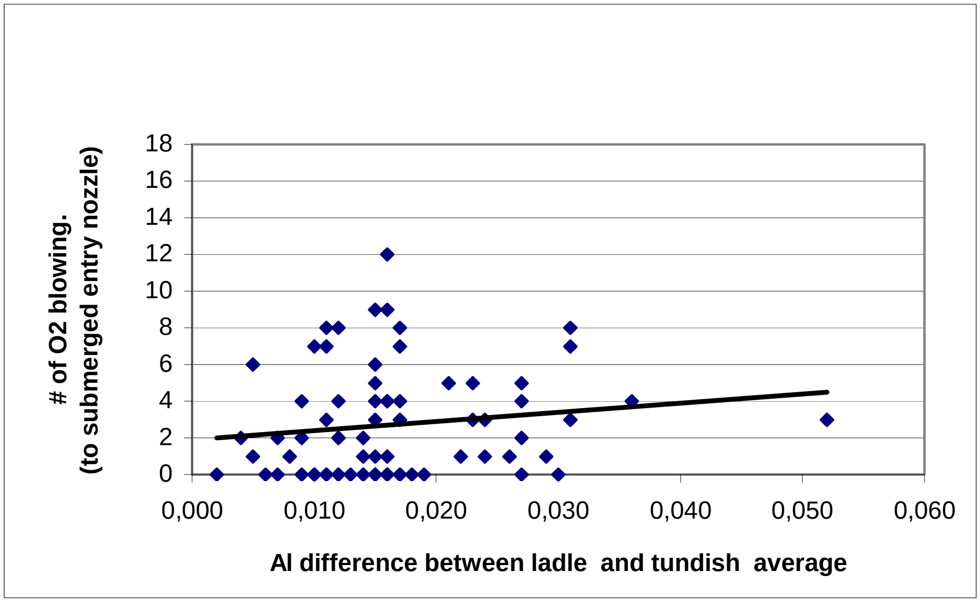

Figure 4.10 Al difference between ladle and tundish average vs. # of O_2 blowing.(to submerged entry nozzle) in 1.2006 (Al-killed SAE 1006).

1.2008 (Al-killed SAE 1008)

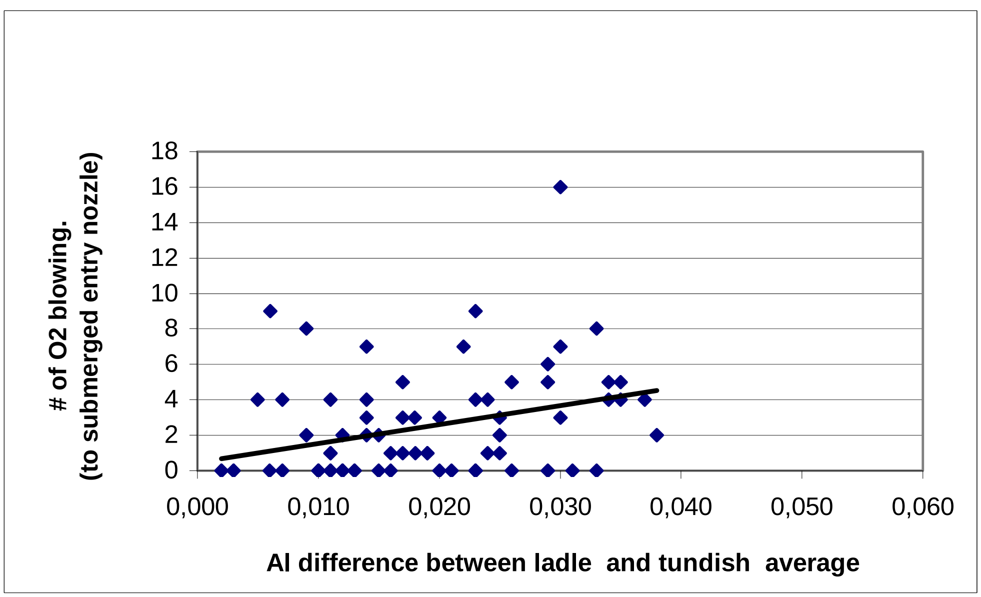

Figure 4.11 Al difference between ladle and tundish average vs. # of O_2 blowing. (to submerged entry nozzle) in 1.2008 (Al-killed SAE 1008).

The castabilities of SAE 1006 and SAE 1008 grade experimental heats are plotted against ΔAl_{oxy} in Figures 4.12 and 4.13, respectively. It is to be noted that a positive ΔAl_{oxy} means that Al_{oxy} in tundish is larger than that in the ladle which may be taken as an indication that extent of formation of Al_{oxy} due to reoxidation exceeds extent of removal of oxide inclusions from liquid steel by flotation. The opposite is true when ΔAl_{oxy} is negative. The castability is seen not to be affected with ΔAl_{oxy}. It is interesting to note that castability does not even improve with negative values of ΔAl_{oxy}.

This may arise from already large Al_{oxy} in the ladle when any increase or decrease of Al_{oxy} in the tundish will not have an important effect. To take the Al_{oxy} content of the steel in the ladle also into account the castabilities of SAE 1006 and SAE 1008 grade experimental heats are plotted against ΔAl_{oxy} / Al_{oxy} in ladle in Figures 4.14 and 4.15, respectively. These figures indicate also that castability is not appreciably affected by (ΔAl_{oxy} / Al_{oxy} in ladle) ratio except when this ratio is larger than 3 for SAE 1008 grade experimental heats for which castability decreases with increase in ΔAl_{oxy} / Al_{oxy} in ladle ratio. For most of the data points in Figures 4.12 to 4.15 ΔAl_{oxy} is positive indicating that there is some reoxidation in going from the ladle to the tundish but reoxidation does not appear to be very important for castability except when reoxidation is severe; it appears that Al_{oxy} content of the steel in the ladle is quite large and castability primarily depends on Al_{oxy} of the steel in the ladle. That this is the case can be seen from Figures 4.16 and 4.17 where castabilities of SAE 1006 and SAE 1008 grade experimental heats, respectively, are plotted against the Al_{oxy} content of steel in the ladle.

1.2006 (Al-killed SAE 1006)

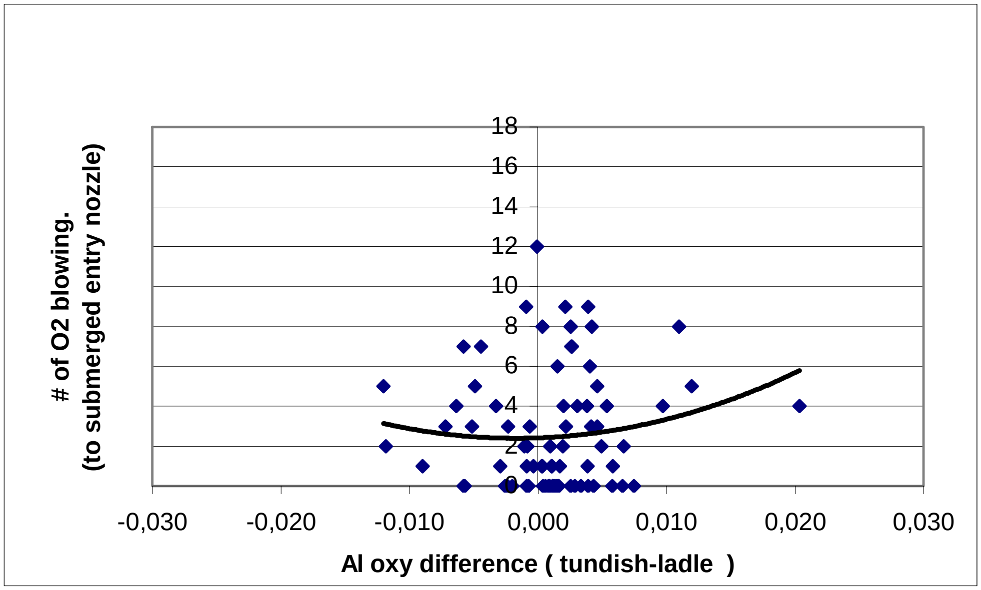

Figure 4.12 # of O_2 blowing. (to submerged entry nozzle) vs. Al_{oxy} difference (tundish-ladle) in 1.2006 (Al-killed SAE 1006).

1.2008 (Al-killed SAE 1008)

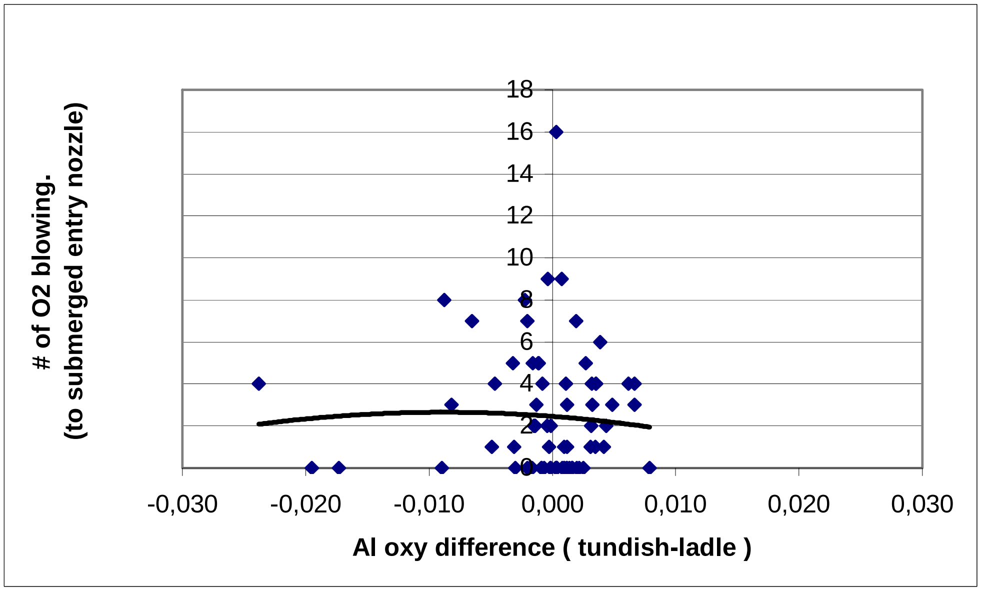

Figure 4.13 # of O_2 blowing. (to submerged entry nozzle) vs. Al_{oxy} difference (tundish-ladle) in 1.2008 (Al-killed SAE 1008).

1.2006 (Al-killed SAE 1006)

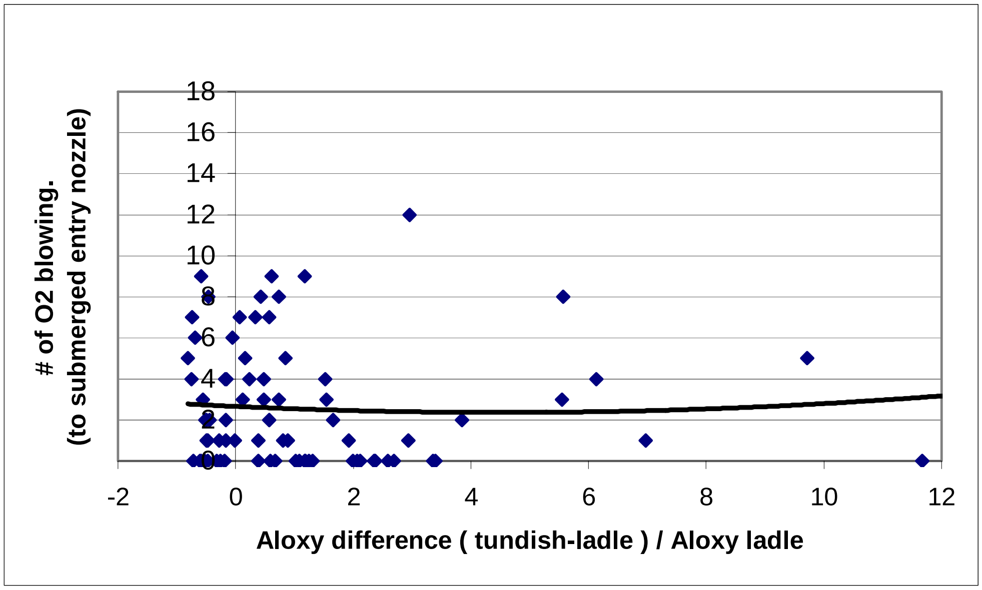

Figure 4.14 # of O_2 blowing. (to submerged entry nozzle) vs. Al_{oxy} difference (tundish-ladle) / Al_{oxy} ladle in 1.2006 (Al-killed SAE 1006).

1.2008 (Al-killed SAE 1008)

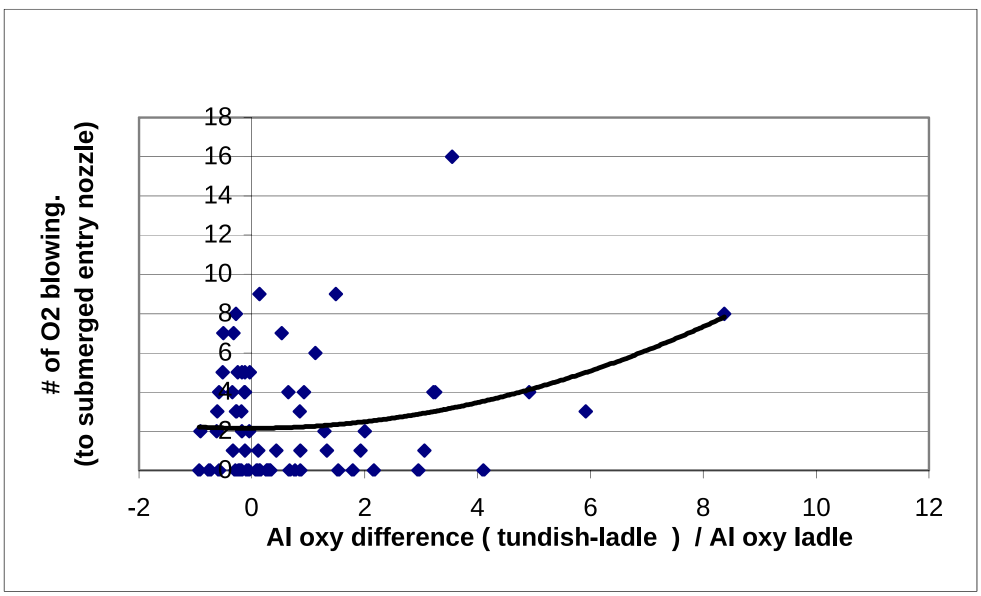

Figure 4.15 # of O_2 blowing. (to submerged entry nozzle) vs. Al_{oxy} difference (tundish-ladle) / Al_{oxy} ladle in 1.2008 (Al-killed SAE 1008).

1.2006 (Al-killed SAE 1006)

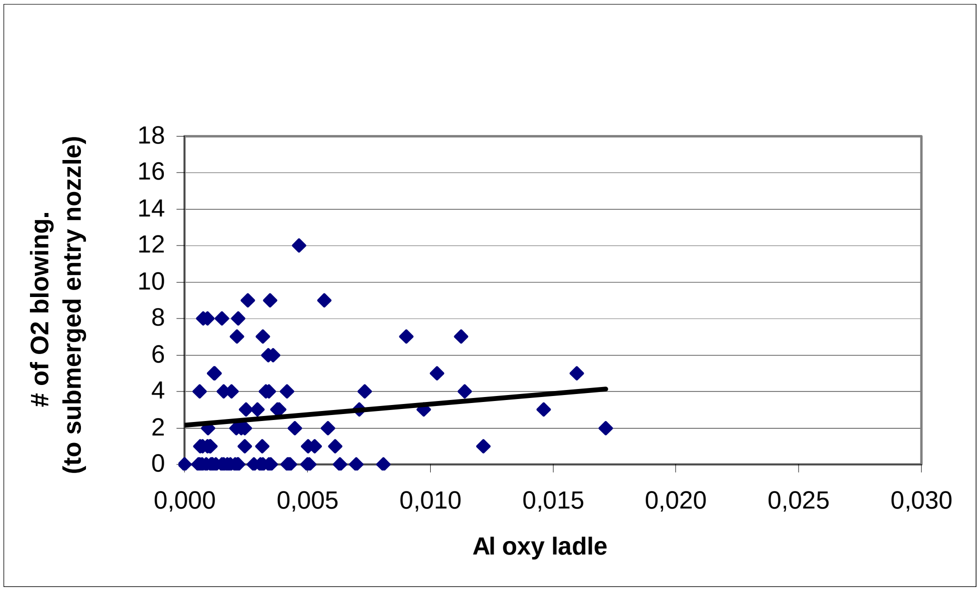

Figure 4.16 # of O_2 blowing. (to submerged entry nozzle) vs. Al_{oxy} ladle in 1.2006 (Al-killed SAE 1006).

1.2008 (Al-killed SAE 1008)

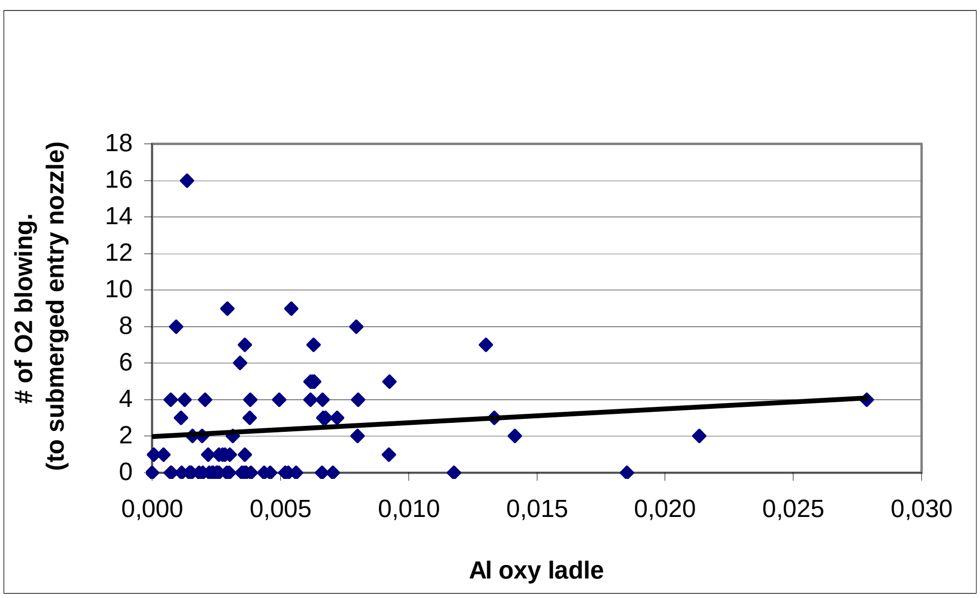

Figure 4.17 # of O_2 blowing. (to submerged entry nozzle) vs. Al_{oxy} ladle in 1.2008 (Al-killed SAE 1008).

The results presented above clearly indicate that castabilities of SAE 1006 and SAE 1008 grade experimental heats decrease with increase in Al_{oxy} content of liquid steel but the data is quite scattered. One possible reason for this scatter is that these steels were all Ca-treated and the effect of Ca was not taken into consideration in the above presentation. Ca injected into Al-deoxidized steels reacts with Al_{oxy} inclusions and convert then into calcium aluminates which may be liquid at steelmaking temperatures if the CaO/Al_{oxy} ratio of the calcium aluminate inclusion is ~ 1 as stated in Chapter 2.

Castabilities of SAE 1006 and SAE 1008 experimental heats are plotted against the amount (in kilogram) of calcium injected in Figures 4.18 and 4.19, respectively. These figures indicate that castability is not improved by calcium addition contrary to expectation. Ca is a volatile metal and significant quantity of calcium is lost when calcium is injected into liquid steel and efficiency of retention of calcium in steel is quite variable. It should accordingly be more appropriate to examine the effect of calcium on castability by use of Ca content of steel. The castabilities of SAE 1006 and SAE 1008 grade experimental heats are plotted against the Ca content in Figures 4.20 and 4.21, respectively. These figures indicate clearly that castabilities of the experimental heats increase with increase in the Ca content and good castabilities are obtained when the Ca content is above ~ 15 ppm.

The results presented above indicate that castability decreases with increase in Al_{oxy} content and decrease in Ca content. To see the effect of both of the Al_{oxy} and Ca contents of steel on castabilty, castabilities of SAE 1006 and SAE 1008 grade experimental heats are plotted against Ca/ Al_{oxy} in Figures 4.22 and 4.23. These figures indicate clearly that castabilities of the experimental heats increase with increase in the Ca/ Al_{oxy} ratio and good castabilities are obtained when the Ca/ Al_{oxy} ratio > 0.2.

1.2006 (Al-killed SAE 1006)

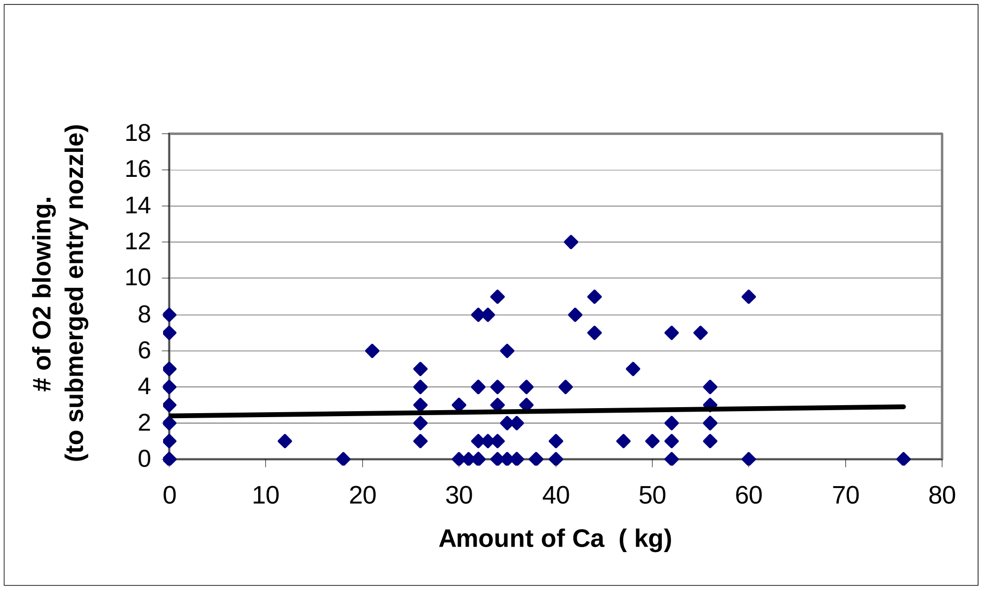

Figure 4.18 # of O_2 blowing. (to submerged entry nozzle) vs. Ca amount in 1.2006 (Al-killed SAE 1006).

1.2008 (Al-killed SAE 1008)

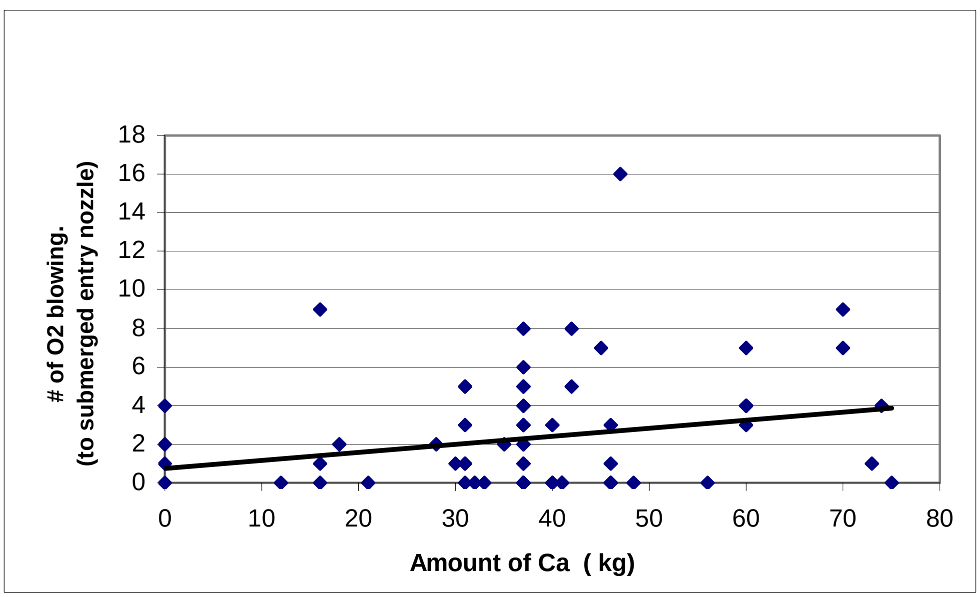

Figure 4.19 # of O_2 blowing. (to submerged entry nozzle) vs. Ca amount in 1.2008 (Al-killed SAE 1008).

1.2006 (Al-killed SAE 1006)

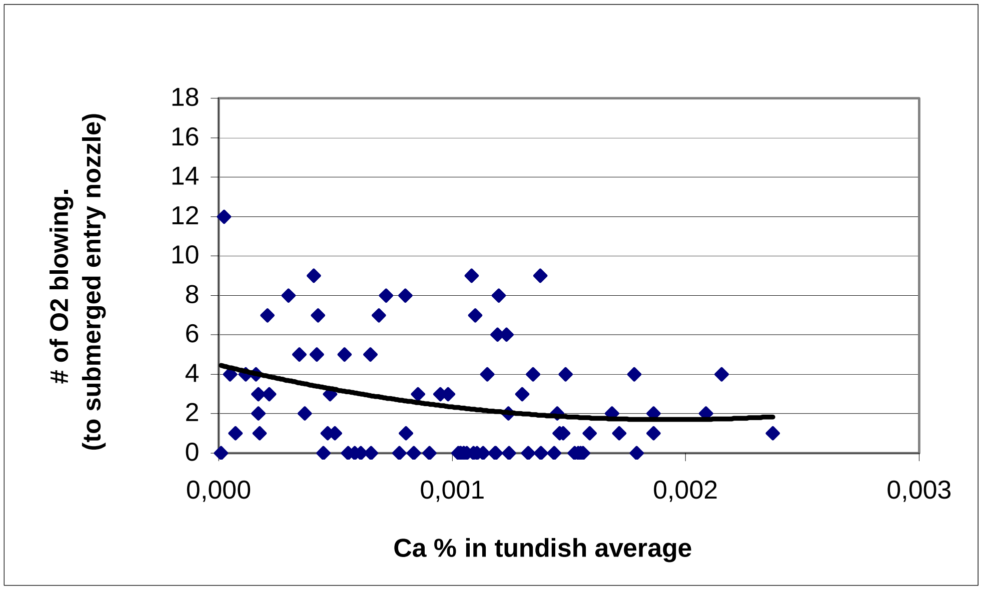

Figure 4.20 # of O_2 blowing.(to submerged entry nozzle) vs. Ca % in tundish average in 1.2006 (Al-killed SAE 1006).

1.2008 (Al-killed SAE 1008)

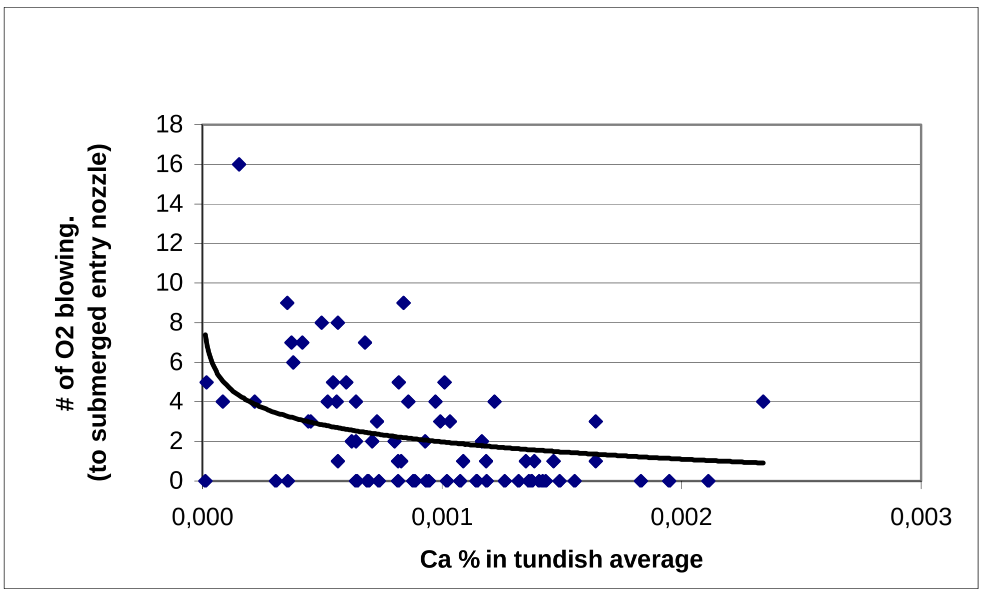

Figure 4.21 # of O_2 blowing.(to submerged entry nozzle) vs. Ca % in tundish average in 1.2008 (Al-killed SAE 1008).

1.2006 (Al-killed SAE 1006)

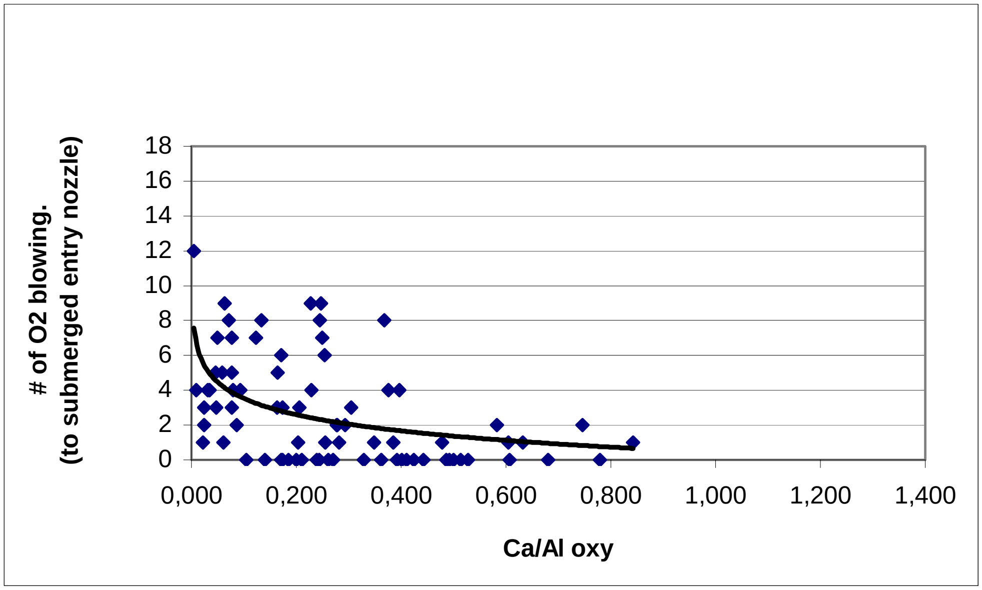

Figure 4.22 # of O_2 blowing. (to submerged entry nozzle) vs. Ca/Al_{oxy} in 1.2006 Al-killed SAE 1006).

1.2008 (Al-killed SAE 1008)

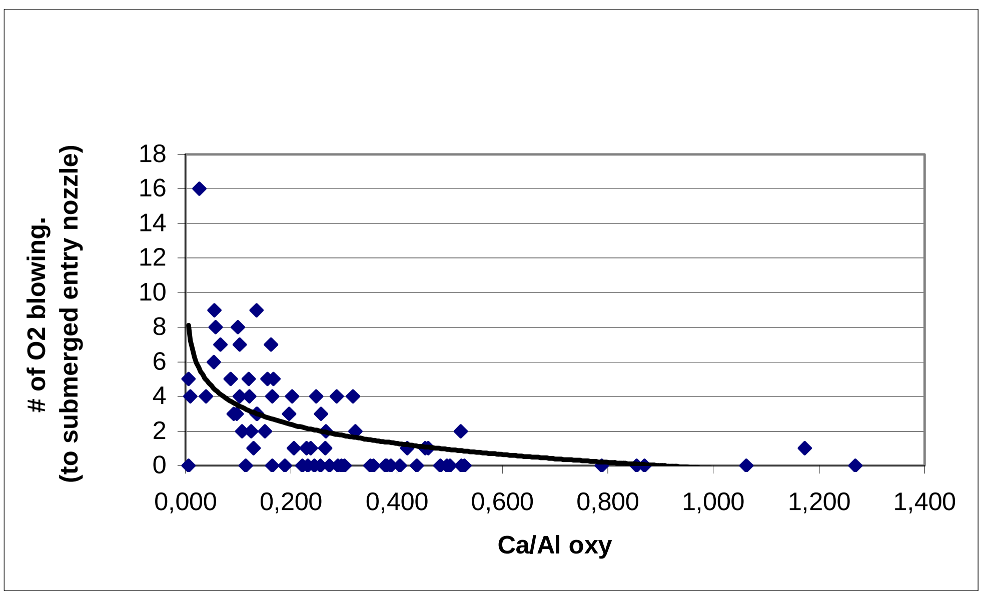

Figure 4.23 # of O_2 blowing. (to submerged entry nozzle) vs. Ca/Al_{oxy} in 1.2008 Al-killed SAE 1008).

CHAPTER 5

CONCLUSIONS

1. The results indicate that the primary source of Al_{oxy} is deoxidation.

2. There is some reoxidation, but reoxidation appears not to effect castability appreciably.

3. Castability of SAE 1006 and SAE 1008 experimental heats decrease with increase in the (Al_{oxy}/Al_{tot}) ratio and reasonably good castabilities are obtained for (Al_{oxy}/Al_{tot}) ratios below 0.15.

4. Castability is not appreciably affected by (ΔAl_{oxy} /Al_{oxy} in ladle) ratio except when this ratio is larger than 3 for SAE 1008 grade experimental heats for which castability decreases with increase in $\Delta Al_{oxy}/Al_{oxy}$ in ladle ratio.

5. Castabilities of the experimental heats increase with increase in the Ca/Al_{oxy} ratio and good castabilities are obtained when the Ca/Al_{oxy} ratio > 0.2.

6. Castabilities of the experimental heats increase with increase in the Ca content and good castabilities are obtained when the Ca content is above ~ 15 ppm.

7. To obtain good castabilities Al_{oxy} inclusions should be better floated in the ladle furnace so studies directed to this aim should be done.

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APPENDIX A

STEEL QUALITY 1-2006

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN		LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED			Oxygen Blowing to Nozzle		
				meter	TIME					meter	canal	number	meter	canal	number
1544	15:36	15:30	260 X 260	10	15:40	1591	INTOCAST	32	DAYSAN		13			13	
1545	15:41	16:30		30	16:03						14			14	
1541	15:55			35	16:07						15			15	
1542	16:03										16			16	
1537	16:14														
1540	16:25														

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	419	1	0.09	0.16	0.034	0.006	0.00	0.02	0.04	0.00	0.430			0.0051	0.0045
CONVE.	419	2	0.05	0.13	0.026	0.005	0.00	0.02	0.04	0.00	0.491			0.0025	0.0042
LADLE	419	1	0.04	0.16	0.026	0.008	0.01	0.02	0.04	0.00	0.002	0.0013	0.0002	0.0005	0.0062
LADLE	419	2	0.04	0.16	0.030	0.009	0.01	0.02	0.04	0.00	0.050	0.0419	0.0077	0.0000	0.0055
LADLE	419	3	0.05	0.31	0.029	0.009	0.01	0.02	0.04	0.00	0.085	0.0830	0.0023	0.0069	0.0078
LADLE	419	4	0.05	0.32	0.022	0.009	0.03	0.02	0.04	0.01	0.072	0.0700	0.0022	0.0011	0.0058
TUNDISH	419	1	0.06	0.34	0.020	0.010	0.04	0.02	0.04	0.01	0.065	0.0465	0.0185	0.0012	0.0081
TUNDISH	419	2	0.05	0.33	0.018	0.009	0.04	0.02	0.04	0.01	0.056	0.0521	0.0039	0.0006	0.0081
TUNDISH	419	3	0.06	0.34	0.018	0.009	0.04	0.02	0.04	0.01	0.058	0.0567	0.0014	0.0007	0.0078

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN		LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED			Oxygen Blowing to Nozzle		
				meter	TIME					meter	canal	number	meter	canal	number
1560	17:28	17:25	260 X 260	14	17:40	1597	INTOCAST	32	DAYSAN	1	13	1		13	
1561	17:36	18:25		32	18:00					1	14	1		14	
1562	17:46			36	18:05					1	15	1		15	
1559	18:09									1	16	1		16	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	421	1	0.04	0.06	0.022	0.002	0.00	0.07	0.04	0.00	0.420			0.0030	0.0036
LADLE	421	1	0.03	0.07	0.023	0.003	0.01	0.07	0.04	0.00	0.022	0.0149	0.0068	0.0000	0.0072
LADLE	421	2	0.04	0.27	0.024	0.006	0.03	0.07	0.04	0.00	0.029	0.0182	0.0109	0.0055	0.0096
LADLE	421	3	0.04	0.33	0.024	0.008	0.02	0.07	0.04	0.01	0.033	0.0265	0.0070	0.0000	0.0081
TUNDISH	421	1	0.04	0.33	0.023	0.009	0.02	0.07	0.04	0.01	0.019	0.0194	0.0000	0.0000	0.0098
TUNDISH	421	2	0.04	0.33	0.024	0.009	0.02	0.07	0.04	0.01	0.019	0.0170	0.0015	0.0000	0.0096
TUNDISH	421	3	0.05	0.33	0.022	0.008	0.02	0.08	0.04	0.01	0.019	0.0169	0.0024	0.0000	0.0100

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN		LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED			Oxygen Blowing to Nozzle		
				meter	TIME					meter	canal	number	meter	canal	number
1601	21:05	21:00	260 X 335	13	21:30	1615	INTOCAST	32	DAYSAN	13	17	1	13,31	17	2
1592	21:10	22:15		20	21:45					31	18	1	7,31	18	2
1590	21:25			28	22:00					16,27	19	2	16	19	1
1589	21:35									26	20	1		20	
1592	22:00														

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	424	1	0.06	0.11	0.028	0.003	0.00	0.02	0.04	0.00	0.506			0.0003	0.0068
LADLE	424	1	0.05	0.17	0.025	0.004	0.01	0.02	0.04	0.00	0.095	0.0915	0.0031	0.0000	0.0087
LADLE	424	2	0.05	0.32	0.024	0.006	0.01	0.02	0.04	0.00	0.065	0.0585	0.0066	0.0000	0.0084
LADLE	424	3	0.05	0.34	0.020	0.008	0.03	0.02	0.04	0.00	0.055	0.0533	0.0012	0.0015	0.0093
TUNDISH	424	1	0.06	0.33	0.021	0.009	0.03	0.02	0.04	0.01	0.032	0.0178	0.0146	0.0005	0.0086
TUNDISH	424	2	0.06	0.34	0.021	0.010	0.03	0.02	0.04	0.01	0.040	0.0214	0.0181	0.0006	0.0087
TUNDISH	424	3	0.06	0.34	0.020	0.009	0.03	0.02	0.04	0.01	0.030	0.0235	0.0068	0.0005	0.0080

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	canal	number	Oxygen Blowing to Nozzle meter	canal	number
1574	22:25	22:15	260 X 335	14	22:35	1590	INTOCAST	32	DAYSAN	3	17	1	3,24	17	2
1562	22:35	23:20		23	22:50						18			18	
1561	22:50			36	23:05					28	19	1	1,28	19	2
1558	23:00									19	20	1	19	20	1

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	425	1	0.10	0.12	0.036	0.003	0.02	0.02	0.04	0.00	0.293			0.0011	0.0070
LADLE	425	1	0.05	0.12	0.034	0.005	0.01	0.03	0.04	0.00	0.113	0.1059	0.0072	0.0000	0.0079
LADLE	425	2	0.05	0.32	0.025	0.007	0.04	0.03	0.04	0.00	0.058	0.0554	0.0023	0.0012	0.0079
LADLE	425	2	0.05	0.32	0.028	0.007	0.01	0.03	0.04	0.00	0.064	0.0630	0.0012	0.0000	0.0098
TUNDISH	425	1	0.07	0.34	0.023	0.009	0.03	0.03	0.04	0.01	0.033	0.0278	0.0050	0.0002	0.0097
TUNDISH	425	2	0.06	0.34	0.024	0.008	0.03	0.03	0.04	0.01	0.037	0.0308	0.0065	0.0004	0.0097
TUNDISH	425	3	0.05	0.34	0.022	0.008	0.03	0.03	0.04	0.01	0.040	0.0341	0.0060	0.0005	0.0099

TUNDISH TEMP(°C)	0	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	canal	number	Oxygen Blowing to Nozzle meter	canal	number
1556	23:25	23:20	260 X 335	18	23:37	1590	INTOCAST	32	DAYSAN	30	17	1		17	
1562	23:40	0:50		30	0:00					11	18	1	11	18	1
1561	23:50										19			19	
1557	00:05									10	20	1	10	20	1

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	426	1	0.03	0.10	0.028	0.006	0.00	0.02	0.04	0.00	0.398			0.0001	0.0086
LADLE	426	1	0.02	0.08	0.022	0.005	0.01	0.02	0.04	0.00	0.095	0.0866	0.0086	0.0000	0.0098
LADLE	426	2	0.04	0.32	0.024	0.007	0.01	0.02	0.04	0.00	0.038	0.0338	0.0040	0.0001	0.0096
LADLE	426	3	0.04	0.32	0.022	0.008	0.04	0.02	0.04	0.00	0.059	0.0571	0.0021	0.0018	0.0091
TUNDISH	426	1	0.05	0.36	0.021	0.009	0.03	0.02	0.04	0.01	0.032	0.0245	0.0080	0.0002	0.0044
TUNDISH	426	2	0.06	0.35	0.022	0.009	0.03	0.02	0.04	0.01	0.031	0.0246	0.0060	0.0002	0.0051

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	canal	number	Oxygen Blowing to Nozzle meter	canal	number
1561	04:57	4:55	260 X 260	10	5:10	1590	INTOCAST	32	SANDOGS		13			13	
1555	05:15	6:00		20	5:22						14			14	
1553	05:22			31	5:36						15			15	
1552	05:31										16			16	
1550	05:51														

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	432	1	0.05	0.12	0.027	0.006	0.00	0.02	0.04	0.00	0.478			0.0010	0.0055
LADLE	432	1	0.03	0.10	0.021	0.005	0.01	0.02	0.04	0.00	0.048	0.0385	0.0097	0.0000	0.0051
LADLE	432	2	0.05	0.27	0.020	0.007	0.01	0.02	0.04	0.01	0.098	0.0899	0.0085	0.0000	0.0078
LADLE	432	3	0.05	0.33	0.017	0.009	0.04	0.02	0.04	0.01	0.068	0.0641	0.0042	0.0022	0.0079
TUNDISH	432	1	0.06	0.34	0.012	0.008	0.04	0.02	0.04	0.01	0.050	0.0466	0.0029	0.0007	0.0082
TUNDISH	432	2	0.06	0.35	0.014	0.009	0.04	0.02	0.04	0.01	0.049	0.0483	0.0010	0.0006	0.0068
TUNDISH	432	3	0.06	0.34	0.012	0.008	0.04	0.02	0.04	0.01	0.050	0.0487	0.0013	0.0005	0.0096

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	canal	number	Oxygen Blowing to Nozzle meter	canal	number
1561	04:57	4:55	260 X 260	10	5:10	1590	INTOCAST	32	SANDOGS		13			13	
1555	05:15	6:00		20	5:22						14			14	
1553	05:22			31	5:36						15			15	
1552	05:31										16			16	
1550	05:51														

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	443	1	0.04	0.12	0.031	0.006	0.00	0.02	0.04	0.00	0.420			0.0000	0.0047
LADLE	443	1	0.04	0.11	0.028	0.005	0.01	0.02	0.04	0.00	0.048	0.0455	0.0024	0.0000	0.0055
LADLE	443	2	0.03	0.27	0.026	0.008	0.01	0.02	0.04	0.00	0.081	0.0751	0.0056	0.0000	0.0041
LADLE	443	3	0.04	0.34	0.022	0.010	0.03	0.02	0.04	0.00	0.061	0.0599	0.0007	0.0012	0.0085
TUNDISH	443	1	0.05	0.34	0.018	0.009	0.03	0.02	0.04	0.01	0.048	0.0400	0.0077	0.0007	0.0092
TUNDISH	443	2	0.06	0.35	0.019	0.010	0.03	0.02	0.04	0.01	0.047	0.0427	0.0041	0.0006	0.0071
TUNDISH	443	3	0.05	0.35	0.017	0.010	0.04	0.02	0.04	0.01	0.046	0.0441	0.0020	0.0006	0.0071

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TUNDISH TEMP(°C)	0	Casting Time (Start/Finish)		DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	canal	number	Oxygen Blowing to Nozzle meter	canal	number
1553	15:08	15:00		260 X260	10	15:14	1590	INTOCAST	32	DAYSAN		13		28,37	13	2
1555	15:17	16:10			20	15:26						14		28,37	14	2
1556	15:26										41	15	1	28,37	15	2
												16		28,37	16	2

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	451	1	0.04	0.19	0.027	0.013	0.00	0.03	0.05	0.00	0.477			0.0003	0.0032
LADLE	451	1	0.03	0.17	0.023	0.010	0.02	0.03	0.05	0.00	0.097	0.0918	0.0050	0.0000	0.0067
LADLE	451	2	0.04	0.28	0.020	0.011	0.01	0.03	0.05	0.01	0.071	0.0672	0.0041	0.0000	0.0073
LADLE	451	3	0.04	0.35	0.018	0.014	0.03	0.03	0.05	0.01	0.059	0.0570	0.0015	0.0005	0.0094
TUNDISH	451	1	0.05	0.35	0.014	0.014	0.03	0.03	0.05	0.01	0.047	0.0458	0.0009	0.0003	0.0080
TUNDISH	451	2	0.05	0.35	0.016	0.014	0.03	0.03	0.05	0.01	0.048	0.0450	0.0029	0.0003	0.0069

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	canal	number	Oxygen Blowing to Nozzle meter	canal	number
1578	22:55	22:45	260 X 335	13	23:00	1590	INTOCAST	32	SANDOGS		17		6	17	1
1571	23:05	23:35		25	23:20						18		6	18	1
1579	23:15			33	23:30						19		6	19	1
1581	23:25										20		6	20	1

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	458	1	0.04	0.16	0.028	0.012	0.00	0.02	0.04	0.00	0.374			0.0001	0.0068
LADLE	458	1	0.03	0.16	0.027	0.012	0.01	0.02	0.04	0.00	0.061	0.0567	0.0039	0.0000	0.0082
LADLE	458	2	0.05	0.32	0.027	0.014	0.01	0.02	0.04	0.01	0.029	0.0254	0.0038	0.0000	0.0033
LADLE	458	3	0.05	0.33	0.022	0.018	0.03	0.02	0.04	0.01	0.035	0.0237	0.0114	0.0008	0.0058
TUNDISH	458	1	0.06	0.34	0.021	0.020	0.03	0.02	0.04	0.01	0.023	0.0157	0.0069	0.0001	0.0074
TUNDISH	458	2	0.06	0.34	0.020	0.019	0.03	0.02	0.04	0.01	0.020	0.0160	0.0041	0.0000	0.0070
TUNDISH	458	3	0.06	0.35	0.017	0.019	0.03	0.02	0.04	0.01	0.026	0.0217	0.0043	0.0000	0.0076

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	canal	number	Oxygen Blowing to Nozzle meter	canal	number
1549	11:00	10:55	260 X 260	13	11:10	1600	INTOCAST	32	DYS	1	13	1	1,21	13	2
1564	11:09	12:05		25	11:24						14			14	
1567	11:31			34	11:35					1	15	1	1	15	1
1567	11:39										16			16	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	464	1	0.05	0.07	0.025	0.002	0.00	0.02	0.04	0.00	0.511			0.0010	0.0037
LADLE	464	1	0.05	0.35	0.010	0.010	0.03	0.02	0.04	0.00	0.030	0.0262	0.0034	0.0003	0.0054
LADLE	464	2	0.05	0.35	0.007	0.010	0.03	0.02	0.04	0.00	0.060	0.0547	0.0051	0.0001	0.0088
LADLE	464	3	0.04	0.34	0.015	0.011	0.03	0.02	0.04	0.00	0.044	0.0399	0.0038	0.0006	0.0022
TUNDISH	464	1	0.06	0.36	0.007	0.011	0.05	0.02	0.04	0.01	0.034	0.0272	0.0066	0.0004	0.0082
TUNDISH	464	2	0.06	0.36	0.006	0.011	0.05	0.02	0.04	0.01	0.035	0.0274	0.0072	0.0008	0.0070
TUNDISH	464	3	0.07	0.35	0.006	0.011	0.05	0.02	0.04	0.01	0.031	0.0274	0.0041	0.0003	0.0094

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	canal	number	Oxygen Blowing to Nozzle meter	canal	number
1568	09:55	9:50	260 X 260	11	10:18	1606	INTOCAST	32	DYS	1	13	1	1	13	1
1551	10:00	10:55		23	10:35					1	14	1	1,22	14	2
1545	10:18			31	10:45					1,18,33	15	3	18,33	15	2
1550	10:32									1,33	16	2	18,33	16	2
1550	10:48														

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	467	1	0.06	0.11	0.022	0.004	0.00	0.02	0.04	0.02	0.373			0.0019	0.0014
LADLE	467	1	0.03	0.10	0.021	0.005	0.01	0.02	0.04	0.01	0.061	0.0540	0.0073	0.0011	0.0046
LADLE	467	2	0.04	0.28	0.021	0.006	0.01	0.02	0.04	0.02	0.042	0.0362	0.0060	0.0000	0.0038
LADLE	467	3	0.04	0.36	0.019	0.012	0.05	0.02	0.04	0.02	0.031	0.0279	0.0032	0.0021	0.0061
TUNDISH	467	1	0.06	0.34	0.021	0.013	0.05	0.02	0.04	0.02	0.022	0.0153	0.0063	0.0007	0.0085
TUNDISH	467	2	0.05	0.34	0.019	0.012	0.05	0.02	0.04	0.02	0.018	0.0143	0.0042	0.0006	0.0062
TUNDISH	467	3	0.06	0.33	0.020	0.012	0.05	0.02	0.04	0.02	0.019	0.0122	0.0070	0.0007	0.0088

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	canal	number	Oxygen Blowing to Nozzle meter	canal	number
1562	20:13	20:05	260 X 335	18	20:30	1595	INTOCAST	32	(STAVERMA-SILIC		17		13	17	1
1572	20:20	20:55		28	20:44						18		2,14	18	2
1576	20:38										19		14	19	1
											20		3,13	20	2

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	4880	1	0.03	0.10	0.029	0.008	0.00	0.02	0.04	0.00	0.466	0.3596	0.1064	0.0004	0.0024
LADLE	4880	1	0.02	0.10	0.028	0.007	0.01	0.02	0.04	0.00	0.079	0.0714	0.0076	0.0018	0.0063
LADLE	4880	2	0.04	0.28	0.028	0.007	0.01	0.02	0.04	0.00	0.040	0.0339	0.0059	0.0000	0.0060
LADLE	4880	3	0.04	0.32	0.023	0.009	0.01	0.02	0.04	0.00	0.058	0.0516	0.0061	0.0027	0.0064
TUNDISH	4880	1	0.05	0.32	0.022	0.009	0.01	0.02	0.04	0.01	0.043	0.0374	0.0061	0.0014	0.0050
TUNDISH	4880	2	0.05	0.32	0.022	0.009	0.01	0.02	0.04	0.01	0.043	0.0374	0.0056	0.0015	0.0054

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	canal	number	Oxygen Blowing to Nozzle meter	canal	number
1570	22:11	22:05	260 X 335	14	22:24	1595	INTOCAST	32	(STAVERMA-SILICA)		17		20,30	17	2
1572	22:12	23:10		24	22:40						18		18,30	18	2
1571	22:45			35	22:54						19		20,30	19	2
1570	22:50										20		20,30	20	2
1568	22:52														

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	4883	1	0.03	0.07	0.026	0.004	0.00	0.02	0.04	0.00	0.445	0.3911	0.0538	0.0009	0.0023
LADLE	4883	1	0.03	0.10	0.025	0.005	0.02	0.03	0.04	0.00	0.158	0.1502	0.0080	0.0000	0.0062
LADLE	4883	2	0.04	0.35	0.024	0.008	0.02	0.03	0.04	0.00	0.080	0.0770	0.0034	0.0000	0.0067
LADLE	4883	3	0.04	0.37	0.019	0.010	0.02	0.03	0.04	0.00	0.073	0.0701	0.0028	0.0025	0.0080
LADLE	4883	4	0.04	0.37	0.017	0.010	0.02	0.03	0.04	0.00	0.072	0.0681	0.0036	0.0027	0.0071
TUNDISH	4883	1	0.05	0.38	0.013	0.011	0.03	0.02	0.04	0.01	0.042	0.0387	0.0033	0.0012	0.0059
TUNDISH	4883	2	0.05	0.36	0.015	0.010	0.02	0.02	0.04	0.01	0.040	0.0347	0.0055	0.0011	0.0074
TUNDISH	4883	3	0.05	0.38	0.014	0.010	0.02	0.02	0.04	0.01	0.042	0.0351	0.0066	0.0012	0.0052

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	canal	number	Oxygen Blowing to Nozzle meter	canal	number
1572	03:30	3:20	260 X 335	10	3:32	1590	INTOCAST	32	(STAVERMA-SILICA)		17			17	
1572	03:45	4:30		17	3:50						18			18	
1561	03:55			25	4:00						19		29	19	1
1555	04:05										20			20	
1557	04:25														

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	491	1	0.08	0.11	0.038	0.003	0.00	0.02	0.04	0.00	0.392			0.0006	0.0021
CONVE.	491	2	0.06	0.08	0.031	0.003	0.00	0.02	0.04	0.00	0.412			0.0001	0.0027
LADLE	491	1	0.05	0.08	0.027	0.003	0.01	0.02	0.04	0.00	0.179	0.1759	0.0033	0.0000	0.0083
LADLE	491	2	0.05	0.28	0.025	0.005	0.01	0.02	0.04	0.00	0.119	0.1179	0.0007	0.0000	0.0081
LADLE	491	3	0.05	0.32	0.022	0.007	0.01	0.02	0.04	0.00	0.084	0.0785	0.0059	0.0025	0.0047
LADLE	491	4	0.05	0.33	0.018	0.007	0.04	0.02	0.04	0.00	0.051	0.0501	0.0008	0.0020	0.0099
TUNDISH	491	1	0.06	0.34	0.019	0.008	0.04	0.02	0.04	0.01	0.047	0.0441	0.0026	0.0010	0.0088
TUNDISH	491	2	0.06	0.34	0.019	0.008	0.04	0.02	0.04	0.01	0.046	0.0424	0.0034	0.0014	0.0098
TUNDISH	491	3	0.06	0.34	0.020	0.008	0.04	0.02	0.04	0.01	0.046	0.0423	0.0039	0.0012	0.0070

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1550	11:35	11:25	260 X 260	15	11:45	1595	INTOCAST	32	(STAVERMA-SILICA)		13		1	13	1
1553	11:45	12:35		25	11:57						14		1	14	1
1551	11:56			43	12:18						15		1	15	1
1550	12:04									1	16	1	1	16	1
1553	12:15														

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	5099	1	0.05	0.08	0.031	0.004	0.00	0.02	0.04	0.00	0.512	0.4891	0.0234	0.0007	0.0051
LADLE	5099	1	0.04	0.09	0.027	0.005	0.02	0.02	0.04	0.00	0.132	0.1290	0.0032	0.0001	0.0062
LADLE	5099	2	0.04	0.30	0.024	0.007	0.02	0.02	0.04	0.00	0.118	0.1118	0.0060	0.0035	0.0063
LADLE	5099	3	0.05	0.35	0.022	0.007	0.02	0.02	0.04	0.00	0.104	0.0993	0.0051	0.0024	0.0068
TUNDISH	5099	1	0.06	0.35	0.018	0.007	0.02	0.02	0.04	0.01	0.075	0.0700	0.0054	0.0009	0.0094
TUNDISH	5099	2	0.05	0.36	0.018	0.007	0.02	0.02	0.04	0.01	0.079	0.0722	0.0069	0.0010	0.0068
TUNDISH	5099	3	0.06	0.36	0.015	0.007	0.02	0.02	0.04	0.01	0.068	0.0567	0.0117	0.0012	0.0077

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1562	20:06	20:00	260 X 335	15	20:20	1591	INTOCAST	32	(STAVERMA-SILICA)		17		11	17	1
1565	20:24	21:00		24	20:32					23	18	1		18	
1562	20:48			35	20:45					28	19	1	10	19	1
											20			20	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	6747	1	0.06	0.12	0.025	0.005	0.00	0.02	0.02	0.01	0.741	0.6968	0.0439	0.0010	0.0041
LADLE	6747	1	0.03	0.13	0.024	0.007	0.01	0.02	0.03	0.00	0.046	0.0375	0.0088	0.0000	0.0048
LADLE	6747	2	0.05	0.35	0.019	0.012	0.03	0.02	0.03	0.00	0.035	0.0288	0.0057	0.0018	0.0053
LADLE	6747	3	0.05	0.36	0.016	0.013	0.02	0.02	0.03	0.00	0.057	0.0396	0.0171	0.0023	0.0051
TUNDISH	6747	1	0.08	0.37	0.015	0.011	0.02	0.02	0.02	0.01	0.043	0.0389	0.0041	0.0013	0.0069
TUNDISH	6747	2	0.07	0.37	0.014	0.011	0.02	0.02	0.02	0.01	0.047	0.0405	0.0067	0.0016	0.0058
TUNDISH	6747	3	0.08	0.37	0.015	0.011	0.02	0.02	0.02	0.01	0.045	0.0397	0.0051	0.0014	0.0065

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1561	21:06	21:00	260 X 335	13	21:19	1588	INTOCAST	32	(STAVERMA-SILICA)	24	17	1	10	17	1
1559	21:21	22:00		25	21:35					2,20	18	2	2	18	1
1558	21:40			34	21:45						19		7,27	19	2
											20		7,26	20	2

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	6749	1	0.05	0.18	0.039	0.013	0.00	0.02	0.02	0.01	0.458	0.4144	0.0441	0.0045	0.0029
CONVE.	6749	2	0.04	0.16	0.037	0.010	0.00	0.02	0.02	0.01	0.479	0.4484	0.0308	0.0045	0.0035
LADLE	6749	1	0.02	0.16	0.042	0.011	0.01	0.02	0.03	0.00	0.057	0.0513	0.0057	0.0000	0.0041
LADLE	6749	2	0.03	0.34	0.036	0.017	0.01	0.02	0.03	0.00	0.044	0.0410	0.0029	0.0002	0.0047
LADLE	6749	3	0.04	0.37	0.025	0.019	0.03	0.02	0.03	0.01	0.049	0.0451	0.0034	0.0011	0.0049
TUNDISH	6749	1	0.06	0.38	0.021	0.015	0.03	0.02	0.02	0.01	0.046	0.0378	0.0078	0.0013	0.0057
TUNDISH	6749	2	0.07	0.35	0.024	0.016	0.03	0.02	0.03	0.01	0.044	0.0350	0.0090	0.0012	0.0075
TUNDISH	6749	3	0.06	0.37	0.022	0.015	0.03	0.02	0.02	0.01	0.044	0.0381	0.0055	0.0011	0.0063

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1576	03:18	3:15	260 X 335	15	3:48	1610	INTOCAST	32	(STAVERMA-SILICA)		17		7,9,16	17	3
1566	03:31	4:20		25	4:02						18		7,10	18	2
1570	04:00			30	4:09						19		7	19	1
											20		7,9,10	20	3

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7259	1	0.04	0.12	0.033	0.016	0.00	0.02	0.02	0.01	0.478	0.3978	0.0798	0.0022	0.0058
LADLE	7259	1	0.03	0.12	0.025	0.010	0.02	0.02	0.03	0.00	0.086	0.0821	0.0036	0.0010	0.0077
LADLE	7259	2	0.05	0.34	0.025	0.014	0.06	0.02	0.03	0.00	0.046	0.0424	0.0035	0.0028	0.0085
TUNDISH	7259	1	0.07	0.36	0.018	0.016	0.05	0.02	0.02	0.01	0.031	0.0259	0.0051	0.0014	0.0058
TUNDISH	7259	2	0.06	0.37	0.018	0.016	0.05	0.02	0.02	0.01	0.032	0.0266	0.0051	0.0013	0.0061
TUNDISH	7259	3	0.06	0.36	0.019	0.016	0.05	0.02	0.02	0.01	0.031	0.0244	0.0067	0.0015	0.0061

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1567	04:30	4:20	260 X 335	15	4:44	1595	INTOCAST	32	(STAVERMA-SILICA)		17		5,28	17	2
1567	04:50	5:25		20	4:52					41	18	1	5,28,41	18	3
1561	05:10			30	5:14						19		3,28	19	2
											20		3,28	20	2

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7260	1	0.06	0.12	0.021	0.007	0.00	0.02	0.02	0.01	0.554	0.5158	0.0385	0.0002	0.0030
LADLE	7260	1	0.04	0.12	0.022	0.007	0.01	0.02	0.03	0.00	0.002	0.0014	0.0010	0.0000	0.0062
LADLE	7260	2	0.04	0.13	0.022	0.007	0.01	0.02	0.03	0.00	0.001	0.0008	0.0005	0.0001	0.0051
LADLE	7260	3	0.07	0.35	0.020	0.012	0.05	0.02	0.03	0.00	0.032	0.0266	0.0057	0.0038	0.0056
TUNDISH	7260	1	0.07	0.36	0.016	0.014	0.05	0.02	0.02	0.01	0.020	0.0155	0.0042	0.0012	0.0046
TUNDISH	7260	2	0.07	0.34	0.016	0.013	0.05	0.02	0.02	0.01	0.011	0.0073	0.0041	0.0007	0.0069
TUNDISH	7260	3	0.07	0.35	0.016	0.014	0.05	0.02	0.02	0.01	0.018	0.0120	0.0059	0.0014	0.0039

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1557	05:40	3:15	260 X 335	15	3:48	1610	INTOCAST	32	(STAVERMA-SILICA)		17			17	
1560	05:58	4:20		25	4:02					3	18	1		18	
1555	06:23			30	4:09						19			19	
1555	06:27										20		8	20	1
													22,32,34,35	LADLE	4

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7262	1	0.04	0.09	0.034	0.012	0.00	0.03	0.03	0.01	0.495	0.4309	0.0641	0.0008	0.0021
LADLE	7262	1	0.03	0.10	0.033	0.009	0.01	0.03	0.03	0.00	0.011	0.0073	0.0038	0.0000	0.0067
LADLE	7262	2	0.04	0.35	0.027	0.013	0.03	0.03	0.03	0.01	0.037	0.0246	0.0122	0.0017	0.0065
TUNDISH	7262	1	0.06	0.35	0.024	0.014	0.03	0.03	0.03	0.01	0.009	0.0056	0.0037	0.0002	0.0053
TUNDISH	7262	2	0.05	0.33	0.023	0.014	0.02	0.03	0.03	0.01	0.007	0.0034	0.0037	0.0001	0.0063
TUNDISH	7262	3	0.05	0.35	0.024	0.014	0.03	0.03	0.03	0.01	0.008	0.0059	0.0022	0.0002	0.0061

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN		LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED			Oxygen Blowing to Nozzle		
				meter	TIME					meter	canal	number	meter	canal	number
1559	06:36	6:30	260 X 335	15	6:48	1590	INTOCAST	32	(STAVERMA-SILICA)		17		6	17	1
1557	06:51	7:25		20	6:54					18	18	1	18	18	1
1560	07:10			30	7:10						19		6,20	19	2
										13,18	20	2	13,18,31	20	3

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7264	1	0.03	0.06	0.038	0.006	0.00	0.03	0.03	0.00	0.548	0.4659	0.0822	0.0015	0.0027
LADLE	7264	1	0.03	0.08	0.041	0.005	0.02	0.03	0.03	0.00	0.046	0.0425	0.0031	0.0000	0.0065
LADLE	7264	2	0.04	0.33	0.033	0.009	0.05	0.03	0.03	0.00	0.026	0.0216	0.0041	0.0027	0.0071
LADLE	7264	3	0.05	0.35	0.029	0.011	0.06	0.03	0.03	0.00	0.037	0.0281	0.0090	0.0028	0.0069
TUNDISH	7264	1	0.05	0.34	0.024	0.011	0.06	0.03	0.03	0.01	0.020	0.0154	0.0050	0.0011	0.0053
TUNDISH	7264	2	0.05	0.33	0.023	0.011	0.06	0.03	0.03	0.01	0.018	0.0133	0.0051	0.0009	0.0055
TUNDISH	7264	3	0.05	0.34	0.022	0.011	0.06	0.03	0.03	0.01	0.021	0.0176	0.0037	0.0013	0.0058

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN		LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED			Oxygen Blowing to Nozzle		
				meter	TIME					meter	canal	number	meter	canal	number
1562	07:37	7:25	260 X 335	19	7:50	1593	INTOCAST	32	(STAVERMA-SILICA)		17		6	17	1
1561	08:00	8:25		26	8:00						18		7	18	1
1565	08:10			33	8:11						19			19	
											20			20	
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7266	1	0.04	0.09	0.037	0.007	0.00	0.03	0.03	0.01	0.487	0.4392	0.0475	0.0007	0.0031
LADLE	7266	1	0.03	0.09	0.036	0.006	0.01	0.03	0.03	0.00	0.038	0.0336	0.0040	0.0000	0.0054
LADLE	7266	2	0.05	0.30	0.028	0.010	0.05	0.03	0.03	0.00	0.028	0.0256	0.0025	0.0037	0.0056
TUNDISH	7266	1	0.06	0.30	0.024	0.011	0.04	0.03	0.03	0.01	0.015	0.0107	0.0047	0.0015	0.0064
TUNDISH	7266	2	0.06	0.30	0.023	0.010	0.04	0.03	0.03	0.01	0.014	0.0097	0.0041	0.0013	0.0066
TUNDISH	7266	3	0.07	0.30	0.024	0.010	0.05	0.03	0.03	0.01	0.013	0.0119	0.0014	0.0023	0.0067

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN		LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED			Oxygen Blowing to Nozzle		
				meter	TIME					meter	canal	number	meter	canal	number
1565	08:30	8:25	260 X 335	20	8:50	1590	INTOCAST	32	(STAVERMA-SILICA)		17		1	17	1
1565	08:50	9:20		30	9:00						18			18	
1561	09:00			34	9:04						19			19	
											20			20	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7268	1	0.05	0.08	0.034	0.005	0.00	0.03	0.02	0.00	0.859	0.8216	0.0370	0.0011	0.0021
LADLE	7268	1	0.04	0.09	0.036	0.004	0.01	0.03	0.03	0.00	0.077	0.0664	0.0106	0.0000	0.0045
LADLE	7268	2	0.04	0.33	0.030	0.008	0.04	0.03	0.03	0.00	0.016	0.0089	0.0075	0.0022	0.0057
LADLE	7268	3	0.04	0.33	0.028	0.009	0.06	0.03	0.03	0.00	0.035	0.0321	0.0032	0.0021	0.0038
TUNDISH	7268	1	0.07	0.34	0.024	0.010	0.06	0.03	0.02	0.01	0.026	0.0225	0.0038	0.0014	0.0060
TUNDISH	7268	2	0.05	0.34	0.023	0.009	0.05	0.03	0.03	0.01	0.027	0.0218	0.0048	0.0016	0.0056
TUNDISH	7268	3	0.06	0.35	0.023	0.010	0.06	0.03	0.03	0.01	0.029	0.0246	0.0040	0.0014	0.0048

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN		LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED			Oxygen Blowing to Nozzle		
				meter	TIME					meter	canal	number	meter	canal	number
1586	10:45	10:40	260 X 335	20	11:25	1608	INTOCAST	32	(STAVERMA-SILICA)		17		9	17	1
1569	10:55	11:45		30	11:36					20	18	1	11,20	18	2
1574	11:30										19		7,25	19	2
										18	20	1	12,18	20	2
												6,9,11,15,16,23,26,28		LADLE	8

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7271	1	0.05	0.22	0.025	0.020	0.00	0.03	0.03	0.01	0.453	0.3874	0.0657	0.0015	0.0030
CONVE.	7271	2	0.07	0.20	0.019	0.021	0.03	0.03	0.03	0.01	0.442	0.4077	0.0347	0.0225	0.0088
CONVE.	7271	3	0.03	0.09	0.016	0.009	0.01	0.03	0.03	0.00	0.558	0.4929	0.0655	0.0072	0.0050
LADLE	7271	1	0.03	0.08	0.019	0.006	0.00	0.03	0.03	0.00	0.003	0.0011	0.0015	0.0004	0.0068
LADLE	7271	2	0.03	0.20	0.021	0.006	0.04	0.03	0.03	0.00	0.007	0.0039	0.0034	0.0034	0.0074
LADLE	7271	3	0.03	0.30	0.021	0.009	0.03	0.03	0.03	0.00	0.018	0.0121	0.0061	0.0010	0.0050
LADLE	7271	4	0.03	0.31	0.020	0.015	0.04	0.03	0.03	0.01	0.044	0.0329	0.0113	0.0019	0.0047
TUNDISH	7271	1	0.03	0.29	0.018	0.016	0.04	0.03	0.03	0.01	0.016	0.0093	0.0064	0.0005	0.0051
TUNDISH	7271	2	0.04	0.29	0.018	0.015	0.04	0.03	0.03	0.01	0.011	0.0065	0.0045	0.0003	0.0063

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN		LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED			Oxygen Blowing to Nozzle		
				meter	TIME					meter	canal	number	meter	canal	number
1560	12:50	12:50	260 X 335	15	13:10	1591	INTOCAST	32	(STAVERMA-SILICA)		17		1	17	1
1559	13:13	13:45		25	13:25						18		1	18	1
1553	13:25			35	13:31						19			19	
											20			20	
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7274	1	0.04	0.22	0.032	0.024	0.03	0.02	0.03	0.01	0.455	0.3555	0.0999	0.0004	0.0037
CONVE.	7274	2	0.04	0.14	0.026	0.014	0.00	0.02	0.03	0.01	0.363	0.2789	0.0842	0.0005	0.0032
LADLE	7274	1	0.04	0.15	0.023	0.013	0.01	0.03	0.03	0.00	0.075	0.0704	0.0046	0.0001	0.0060
LADLE	7274	2	0.04	0.29	0.021	0.016	0.03	0.03	0.03	0.01	0.025	0.0212	0.0040	0.0000	0.0067
LADLE	7274	3	0.04	0.32	0.016	0.017	0.09	0.03	0.03	0.01	0.076	0.0736	0.0020	0.0031	0.0071
LADLE	7274	4	0.04	0.32	0.015	0.018	0.09	0.03	0.03	0.01	0.067	0.0656	0.0010	0.0027	0.0066
TUNDISH	7274	1	0.06	0.33	0.012	0.017	0.10	0.03	0.03	0.02	0.057	0.0527	0.0041	0.0017	0.0049
TUNDISH	7274	2	0.06	0.32	0.013	0.018	0.09	0.03	0.03	0.02	0.055	0.0446	0.0106	0.0020	0.0057
TUNDISH	7274	3	0.07	0.32	0.013	0.017	0.11	0.03	0.03	0.02	0.053	0.0448	0.0083	0.0020	0.0066

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN		LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED			Oxygen Blowing to Nozzle		
				meter	TIME					meter	canal	number	meter	canal	number
1566	13:55	13:45	260 X 335	14	14:00	1593	INTOCAST	32	(STAVERMA-SILICA)		17		1	17	1
1561	14:20	14:55		25	14:10						18			18	
1563	14:37			30	15:20						19			19	
											20			20	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7276	1	0.04	0.13	0.035	0.018	0.00	0.03	0.03	0.01	0.400	0.3524	0.0472	0.0021	0.0031
LADLE	7276	1	0.03	0.13	0.036	0.016	0.01	0.03	0.03	0.00	0.110	0.1051	0.0047	0.0000	0.0072
LADLE	7276	2	0.03	0.31	0.033	0.019	0.01	0.03	0.03	0.01	0.053	0.0516	0.0018	0.0000	0.0063
LADLE	7276	3	0.04	0.31	0.029	0.020	0.07	0.03	0.03	0.01	0.038	0.0367	0.0011	0.0035	0.0072
TUNDISH	7276	1	0.05	0.33	0.023	0.020	0.08	0.03	0.03	0.02	0.067	0.0591	0.0084	0.0021	0.0053
TUNDISH	7276	2	0.05	0.33	0.021	0.019	0.08	0.03	0.03	0.02	0.074	0.0689	0.0046	0.0029	0.0049
TUNDISH	7276	3	0.05	0.32	0.021	0.020	0.07	0.03	0.03	0.02	0.032	0.0246	0.0076	0.0022	0.0042

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1574	15:10	15:05	260 X 335	11	15:33	1600	INTOCAST	32	(STAVERMA-SILICA)		17			17	
1556	15:25	16:10		20	15:45						18		7	18	1
1563	15:43			29	15:55						19		8	19	1
1566	15:50										20		2	20	1

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7278	1	0.05	0.11	0.032	0.011	0.00	0.12	0.03	0.01	0.391	0.3151	0.0760	0.0006	0.0032
CONVE.	7278	2	0.03	0.09	0.026	0.009	0.00	0.12	0.03	0.01	0.538	0.4630	0.0750	0.0002	0.0028
LADLE	7278	1	0.04	0.11	0.028	0.010	0.01	0.10	0.03	0.00	0.058	0.0533	0.0051	0.0000	0.0077
LADLE	7278	2	0.04	0.32	0.028	0.012	0.01	0.11	0.03	0.01	0.028	0.0227	0.0055	0.0000	0.0075
LADLE	7278	3	0.04	0.34	0.021	0.012	0.07	0.11	0.03	0.01	0.053	0.0488	0.0039	0.0037	0.0078
TUNDISH	7278	1	0.08	0.33	0.016	0.012	0.09	0.12	0.03	0.01	0.028	0.0260	0.0024	0.0008	0.0062
TUNDISH	7278	2	0.07	0.33	0.016	0.012	0.08	0.12	0.03	0.01	0.031	0.0265	0.0043	0.0010	0.0056
TUNDISH	7278	3	0.06	0.33	0.016	0.012	0.08	0.13	0.03	0.01	0.031	0.0278	0.0030	0.0010	0.0050

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1566	16:15	16:10	260 X 335	11	16:23	1594	INTOCAST	32	(STAVERMA-SILICA)		17		33	17	1
1561	16:30	17:00		16	16:30						18		36	18	1
1567	16:45			30	16:46						19		36	19	1
											20		36	20	1

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7280	1	0.04	0.08	0.037	0.008	0.00	0.03	0.03	0.01	0.544	0.4738	0.0707	0.0005	0.0027
LADLE	7280	1	0.03	0.08	0.034	0.007	0.01	0.03	0.03	0.00	0.132	0.1275	0.0049	0.0000	0.0073
LADLE	7280	2	0.04	0.32	0.036	0.012	0.01	0.03	0.03	0.00	0.050	0.0461	0.0042	0.0000	0.0063
LADLE	7280	3	0.04	0.35	0.021	0.012	0.07	0.03	0.03	0.01	0.044	0.0399	0.0042	0.0047	0.0068
TUNDISH	7280	1	0.05	0.35	0.013	0.012	0.07	0.03	0.03	0.01	0.028	0.0208	0.0073	0.0017	0.0051
TUNDISH	7280	2	0.05	0.35	0.013	0.012	0.07	0.03	0.03	0.01	0.028	0.0201	0.0083	0.0016	0.0053
TUNDISH	7280	3	0.05	0.35	0.014	0.012	0.07	0.03	0.03	0.01	0.028	0.0255	0.0029	0.0021	0.0052

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1572	17:06	17:00	260 X 335	10	17:13	1592	INTOCAST	32	(STAVERMA-SILICA)		17		33	17	1
1573	17:22	17:55		21	17:25						18		36	18	1
1567	17:40			26	17:33						19		36	19	1
											20		36	20	1

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7282	1	0.03	0.07	0.031	0.006	0.00	0.02	0.03	0.00	0.405	0.3457	0.0594	0.0003	0.0054
LADLE	7282	1	0.02	0.07	0.030	0.006	0.01	0.02	0.03	0.00	0.104	0.0873	0.0166	0.0000	0.0095
LADLE	7282	2	0.03	0.27	0.033	0.008	0.03	0.02	0.03	0.00	0.043	0.0391	0.0035	0.0001	0.0091
LADLE	7282	3	0.04	0.35	0.028	0.010	0.06	0.02	0.03	0.00	0.037	0.0356	0.0016	0.0025	0.0083
TUNDISH	7282	1	0.05	0.35	0.017	0.010	0.06	0.02	0.03	0.01	0.024	0.0204	0.0039	0.0021	0.0086
TUNDISH	7282	2	0.05	0.35	0.019	0.010	0.06	0.02	0.03	0.01	0.029	0.0240	0.0045	0.0021	0.0081
TUNDISH	7282	3	0.05	0.35	0.020	0.009	0.06	0.02	0.03	0.01	0.033	0.0201	0.0125	0.0022	0.0092

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	canal	number	Oxygen Blowing to Nozzle meter	canal	number
1560	19:20	19:10	260 X 335	11	19:30	1592	INTOCAST	32	(STAVERMA-SILICA)		21			21	
1562	19:32	20:10		21	19:45						22			22	
1559	19:55			33	19:55						23			23	
											24			24	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7285	1	0.03	0.07	0.034	0.007	0.00	0.02	0.03	0.01	0.734	0.5884	0.1454	0.0031	0.0035
LADLE	7285	1	0.02	0.09	0.036	0.008	0.01	0.02	0.03	0.00	0.068	0.0664	0.0017	0.0000	0.0067
LADLE	7285	2	0.04	0.27	0.036	0.010	0.04	0.02	0.03	0.00	0.036	0.0274	0.0086	0.0002	0.0078
LADLE	7285	3	0.05	0.30	0.029	0.011	0.06	0.02	0.03	0.00	0.041	0.0382	0.0032	0.0017	0.0086
TUNDISH	7285	1	0.06	0.31	0.021	0.012	0.07	0.02	0.03	0.01	0.031	0.0170	0.0139	0.0018	0.0065
TUNDISH	7285	2	0.06	0.31	0.020	0.012	0.07	0.02	0.03	0.01	0.030	0.0247	0.0057	0.0018	0.0060
TUNDISH	7285	3	0.06	0.32	0.019	0.012	0.08	0.02	0.03	0.01	0.029	0.0190	0.0097	0.0018	0.0068

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	canal	number	Oxygen Blowing to Nozzle meter	canal	number
1513	20:09	20:00	260 X 335	15	20:15	1593	INTOCAST	32	(STAVERMA-SILICA)		17			17	
1528	20:19	20:55		23	20:24						18			18	
1538	20:38			32	20:35						19			19	
											20			20	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7325	1	0.06	0.16	0.029	0.011	0.00	0.02	0.03	0.01	0.567	0.5076	0.0589	0.0007	0.0038
LADLE	7325	1	0.03	0.13	0.021	0.008	0.05	0.02	0.03	0.00	0.045	0.0403	0.0047	0.0000	0.0066
LADLE	7325	2	0.03	0.29	0.022	0.009	0.04	0.02	0.03	0.00	0.029	0.0240	0.0047	0.0000	0.0070
LADLE	7325	3	0.03	0.31	0.019	0.010	0.07	0.02	0.03	0.00	0.048	0.0448	0.0031	0.0024	0.0076
TUNDISH	7325	1	0.04	0.31	0.017	0.010	0.08	0.02	0.03	0.01	0.021	0.0187	0.0026	0.0011	0.0067
TUNDISH	7325	2	0.04	0.31	0.017	0.010	0.08	0.02	0.03	0.01	0.021	0.0197	0.0015	0.0010	0.0068
TUNDISH	7325	3	0.04	0.31	0.017	0.010	0.08	0.02	0.03	0.01	0.022	0.0192	0.0025	0.0010	0.0069

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	canal	number	Oxygen Blowing to Nozzle meter	canal	number
1583	20:48	20:45	260 X 335	10	21:10	1610	INTOCAST	32	(STAVERMA-SILICA)		17			17	
1565	21:00	21:50		18	21:21						18		3	18	1
1575	21:20			25	21:30						19		1	19	1
1581	21:30										20			20	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7326	1	0.05	0.13	0.026	0.007	0.00	0.02	0.03	0.01	0.452	0.4019	0.0503	0.0004	0.0033
LADLE	7326	1	0.04	0.13	0.021	0.008	0.05	0.02	0.03	0.00	0.092	0.0806	0.0111	0.0000	0.0080
LADLE	7326	2	0.04	0.30	0.020	0.011	0.04	0.02	0.03	0.00	0.051	0.0481	0.0033	0.0000	0.0075
LADLE	7326	3	0.04	0.33	0.016	0.011	0.08	0.03	0.03	0.01	0.041	0.0399	0.0010	0.0039	0.0061
TUNDISH	7326	1	0.05	0.32	0.013	0.011	0.08	0.02	0.03	0.01	0.026	0.0248	0.0017	0.0018	0.0058
TUNDISH	7326	2	0.05	0.32	0.013	0.012	0.08	0.02	0.03	0.01	0.028	0.0260	0.0020	0.0019	0.0058
TUNDISH	7326	3	0.05	0.31	0.013	0.011	0.08	0.02	0.03	0.01	0.025	0.0221	0.0027	0.0015	0.0061

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1574	21:55	21:50	260 X 335	10	22:00	1593	INTOCAST	32	(STAVERMA-SILICA)		17			17	
1570	22:05	22:45		18	22:10						18			18	
1571	22:36			30	22:25						19			19	
											20			20	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7327	1	0.06	0.12	0.035	0.006	0.00	0.02	0.03	0.01	0.471	0.4275	0.0438	0.0005	0.0025
CONVE.	7327	2	0.04	0.10	0.030	0.005	0.00	0.02	0.03	0.00	0.893	0.8466	0.0466	0.0004	0.0023
LADLE	7327	1	0.03	0.11	0.028	0.006	0.04	0.02	0.03	0.01	0.051	0.0411	0.0100	0.0000	0.0067
LADLE	7327	2	0.03	0.27	0.032	0.008	0.03	0.02	0.03	0.01	0.010	0.0062	0.0035	0.0000	0.0068
LADLE	7327	3	0.04	0.28	0.028	0.010	0.05	0.02	0.03	0.01	0.032	0.0301	0.0019	0.0022	0.0070
TUNDISH	7327	1	0.05	0.30	0.022	0.011	0.06	0.02	0.03	0.02	0.035	0.0321	0.0031	0.0012	0.0055
TUNDISH	7327	2	0.06	0.30	0.022	0.011	0.06	0.02	0.03	0.02	0.033	0.0303	0.0023	0.0010	0.0059
TUNDISH	7327	3	0.05	0.30	0.022	0.010	0.06	0.02	0.03	0.02	0.036	0.0336	0.0041	0.0013	0.0058

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1567	22:50	22:45	260 X 335	9	22:55	1594	INTOCAST	32	(STAVERMA-SILICA)		17			17	
1568	22:56	23:40		20	23:10						18			18	
1569	23:11			30	23:23						19			19	
1566	23:25										20			20	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7328	1	0.04	0.17	0.038	0.013	0.00	0.02	0.03	0.01	0.542	0.4942	0.0479	0.0014	0.0028
CONVE.	7328	2	0.04	0.12	0.028	0.007	0.00	0.02	0.03	0.00	0.342	0.3131	0.0286	0.0001	0.0035
LADLE	7328	1	0.03	0.12	0.024	0.006	0.04	0.02	0.03	0.00	0.055	0.0485	0.0066	0.0000	0.0059
LADLE	7328	2	0.03	0.31	0.025	0.008	0.03	0.02	0.03	0.01	0.019	0.0130	0.0056	0.0000	0.0064
LADLE	7328	3	0.04	0.34	0.023	0.011	0.07	0.02	0.03	0.01	0.055	0.0534	0.0021	0.0028	0.0062
TUNDISH	7328	1	0.04	0.34	0.021	0.011	0.07	0.02	0.03	0.01	0.040	0.0345	0.0053	0.0014	0.0052
TUNDISH	7328	2	0.04	0.34	0.020	0.011	0.07	0.02	0.03	0.01	0.039	0.0358	0.0030	0.0013	0.0051
TUNDISH	7328	3	0.04	0.34	0.021	0.012	0.07	0.02	0.03	0.01	0.038	0.0283	0.0109	0.0013	0.0051

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1561	00:42	0:35	260 X 335	15	0:55	1590	INTOCAST	32	(STAVERMA-SILICA)	1	17	1	15	17	1
1556	00:59	1:35		20	1:02					1	18	1	15	18	1
1546	01:29									1	19	1	1	19	1
											20		12,23	20	2
													17,18,19,20	LADLE	4

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7331	1	0.05	0.14	0.043	0.009	0.00	0.02	0.03	0.01	1.268	1.2515	0.0166	0.0003	0.0022
CONVE.	7331	2	0.03	0.09	0.034	0.006	0.00	0.02	0.03	0.00	0.386	0.3390	0.0467	0.0002	0.0027
LADLE	7331	1	0.02	0.09	0.029	0.006	0.04	0.03	0.03	0.00	0.073	0.0604	0.0125	0.0000	0.0089
LADLE	7331	2	0.04	0.29	0.033	0.007	0.02	0.03	0.03	0.00	0.006	0.0028	0.0035	0.0000	0.0079
LADLE	7331	3	0.05	0.28	0.031	0.010	0.06	0.03	0.03	0.00	0.044	0.0389	0.0049	0.0023	0.0082
LADLE	7331	4	0.05	0.33	0.028	0.010	0.07	0.03	0.03	0.00	0.041	0.0308	0.0103	0.0014	0.0090
TUNDISH	7331	1	0.06	0.32	0.029	0.012	0.06	0.02	0.03	0.01	0.028	0.0216	0.0066	0.0005	0.0073
TUNDISH	7331	2	0.06	0.31	0.029	0.011	0.06	0.02	0.03	0.01	0.023	0.0186	0.0042	0.0003	0.0081

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	canal	number	Oxygen Blowing to Nozzle meter	canal	number
1567	04:53	4:30	260 X 335	20	04:55	1593	INTOCAST	32	(STAVERMA-SILICA)	7	17	1		17	
1565	05:07	5:25		30	05:08						18			18	
1568	05:15			36	05:16						19			19	
										11	20	1		20	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7338	1	0.06	0.09	0.031	0.003	0.00	0.02	0.03	0.00	0.718	0.6649	0.0529	0.0008	0.0021
LADLE	7338	1	0.05	0.10	0.026	0.004	0.04	0.02	0.03	0.00	0.073	0.0674	0.0053	0.0000	0.0066
LADLE	7338	2	0.05	0.30	0.012	0.005	0.08	0.02	0.03	0.00	0.046	0.0455	0.0006	0.0036	0.0067
TUNDISH	7338	1	0.06	0.29	0.009	0.005	0.07	0.02	0.03	0.01	0.028	0.0199	0.0076	0.0015	0.0043
TUNDISH	7338	2	0.06	0.29	0.009	0.005	0.07	0.02	0.03	0.01	0.029	0.0186	0.0108	0.0023	0.0066
TUNDISH	7338	3	0.06	0.29	0.009	0.005	0.07	0.02	0.03	0.01	0.026	0.0197	0.0059	0.0008	0.0059

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	canal	number	Oxygen Blowing to Nozzle meter	canal	number
1577	05:32	5:25	260 X 335	17	5:47	1595	INTOCAST	32	(STAVERMA-SILICA)		17		10	17	1
1575	05:54	6:15		34	6:13						18		12	18	1
1575	06:05										19		13	19	1
1566	06:11										20		10	20	1
1566	06:13									14,23,25,27,28,29,30,31,32,33				LADLE	10

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7340	1	0.05	0.13	0.028	0.007	0.00	0.02	0.03	0.01	0.528	0.4677	0.0601	0.0007	0.0022
LADLE	7340	1	0.04	0.12	0.021	0.005	0.04	0.02	0.03	0.00	0.054	0.0495	0.0041	0.0001	0.0079
LADLE	7340	2	0.04	0.26	0.021	0.006	0.06	0.02	0.03	0.00	0.039	0.0337	0.0052	0.0026	0.0080
LADLE	7340	3	0.04	0.28	0.021	0.009	0.05	0.02	0.03	0.00	0.036	0.0291	0.0073	0.0008	0.0082
TUNDISH	7340	1	0.05	0.31	0.022	0.010	0.02	0.02	0.03	0.01	0.007	0.0047	0.0025	0.0001	0.0070
TUNDISH	7340	2	0.05	0.31	0.022	0.010	0.03	0.02	0.03	0.01	0.010	0.0046	0.0057	0.0001	0.0068

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	canal	number	Oxygen Blowing to Nozzle meter	canal	number
1565	06:25	6:15	260 X 335	15	06:40	1595	INTOCAST	32	(STAVERMA-SILICA)		17		2	17	1
1566	07:00	7:10		27	06:55						18		2	18	1
1566	07:05			35	07:04						19		2	19	1
											20		2	20	1

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7342	1	0.05	0.09	0.035	0.005	0.00	0.02	0.03	0.00	0.390	0.3173	0.0731	0.0036	0.0031
LADLE	7342	1	0.03	0.10	0.032	0.005	0.05	0.02	0.03	0.00	0.053	0.0454	0.0073	0.0002	0.0083
LADLE	7342	2	0.04	0.36	0.018	0.008	0.06	0.02	0.03	0.00	0.039	0.0347	0.0045	0.0033	0.0092
TUNDISH	7342	1	0.05	0.37	0.018	0.008	0.06	0.02	0.03	0.01	0.036	0.0320	0.0038	0.0022	0.0040
TUNDISH	7342	2	0.06	0.36	0.017	0.008	0.06	0.02	0.03	0.01	0.034	0.0300	0.0041	0.0018	0.0047
TUNDISH	7342	3	0.05	0.37	0.018	0.008	0.06	0.02	0.03	0.01	0.036	0.0326	0.0031	0.0023	0.0050

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	canal	number	Oxygen Blowing to Nozzle meter	canal	number
1566	07:16	7:10	260 X 335	14	07:28	1590	INTOCAST	32	(STAVERMA-SILICA)	15	17	1		17	
1562	07:34	8:15		27	07:45					39	18	1		18	
1559	07:47			35	07:55					15	19	1		19	
											20			20	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7344	1	0.06	0.14	0.033	0.008	0.00	0.02	0.03	0.01	0.402	0.3559	0.0463	0.0011	0.0015
LADLE	7344	1	0.04	0.16	0.029	0.007	0.03	0.02	0.03	0.00	0.043	0.0310	0.0116	0.0028	0.0064
LADLE	7344	2	0.04	0.34	0.024	0.012	0.06	0.02	0.03	0.01	0.044	0.0382	0.0063	0.0028	0.0069
TUNDISH	7344	1	0.05	0.34	0.022	0.013	0.04	0.02	0.03	0.01	0.029	0.0195	0.0092	0.0012	0.0061
TUNDISH	7344	2	0.05	0.34	0.023	0.013	0.04	0.02	0.03	0.01	0.028	0.0236	0.0041	0.0010	0.0063
TUNDISH	7344	3	0.05	0.36	0.021	0.013	0.04	0.02	0.03	0.01	0.023	0.0165	0.0070	0.0010	0.0074

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	canal	number	Oxygen Blowing to Nozzle meter	canal	number
1572	10:30	10:25	260 X 335	10	10:45	1610	INTOCAST	32	(STAVERMA-SILICA)		17		14,24	17	2
1576	10:55	11:25		20	10:53						18		32	18	1
1576	11:00			30	11:10						19		13,35	19	2
											20		20,31	20	2

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7349	1	0.05	0.14	0.026	0.011	0.00	0.02	0.03	0.01	0.589	0.5302	0.0584	0.0009	0.0014
LADLE	7349	1	0.03	0.14	0.022	0.010	0.05	0.02	0.03	0.00	0.141	0.1289	0.0120	0.0004	0.0039
LADLE	7349	2	0.04	0.29	0.009	0.012	0.10	0.02	0.03	0.01	0.055	0.0520	0.0027	0.0019	0.0058
LADLE	7349	3	0.05	0.29	0.007	0.012	0.09	0.02	0.03	0.00	0.036	0.0341	0.0021	0.0005	0.0059
TUNDISH	7349	1	0.06	0.27	0.006	0.011	0.09	0.02	0.03	0.01	0.026	0.0231	0.0034	0.0003	0.0068
TUNDISH	7349	2	0.07	0.27	0.005	0.012	0.09	0.02	0.03	0.01	0.024	0.0206	0.0038	0.0002	0.0056
TUNDISH	7349	3	0.06	0.27	0.005	0.011	0.09	0.02	0.03	0.01	0.027	0.0194	0.0073	0.0002	0.0056

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	canal	number	Oxygen Blowing to Nozzle meter	canal	number
1562	11:31	11:25	260 X 335	12	11:40	1590	INTOCAST	32	(STAVERMA-SILICA)		17			17	
1563	11:45	12:20		20	11:50					42	18	1	1	18	1
				32	12:05						19		1	19	1
											20			20	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7351	1	0.07	0.17	0.030	0.012	0.00	0.02	0.03	0.01	0.447	0.3419	0.1053	0.0019	0.0021
LADLE	7351	1	0.03	0.14	0.023	0.009	0.04	0.02	0.03	0.01	0.023	0.0179	0.0048	0.0000	0.0060
LADLE	7351	2	0.05	0.28	0.023	0.015	0.06	0.02	0.03	0.01	0.028	0.0248	0.0035	0.0032	0.0067
LADLE	7351	3	0.05	0.30	0.017	0.015	0.07	0.02	0.03	0.01	0.045	0.0365	0.0081	0.0025	0.0051
TUNDISH	7351	1	0.05	0.30	0.013	0.015	0.07	0.02	0.03	0.02	0.029	0.0266	0.0022	0.0011	0.0050
TUNDISH	7351	2	0.06	0.30	0.013	0.015	0.07	0.02	0.03	0.01	0.029	0.0263	0.0027	0.0012	0.0050
TUNDISH	7351	3	0.05	0.30	0.013	0.014	0.07	0.02	0.03	0.01	0.028	0.0260	0.0020	0.0010	0.0050

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1559	12:25	12:20	260 X 335	16	12:40	1590	INTOCAST	32	(STAVERMA-SILICA)		17			17	
1555	12:35	13:25		27	12:55						18			18	
1553	12:49			33	13:00						19			19	
1554	13:00										20			20	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7354	1	0.08	0.11	0.030	0.004	0.00	0.02	0.03	0.00	0.342	0.2650	0.0767	0.0016	0.0029
LADLE	7354	1	0.03	0.13	0.026	0.005	0.03	0.03	0.03	0.00	0.038	0.0338	0.0043	0.0000	0.0045
LADLE	7354	2	0.05	0.29	0.020	0.012	0.07	0.03	0.03	0.00	0.045	0.0402	0.0050	0.0029	0.0056
TUNDISH	7354	1	0.09	0.30	0.017	0.012	0.07	0.03	0.03	0.01	0.027	0.0249	0.0021	0.0010	0.0051
TUNDISH	7354	2	0.06	0.30	0.016	0.011	0.06	0.02	0.03	0.01	0.028	0.0243	0.0032	0.0011	0.0056
TUNDISH	7354	3	0.06	0.30	0.016	0.011	0.06	0.02	0.03	0.01	0.028	0.0259	0.0026	0.0012	0.0054

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1566	15:40	15:35	260 X 335	11	16:00	1590	INTOCAST	32	(STAVERMA-SILICA)		17			17	
1565	15:50	16:35		19	16:11						18		7	18	1
1571	16:05			30	16:24						19			19	
1572	16:15										20			20	
1574	16:23														

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7359	1	0.04	0.13	0.032	0.010	0.00	0.02	0.03	0.01	0.433	0.3655	0.0679	0.0005	0.0013
LADLE	7359	1	0.03	0.14	0.025	0.010	0.04	0.02	0.03	0.00	0.102	0.0905	0.0116	0.0000	0.0059
LADLE	7359	2	0.04	0.29	0.018	0.014	0.07	0.02	0.03	0.01	0.037	0.0360	0.0007	0.0084	0.0076
TUNDISH	7359	1	0.05	0.29	0.012	0.015	0.07	0.02	0.03	0.01	0.023	0.0208	0.0025	0.0005	0.0060
TUNDISH	7359	2	0.05	0.29	0.012	0.015	0.07	0.02	0.03	0.01	0.023	0.0204	0.0026	0.0005	0.0056
TUNDISH	7359	3	0.05	0.29	0.012	0.015	0.07	0.02	0.03	0.01	0.024	0.0219	0.0022	0.0005	0.0061

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1564	20:23	20:20	260 X 335	12	20:44	1610	INTOCAST	32	(STAVERMA-SILICA)		17			17	
1577	20:30	21:15		24	20:55						18			18	
1575	20:45			32	21:05						19			19	
											20			20	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7368	1	0.04	0.08	0.027	0.006	0.00	0.03	0.03	0.00	0.505	0.4109	0.0939	0.0001	0.0043
LADLE	7368	1	0.03	0.10	0.023	0.006	0.01	0.03	0.03	0.00	0.098	0.0711	0.0269	0.0000	0.0085
LADLE	7368	2	0.03	0.27	0.023	0.008	0.03	0.03	0.03	0.00	0.053	0.0493	0.0037	0.0000	0.0083
LADLE	7368	3	0.04	0.34	0.019	0.010	0.09	0.03	0.03	0.00	0.044	0.0435	0.0009	0.0019	0.0071
TUNDISH	7368	1	0.06	0.34	0.019	0.010	0.08	0.02	0.03	0.01	0.033	0.0314	0.0015	0.0009	0.0085
TUNDISH	7368	2	0.05	0.34	0.018	0.009	0.09	0.02	0.03	0.01	0.036	0.0341	0.0022	0.0012	0.0066
TUNDISH	7368	3	0.05	0.34	0.017	0.009	0.09	0.02	0.03	0.01	0.035	0.0325	0.0023	0.0010	0.0065

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1570	21:20	21:15	260 X 335	10	21:30	1594	INTOCAST	32	(STAVERMA-SILICA)		17			17	
1564	21:37	22:10		19	21:40						18			18	
1560	21:45			28	21:50						19			19	
											20			20	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7370	1	0.05	0.15	0.024	0.009	0.00	0.02	0.03	0.01	0.473	0.4191	0.0537	0.0001	0.0036
LADLE	7370	1	0.04	0.14	0.021	0.008	0.01	0.02	0.03	0.00	0.083	0.0716	0.0114	0.0000	0.0046
LADLE	7370	2	0.04	0.30	0.021	0.011	0.04	0.02	0.03	0.00	0.043	0.0383	0.0048	0.0000	0.0060
LADLE	7370	3	0.04	0.32	0.016	0.011	0.08	0.02	0.03	0.00	0.051	0.0487	0.0022	0.0020	0.0065
TUNDISH	7370	1	0.05	0.32	0.013	0.010	0.08	0.02	0.03	0.01	0.040	0.0370	0.0032	0.0009	0.0055
TUNDISH	7370	2	0.05	0.31	0.014	0.010	0.08	0.02	0.03	0.01	0.041	0.0358	0.0047	0.0010	0.0056
TUNDISH	7370	3	0.05	0.32	0.014	0.010	0.08	0.02	0.03	0.01	0.041	0.0375	0.0035	0.0009	0.0052

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1574	22:15	22:10	260 X 335	18	22:37	1592	INTOCAST	32	(STAVERMA-SILICA)		17		10,14	17	2
1569	22:35	23:10		21	22:41					15	18	1	18	18	1
1565	22:45			30	22:52						19		10,20	19	2
1566	22:55									12	20	1	7,12,18	20	3

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7372	1	0.05	0.09	0.024	0.006	0.00	0.02	0.03	0.00	0.817	0.7985	0.0184	0.0003	0.0037
LADLE	7372	1	0.03	0.10	0.021	0.006	0.01	0.02	0.03	0.00	0.062	0.0585	0.0037	0.0000	0.0061
LADLE	7372	2	0.04	0.25	0.022	0.008	0.03	0.02	0.03	0.00	0.027	0.0224	0.0047	0.0002	0.0075
LADLE	7372	3	0.04	0.34	0.017	0.010	0.08	0.02	0.03	0.00	0.049	0.0476	0.0009	0.0020	0.0063
TUNDISH	7372	1	0.05	0.33	0.015	0.009	0.07	0.02	0.03	0.01	0.031	0.0226	0.0081	0.0008	0.0073
TUNDISH	7372	2	0.05	0.33	0.015	0.009	0.07	0.02	0.03	0.01	0.033	0.0190	0.0145	0.0008	0.0068
TUNDISH	7372	3	0.05	0.33	0.015	0.009	0.07	0.02	0.03	0.01	0.032	0.0193	0.0132	0.0008	0.0063

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1583	03:24	3:20	260 X 335	15	03:48	1610	INTOCAST	32	(STAVERMA-SILICA)		17			17	
1574	03:53	4:20		22	03:58						18			18	
1582	04:00			29	04:07						19			19	
1585	04:13										20			20	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7381	1	0.04	0.10	0.020	0.007	0.00	0.02	0.03	0.00	0.555	0.4559	0.0989	0.0006	0.0035
LADLE	7381	1	0.03	0.10	0.017	0.006	0.01	0.02	0.03	0.00	0.052	0.0452	0.0064	0.0001	0.0061
LADLE	7381	2	0.05	0.36	0.012	0.012	0.03	0.02	0.03	0.00	0.027	0.0171	0.0096	0.0005	0.0061
LADLE	7381	3	0.05	0.37	0.007	0.012	0.08	0.02	0.03	0.00	0.051	0.0479	0.0028	0.0025	0.0065
TUNDISH	7381	1	0.06	0.37	0.006	0.011	0.08	0.02	0.03	0.01	0.044	0.0408	0.0031	0.0011	0.0085
TUNDISH	7381	2	0.07	0.37	0.006	0.011	0.08	0.02	0.03	0.01	0.043	0.0417	0.0010	0.0010	0.0098
TUNDISH	7381	3	0.06	0.37	0.006	0.011	0.09	0.02	0.03	0.01	0.045	0.0430	0.0021	0.0011	0.0064

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1585	04:28	4:20	260 X 335	10	04:32	1594	INTOCAST	32	(STAVERMA-SILICA)		17			17	
1582	04:39	5:20		20	04:46						18			18	
1579	04:46			30	04:58						19			19	
1572	05:10										20			20	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7383	1	0.03	0.07	0.019	0.004	0.00	0.02	0.03	0.00	0.410	0.3888	0.0208	0.0022	0.0070
LADLE	7383	1	0.02	0.09	0.017	0.005	0.01	0.02	0.03	0.00	0.081	0.0788	0.0019	0.0002	0.0070
LADLE	7383	2	0.04	0.32	0.019	0.007	0.08	0.02	0.03	0.00	0.052	0.0507	0.0011	0.0039	0.0084
TUNDISH	7383	1	0.06	0.32	0.011	0.006	0.08	0.02	0.03	0.01	0.039	0.0359	0.0033	0.0007	0.0088
TUNDISH	7383	2	0.05	0.31	0.010	0.006	0.08	0.02	0.03	0.01	0.040	0.0369	0.0032	0.0009	0.0093
TUNDISH	7383	3	0.05	0.32	0.010	0.006	0.08	0.02	0.03	0.01	0.040	0.0334	0.0070	0.0007	0.0077

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1575	05:30	5:20	260 X 335	15	05:42	1595	INTOCAST	32	(STAVERMA-SILICA)		17		3,15,32	17	3
1570	05:42	6:25		22	05:58						18		3,15,32	18	3
1573	05:58			32	06:13						19		3,15,32	19	3
1569	06:13										20		3,15,32	20	3
1564	06:20												16,17,18,19,28,29,30	LADLE	7

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7384	1	0.07	0.08	0.022	0.003	0.00	0.02	0.03	0.00	0.561	0.5608	0.0005	0.0014	0.0033
LADLE	7384	1	0.04	0.07	0.018	0.003	0.01	0.02	0.03	0.00	0.038	0.0336	0.0047	0.0001	0.0064
LADLE	7384	2	0.06	0.26	0.018	0.004	0.06	0.02	0.03	0.00	0.008	0.0044	0.0035	0.0006	0.0059
LADLE	7384	3	0.06	0.26	0.015	0.006	0.05	0.02	0.03	0.00	0.025	0.0208	0.0047	0.0008	0.0054
TUNDISH	7384	1	0.07	0.26	0.017	0.006	0.06	0.02	0.03	0.01	0.015	0.0102	0.0046	0.0000	0.0067
TUNDISH	7384	2	0.07	0.25	0.017	0.006	0.06	0.02	0.03	0.01	0.011	0.0063	0.0050	0.0000	0.0069
TUNDISH	7384	3	0.07	0.25	0.017	0.006	0.05	0.02	0.03	0.01	0.010	0.0063	0.0042	0.0000	0.0072

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1575	06:37	6:25	260 X 335	15	06:44	1593	INTOCAST	32	(STAVERMA-SILICA)		17			17	
1577	06:48	7:25		23	06:55						18			18	
1574	07:14			35	07:10						19			19	
											20		22	20	1

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7386	1	0.08	0.11	0.018	0.004	0.00	0.02	0.03	0.00	0.498	0.4560	0.0424	0.0007	0.0061
LADLE	7386	1	0.04	0.09	0.018	0.005	0.01	0.02	0.03	0.00	0.066	0.0540	0.0118	0.0001	0.0046
LADLE	7386	2	0.04	0.28	0.017	0.009	0.06	0.02	0.03	0.01	0.042	0.0368	0.0053	0.0022	0.0053
TUNDISH	7386	1	0.05	0.30	0.014	0.009	0.04	0.02	0.03	0.02	0.018	0.0110	0.0075	0.0001	0.0066
TUNDISH	7386	2	0.05	0.30	0.015	0.009	0.04	0.02	0.03	0.02	0.018	0.0148	0.0028	0.0001	0.0070
TUNDISH	7386	3	0.05	0.30	0.013	0.008	0.04	0.02	0.03	0.02	0.018	0.0147	0.0030	0.0001	0.0060

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1568	07:32	7:23	260 X 335	22	05:42	1592	INTOCAST	32	(STAVERMA-SILICA)		17		2,16	17	2
1564	07:51	8:25		30	05:58						18			18	
1565	08:05										19			19	
											20			20	
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
LADLE	7388	1	0.03	0.11	0.016	0.006	0.01	0.02	0.03	0.00	0.082	0.0715	0.0104	0.0000	0.0044
LADLE	7388	2	0.04	0.28	0.016	0.007	0.07	0.02	0.03	0.00	0.029	0.0242	0.0051	0.0020	0.0055
LADLE	7388	3	0.05	0.29	0.015	0.010	0.08	0.02	0.03	0.01	0.036	0.0301	0.0058	0.0012	0.0050
TUNDISH	7388	1	0.06	0.30	0.016	0.011	0.07	0.02	0.03	0.01	0.029	0.0262	0.0033	0.0004	0.0060
TUNDISH	7388	2	0.05	0.29	0.015	0.011	0.07	0.02	0.03	0.01	0.028	0.0240	0.0040	0.0004	0.0066
TUNDISH	7388	3	0.06	0.29	0.016	0.011	0.07	0.02	0.03	0.01	0.029	0.0218	0.0071	0.0004	0.0071

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1563	04:10	4:05	260 X 335	12	04:22	1605	INTOCAST	32	(STAVERMA-SILICA)		17		22	17	1
1563	04:36	5:20		21	04:33						18		9,19	18	2
1556	04:41			33	04:50					43,46	19	2	20	19	1
1557	04:47										20			20	
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	8669	1	0.05	0.14	0.025	0.008	0.00	0.02	0.04	0.00	0.437	0.3144	0.1223	0.0015	0.0044
LADLE	8669	1	0.03	0.14	0.018	0.008	0.01	0.02	0.04	0.00	0.103	0.0969	0.0057	0.0000	0.0070
LADLE	8669	2	0.03	0.32	0.018	0.013	0.01	0.02	0.04	0.00	0.036	0.0318	0.0044	0.0000	0.0062
LADLE	8669	3	0.04	0.35	0.015	0.014	0.02	0.02	0.04	0.00	0.055	0.0522	0.0033	0.0021	0.0064
TUNDISH	8669	1	0.04	0.34	0.015	0.013	0.02	0.02	0.04	0.01	0.036	0.0268	0.0096	0.0010	0.0089
TUNDISH	8669	2	0.05	0.33	0.015	0.013	0.02	0.02	0.03	0.01	0.039	0.0288	0.0103	0.0011	0.0092
TUNDISH	8669	3	0.05	0.34	0.015	0.013	0.02	0.02	0.03	0.01	0.040	0.0203	0.0193	0.0014	0.0092

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1554	05:30	5:20	260 X 335	13	05:41	1604	INTOCAST	32	(STAVERMA-SILICA)		17			17	
1555	05:38	6:30		20	05:49						18		2	18	1
1554	05:59			30	06:01					13	19	1		19	
											20			20	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	8671	1	0.04	0.13	0.030	0.009	0.00	0.02	0.03	0.00	0.399	0.3646	0.0344	0.0003	0.0048
LADLE	8671	1	0.03	0.15	0.020	0.009	0.01	0.02	0.04	0.00	0.076	0.0710	0.0050	0.0000	0.0049
LADLE	8671	2	0.03	0.32	0.010	0.011	0.02	0.02	0.04	0.00	0.112	0.1118	0.0006	0.0000	0.0052
TUNDISH	8671	1	0.04	0.33	0.007	0.011	0.04	0.02	0.04	0.01	0.089	0.0834	0.0054	0.0023	0.0078
TUNDISH	8671	2	0.04	0.33	0.008	0.012	0.04	0.02	0.04	0.01	0.080	0.0744	0.0058	0.0016	0.0084
TUNDISH	8671	3	0.04	0.33	0.006	0.011	0.04	0.02	0.04	0.01	0.090	0.0876	0.0023	0.0017	0.0081

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN		LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED			Oxygen Blowing to Nozzle		
				meter	TIME					meter	canal	number	meter	canal	number
1576	06:45	6:40	260 X 335	12	07:06	1615	INTOCAST	32	(STAVERMA-SILICA)		17		8	17	1
1555	07:02	7:45		23	07:21						18		7	18	1
1556	07:15			30	07:30						19		9	19	1
1566	07:31									12	20	1	1	20	1
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	8673	1	0.05	0.15	0.022	0.008	0.00	0.02	0.04	0.01	0.487	0.4426	0.0440	0.0007	0.0049
LADLE	8673	1	0.03	0.32	0.005	0.010	0.04	0.02	0.04	0.00	0.096	0.0956	0.0001	0.0015	0.0069
LADLE	8673	2	0.04	0.16	0.014	0.007	0.01	0.02	0.04	0.00	0.174	0.1720	0.0021	0.0000	0.0086
LADLE	8673	3	0.04	0.29	0.012	0.008	0.01	0.02	0.04	0.00	0.147	0.1470	0.0003	0.0000	0.0092
LADLE	8673	4	0.04	0.35	0.007	0.009	0.04	0.02	0.04	0.00	0.131	0.1299	0.0006	0.0017	0.0099
TUNDISH	8673	1	0.05	0.35	0.007	0.009	0.04	0.02	0.04	0.01	0.121	0.0909	0.0299	0.0015	0.0098
TUNDISH	8673	2	0.05	0.35	0.007	0.008	0.04	0.02	0.04	0.01	0.117	0.0923	0.0250	0.0015	0.0093
TUNDISH	8673	3	0.05	0.34	0.008	0.008	0.04	0.02	0.04	0.01	0.111	0.1026	0.0080	0.0010	0.0082

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN		LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED			Oxygen Blowing to Nozzle		
				meter	TIME					meter	canal	number	meter	canal	number
1576	08:45	8:40	260 X 335	12	08:57	1599	INTOCAST	32	(STAVERMA-SILICA)		17		17	17	1
1574	08:55	9:45		23	09:12						18			18	
1570	09:22			30	09:30						19		2	19	1
											20		10	20	1
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	8677	1	0.05	0.12	0.024	0.006	0.01	0.02	0.04	0.00	0.605	0.5388	0.0657	0.0086	0.0078
LADLE	8677	1	0.04	0.13	0.017	0.007	0.01	0.02	0.04	0.00	0.106	0.0947	0.0113	0.0002	0.0064
LADLE	8677	2	0.03	0.30	0.017	0.008	0.01	0.02	0.04	0.00	0.069	0.0635	0.0051	0.0000	0.0058
LADLE	8677	3	0.04	0.32	0.016	0.009	0.03	0.02	0.04	0.00	0.056	0.0527	0.0030	0.0052	0.0068
TUNDISH	8677	1	0.05	0.33	0.016	0.012	0.03	0.02	0.04	0.01	0.040	0.0331	0.0070	0.0014	0.0073
TUNDISH	8677	2	0.04	0.32	0.015	0.011	0.03	0.02	0.04	0.01	0.039	0.0301	0.0086	0.0013	0.0076
TUNDISH	8677	3	0.05	0.32	0.016	0.011	0.03	0.02	0.04	0.01	0.038	0.0312	0.0071	0.0012	0.0083

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN		LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED			Oxygen Blowing to Nozzle		
				meter	TIME					meter	canal	number	meter	canal	number
1564	09:50	9:45	260 X 335	14	10:02	1593	INTOCAST	32	(STAVERMA-SILICA)		17		25	17	1
1560	10:05	10:40		23	10:09						18			18	
1556	10:30			34	10:24						19		25	19	1
											20		25	20	1
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	8679	1	0.03	0.12	0.022	0.008	0.00	0.02	0.04	0.00	0.631	0.5437	0.0877	0.0014	0.0026
LADLE	8679	1	0.04	0.11	0.020	0.006	0.01	0.02	0.04	0.00	0.163	0.1579	0.0047	0.0000	0.0052
LADLE	8679	2	0.04	0.35	0.010	0.007	0.03	0.02	0.04	0.00	0.113	0.1125	0.0008	0.0021	0.0058
LADLE	8679	3	0.05	0.35	0.007	0.008	0.03	0.02	0.04	0.00	0.085	0.0748	0.0097	0.0021	0.0103
TUNDISH	8679	1	0.05	0.34	0.006	0.008	0.03	0.02	0.04	0.01	0.054	0.0485	0.0054	0.0003	0.0099
TUNDISH	8679	2	0.05	0.34	0.005	0.008	0.03	0.02	0.04	0.01	0.054	0.0495	0.0042	0.0002	0.0097
TUNDISH	8679	3	0.05	0.34	0.006	0.008	0.03	0.02	0.04	0.01	0.054	0.0499	0.0042	0.0002	0.0100

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1567	04:25	4:20	260 X 335	10	04:33	1594	INTOCAST	32	(STAVERMA-SILICA)		17			17	
1569	04:35	5:20		21	04:45						18			18	
1571	04:50			30	04:56						19			19	
1568	05:03									1	20	1		20	
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	8942	1	0.05	0.09	0.021	0.005	0.00	0.02	0.06	0.02	0.540	0.4936	0.0466	0.0017	0.0002
LADLE	8942	1	0.04	0.11	0.018	0.007	0.02	0.02	0.06	0.02	0.124	0.1233	0.0004	0.0000	0.0047
LADLE	8942	2	0.04	0.28	0.016	0.009	0.02	0.02	0.06	0.02	0.075	0.0647	0.0103	0.0002	0.0057
LADLE	8942	3	0.04	0.30	0.011	0.010	0.04	0.02	0.06	0.02	0.050	0.0460	0.0043	0.0025	0.0045
TUNDISH	8942	1	0.07	0.31	0.006	0.009	0.06	0.02	0.06	0.03	0.031	0.0280	0.0028	0.0004	0.0061
TUNDISH	8942	2	0.05	0.30	0.007	0.010	0.05	0.02	0.06	0.03	0.039	0.0371	0.0016	0.0006	0.0066
TUNDISH	8942	3	0.05	0.31	0.007	0.010	0.05	0.02	0.06	0.03	0.036	0.0332	0.0025	0.0007	0.0058

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1571	05:28	5:25	260 X 335	6	05:45	1610	INTOCAST	32	(STAVERMA-SILICA)		17		4,5	17	2
1556	05:45	6:25		20	06:03						18		4,5	18	2
1566	06:00			32	07:17						19		4,5	19	2
1573	06:17										20		4,5	20	2
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	8944	1	0.05	0.10	0.028	0.006	0.00	0.02	0.04	0.00	0.415	0.3516	0.0629	0.0004	0.0009
LADLE	8944	1	0.04	0.10	0.022	0.007	0.02	0.02	0.04	0.00	0.159	0.1549	0.0042	0.0002	0.0049
LADLE	8944	2	0.04	0.31	0.018	0.010	0.01	0.02	0.04	0.00	0.081	0.0779	0.0029	0.0007	0.0044
LADLE	8944	3	0.04	0.32	0.008	0.010	0.04	0.02	0.04	0.00	0.046	0.0433	0.0022	0.0021	0.0047
TUNDISH	8944	1	0.05	0.32	0.005	0.010	0.05	0.02	0.04	0.01	0.035	0.0277	0.0076	0.0007	0.0061
TUNDISH	8944	2	0.05	0.31	0.005	0.010	0.04	0.02	0.04	0.01	0.030	0.0216	0.0082	0.0007	0.0055
TUNDISH	8944	3	0.05	0.31	0.005	0.009	0.04	0.02	0.04	0.01	0.034	0.0306	0.0033	0.0007	0.0063

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1575	06:30	6:25	260 X 335	6	05:45	1610	INTOCAST	32	(STAVERMA-SILICA)		17		4	17	1
1574	06:50	7:20		20	06:03						18		4	18	1
1574	07:00			32	07:17						19		4	19	1
											20		4	20	1
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	8946	1	0.04	0.20	0.033	0.021	0.00	0.02	0.03	0.01	0.519	0.2401	0.2784	0.0013	0.0014
LADLE	8946	1	0.03	0.18	0.028	0.019	0.01	0.02	0.04	0.00	0.031	0.0262	0.0047	0.0000	0.0042
LADLE	8946	2	0.03	0.20	0.025	0.022	0.01	0.02	0.04	0.01	0.077	0.0722	0.0048	0.0001	0.0038
LADLE	8946	3	0.04	0.31	0.016	0.024	0.03	0.02	0.04	0.01	0.046	0.0451	0.0009	0.0016	0.0043
TUNDISH	8946	1	0.06	0.32	0.009	0.022	0.04	0.02	0.04	0.01	0.039	0.0378	0.0012	0.0009	0.0050
TUNDISH	8946	2	0.06	0.32	0.009	0.022	0.04	0.02	0.04	0.01	0.039	0.0375	0.0012	0.0008	0.0052
TUNDISH	8946	3	0.06	0.32	0.010	0.022	0.04	0.02	0.04	0.01	0.037	0.0357	0.0014	0.0007	0.0054

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN		LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED			Oxygen Blowing to Nozzle		
				meter	TIME					meter	canal	number	meter	canal	number
1562	07:25	7:20	260 X 335	12	07:35	1592	INTOCAST	32	(STAVERMA-SILICA)		17			17	
1564	07:45	8:20		20	07:46						18			18	
1561	07:55			28	07:56						19			19	
											20			20	
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	8948	1	0.06	0.14	0.030	0.012	0.00	0.02	0.04	0.00	0.479	0.4070	0.0722	0.0003	0.0016
LADLE	8948	1	0.03	0.12	0.023	0.009	0.02	0.02	0.04	0.00	0.050	0.0437	0.0061	0.0000	0.0047
LADLE	8948	2	0.03	0.13	0.024	0.012	0.01	0.02	0.04	0.00	0.081	0.0753	0.0054	0.0000	0.0053
LADLE	8948	3	0.05	0.32	0.017	0.014	0.03	0.02	0.04	0.00	0.047	0.0461	0.0006	0.0029	0.0040
TUNDISH	8948	1	0.06	0.32	0.011	0.015	0.03	0.02	0.04	0.01	0.034	0.0320	0.0023	0.0005	0.0063
TUNDISH	8948	2	0.05	0.33	0.010	0.014	0.03	0.02	0.04	0.01	0.039	0.0370	0.0019	0.0008	0.0064
TUNDISH	8948	3	0.06	0.33	0.011	0.014	0.03	0.02	0.04	0.01	0.038	0.0356	0.0020	0.0007	0.0062

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN		LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED			Oxygen Blowing to Nozzle		
				meter	TIME					meter	canal	number	meter	canal	number
1563	09:15	9:10	260 X 335	15	09:28	1593	INTOCAST	32	(STAVERMA-SILICA)	5	17	1		17	
1568	09:40	10:10		25	09:41						18			18	
1563	09:54			36	09:54						19			19	
											20			20	
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	8952	1	0.04	0.20	0.022	0.020	0.00	0.02	0.04	0.01	0.501	0.4323	0.0687	0.0001	0.0028
LADLE	8952	1	0.03	0.19	0.019	0.018	0.01	0.02	0.04	0.00	0.103	0.0971	0.0055	0.0001	0.0045
LADLE	8952	2	0.04	0.37	0.018	0.023	0.01	0.02	0.04	0.00	0.042	0.0363	0.0062	0.0000	0.0061
LADLE	8952	3	0.04	0.38	0.014	0.024	0.02	0.02	0.04	0.00	0.049	0.0476	0.0017	0.0032	0.0044
TUNDISH	8952	1	0.05	0.39	0.012	0.023	0.02	0.02	0.04	0.01	0.039	0.0353	0.0033	0.0011	0.0074
TUNDISH	8952	2	0.05	0.39	0.012	0.022	0.02	0.02	0.04	0.01	0.039	0.0372	0.0014	0.0012	0.0077
TUNDISH	8952	3	0.05	0.38	0.012	0.022	0.02	0.02	0.04	0.01	0.038	0.0354	0.0030	0.0013	0.0084

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN		LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED			Oxygen Blowing to Nozzle		
				meter	TIME					meter	canal	number	meter	canal	number
1574	01:44	1:40	260 X 335	15	02:13	1610	INTOCAST	32	(STAVERMA-SILICA)		17		10	17	1
1558	01:55	2:45		23	02:23						18		10	18	1
1561	02:12										19		10	19	1
1565	02:22										20			20	
1569	02:35													LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	9070	1	0.04	0.11	0.026	0.008	0.00	0.02	0.04	0.01	0.642	0.5204	0.1214	0.0012	0.0009
LADLE	9070	1	0.03	0.13	0.021	0.010	0.02	0.02	0.04	0.00	0.130	0.1280	0.0022	0.0000	0.0051
LADLE	9070	2	0.05	0.36	0.011	0.012	0.05	0.02	0.04	0.00	0.081	0.0710	0.0102	0.0017	0.0053
LADLE	9070	3	0.05	0.36	0.007	0.012	0.05	0.02	0.04	0.00	0.053	0.0505	0.0025	0.0008	0.0069
TUNDISH	9070	1	0.06	0.34	0.007	0.012	0.05	0.02	0.04	0.01	0.038	0.0282	0.0096	0.0008	0.0085
TUNDISH	9070	2	0.05	0.35	0.007	0.011	0.05	0.02	0.04	0.01	0.038	0.0344	0.0037	0.0009	0.0090

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1559	02:55	2:45	260 X 335	14	03:02	1590	INTOCAST	32	(STAVERMA-SILICA)	14	17	1	14	17	1
1558	03:16	3:40		25	03:15						18			18	
										8	19	1	8	19	1
											20			20	
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	9072	1	0.04	0.17	0.023	0.015	0.00	0.02	0.04	0.01	0.482	0.4303	0.0521	0.0003	0.0019
LADLE	9072	1	0.03	0.19	0.018	0.014	0.02	0.02	0.04	0.01	0.070	0.0658	0.0047	0.0000	0.0051
LADLE	9072	2	0.04	0.29	0.021	0.017	0.02	0.02	0.04	0.01	0.039	0.0347	0.0038	0.0000	0.0055
LADLE	9072	3	0.05	0.34	0.019	0.019	0.02	0.02	0.04	0.01	0.038	0.0361	0.0023	0.0013	0.0051
TUNDISH	9072	1	0.05	0.34	0.019	0.019	0.02	0.02	0.04	0.02	0.031	0.0259	0.0048	0.0014	0.0078
TUNDISH	9072	2	0.06	0.34	0.019	0.019	0.02	0.02	0.04	0.02	0.028	0.0245	0.0037	0.0011	0.0079

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1551	03:48	3:40	260 X 335	18	04:03	1590	INTOCAST	32	(STAVERMA-SILICA)		17		20	17	1
1546	03:58	4:30									18		7	18	1
1546	04:06										19		21	19	1
											20		14,30	20	2
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	9074	1	0.12	0.14	0.024	0.006	0.00	0.02	0.04	0.01	0.848	0.7779	0.0697	0.0009	0.0036
CONVE.	9074	2	0.05	0.09	0.019	0.005	0.00	0.02	0.04	0.00	0.741	0.5811	0.1595	0.0023	0.0039
LADLE	9074	1	0.04	0.10	0.017	0.006	0.03	0.02	0.04	0.00	0.051	0.0457	0.0056	0.0000	0.0047
LADLE	9074	2	0.05	0.34	0.015	0.008	0.03	0.02	0.04	0.00	0.047	0.0311	0.0160	0.0020	0.0050
TUNDISH	9074	1	0.05	0.35	0.014	0.010	0.02	0.02	0.04	0.01	0.024	0.0197	0.0040	0.0007	0.0092

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1563	04:43	4:30	260 X 335	15	04:51	1590	INTOCAST	32	(STAVERMA-SILICA)		17		5	17	1
1563	04:53	5:25		27	05:07					7	18	1	3	18	1
1559	05:16										19		1	19	1
											20		8	20	1
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	9076	1	0.04	0.16	0.022	0.013	0.00	0.02	0.04	0.01	0.533	0.4757	0.0573	0.0010	0.0045
LADLE	9076	1	0.03	0.14	0.017	0.010	0.02	0.02	0.05	0.01	0.052	0.0473	0.0043	0.0000	0.0043
LADLE	9076	2	0.04	0.34	0.016	0.012	0.02	0.02	0.05	0.01	0.047	0.0435	0.0034	0.0012	0.0051
TUNDISH	9076	1	0.05	0.34	0.014	0.013	0.03	0.02	0.04	0.01	0.031	0.0244	0.0068	0.0015	0.0075
TUNDISH	9076	2	0.05	0.35	0.015	0.013	0.03	0.02	0.04	0.01	0.031	0.0246	0.0062	0.0015	0.0090

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1561	05:33	5:25	260 X 335	16	05:46	1592	INTOCAST	32	(STAVERMA-SILICA)	1	17	1	1	17	1
1556	05:47	6:20		28	06:00						18			18	
1555	06:04									1	19	1	1	19	1
											20			20	
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	9077	1	0.05	0.16	0.023	0.016	0.00	0.02	0.05	0.02	0.395	0.3168	0.0779	0.0003	0.0033
LADLE	9077	1	0.03	0.16	0.020	0.014	0.02	0.02	0.05	0.02	0.200	0.1971	0.0033	0.0000	0.0046
LADLE	9077	2	0.06	0.40	0.007	0.017	0.04	0.02	0.05	0.02	0.087	0.0849	0.0025	0.0011	0.0063
TUNDISH	9077	1	0.07	0.40	0.006	0.017	0.04	0.02	0.05	0.02	0.072	0.0694	0.0023	0.0018	0.0086
TUNDISH	9077	2	0.06	0.40	0.006	0.017	0.04	0.02	0.05	0.03	0.070	0.0668	0.0031	0.0014	0.0080

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1558	06:28	6:20	260 X 335	20	06:52	1590	INTOCAST	32	(STAVERMA-SILICA)		17		16	17	1
		7:20		26	07:04						18		16	18	1
											19			19	
											20		27	20	1
													10,16,17,18,22,25	LADLE	6

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	9078	1	0.05	0.12	0.014	0.007	0.00	0.02	0.06	0.01	0.497	0.4726	0.0242	0.0013	0.0043
LADLE	9078	1	0.04	0.11	0.012	0.007	0.01	0.02	0.06	0.01	0.111	0.1079	0.0032	0.0000	0.0039
LADLE	9078	2	0.05	0.27	0.010	0.010	0.02	0.02	0.06	0.01	0.073	0.0585	0.0146	0.0024	0.0043
TUNDISH	9078	1	0.06	0.31	0.010	0.012	0.02	0.02	0.06	0.01	0.020	0.0106	0.0098	0.0002	0.0063
TUNDISH	9078	2	0.06	0.31	0.010	0.011	0.02	0.02	0.06	0.01	0.021	0.0162	0.0051	0.0002	0.0062

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1551	08:44	8:40	260 X 335	15	09:06	1600	INTOCAST	32	(STAVERMA-SILICA)		17			17	
1550	09:03	10:05		25	09:18						18		7	18	1
1561	09:17			46	09:40						19		7	19	1
1561	09:40										20			20	
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	9082	1	0.05	0.10	0.022	0.006	0.00	0.02	0.04	0.02	0.724	0.6697	0.0545	0.0003	0.0046
LADLE	9082	1	0.04	0.11	0.016	0.007	0.01	0.02	0.05	0.01	0.102	0.0973	0.0048	0.0000	0.0047
LADLE	9082	2	0.06	0.28	0.013	0.009	0.03	0.02	0.05	0.02	0.082	0.0783	0.0036	0.0021	0.0064
LADLE	9082	3	0.06	0.33	0.011	0.010	0.03	0.02	0.05	0.02	0.067	0.0621	0.0050	0.0011	0.0066
TUNDISH	9082	1	0.07	0.34	0.010	0.010	0.03	0.02	0.05	0.03	0.041	0.0377	0.0033	0.0004	0.0074
TUNDISH	9082	2	0.08	0.33	0.009	0.009	0.03	0.02	0.05	0.02	0.048	0.0458	0.0017	0.0005	0.0061
TUNDISH	9082	3	0.07	0.33	0.008	0.009	0.03	0.02	0.05	0.02	0.048	0.0463	0.0012	0.0005	0.0067

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1575	10:17	10:15	260 X 335	21	10:50	1610	INTOCAST	32	(STAVERMA-SILICA)		17			17	
1565	10:33	11:30		32	11:08						18		19,30,44	18	3
1568	10:50			37	11:12						19		17,30,44	19	3
1565	11:11										20		21,32,45	20	3
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	9084	1	0.09	0.14	0.016	0.006	0.00	0.02	0.04	0.01	0.363	0.3426	0.0206	0.0003	0.0062
CONVE.	9084	2	0.07	0.10	0.015	0.004	0.00	0.02	0.04	0.00	0.751	0.7144	0.0367	0.0007	0.0083
LADLE	9084	1	0.05	0.11	0.012	0.006	0.02	0.03	0.05	0.00	0.050	0.0458	0.0039	0.0000	0.0032
LADLE	9084	2	0.05	0.29	0.010	0.009	0.01	0.03	0.05	0.00	0.038	0.0351	0.0029	0.0000	0.0037
LADLE	9084	3	0.05	0.35	0.006	0.010	0.04	0.02	0.05	0.00	0.046	0.0432	0.0026	0.0009	0.0057
TUNDISH	9084	1	0.07	0.35	0.005	0.009	0.04	0.02	0.04	0.01	0.031	0.0269	0.0042	0.0003	0.0062
TUNDISH	9084	2	0.06	0.34	0.005	0.009	0.04	0.02	0.04	0.01	0.030	0.0236	0.0068	0.0003	0.0060
TUNDISH	9084	3	0.06	0.34	0.005	0.009	0.04	0.02	0.04	0.01	0.033	0.0244	0.0086	0.0006	0.0065

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	canal	number	Oxygen Blowing to Nozzle meter	canal	number
1547	13:05	12:55	260 X 335	17	13:23	1603	INTOCAST	32	(STAVERMA-SILICA)		17			17	
1553	13:37	14:20		25	13:30						18		14,26	18	2
1550	13:45			37	13:45						19		13	19	1
1549	14:00										20		14	20	1
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	9090	1	0.07	0.18	0.019	0.012	0.00	0.02	0.04	0.01	0.465	0.4070	0.0584	0.0006	0.0000
LADLE	9090	1	0.03	0.11	0.012	0.007	0.01	0.02	0.04	0.00	0.139	0.1206	0.0184	0.0000	0.0081
LADLE	9090	2	0.04	0.32	0.009	0.011	0.03	0.02	0.04	0.00	0.086	0.0844	0.0019	0.0025	0.0069
TUNDISH	9090	1	0.05	0.32	0.007	0.012	0.03	0.02	0.04	0.01	0.054	0.0489	0.0049	0.0002	0.0074
TUNDISH	9090	2	0.06	0.30	0.008	0.012	0.03	0.02	0.04	0.01	0.046	0.0369	0.0089	0.0001	0.0096
TUNDISH	9090	3	0.05	0.31	0.007	0.012	0.03	0.02	0.04	0.01	0.051	0.0473	0.0034	0.0002	0.0098

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	canal	number	Oxygen Blowing to Nozzle meter	canal	number
1558	17:40	17:35	260 X 335	13	17:51	1595	INTOCAST	32	(STAVERMA-SILICA)	8	17	1	8	17	1
1559	17:50	18:35		22	18:02						18			18	
1564	18:00			33	18:15						19			19	
1561	18:10									6,7	20	2	6,7	20	2
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	9100	1	0.06	0.10	0.023	0.006	0.00	0.02	0.04	0.01	0.429	0.4242	0.0053	0.0008	0.0054
LADLE	9100	1	0.04	0.12	0.015	0.007	0.02	0.02	0.04	0.01	0.136	0.1293	0.0071	0.0000	0.0049
LADLE	9100	2	0.04	0.30	0.015	0.013	0.04	0.02	0.04	0.01	0.062	0.0545	0.0071	0.0013	0.0049
TUNDISH	9100	1	0.05	0.32	0.011	0.014	0.03	0.02	0.04	0.02	0.039	0.0341	0.0049	0.0012	0.0079
TUNDISH	9100	2	0.05	0.32	0.011	0.014	0.03	0.02	0.04	0.02	0.038	0.0331	0.0050	0.0008	0.0071
TUNDISH	9100	3	0.05	0.32	0.011	0.014	0.03	0.02	0.04	0.02	0.038	0.0336	0.0045	0.0009	0.0074

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	canal	number	Oxygen Blowing to Nozzle meter	canal	number
1557	19:35	19:30	260 X 335	11	19:45	1594	INTOCAST	32	(STAVERMA-SILICA)		17			17	
1563	19:46	20:25		18	19:52					22	18	1		18	
1560	20:20			28	20:06						19			19	
											20			20	
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	9104	1	0.04	0.13	0.026	0.012	0.00	0.02	0.05	0.02	0.411	0.3242	0.0870	0.0008	0.0029
LADLE	9104	1	0.03	0.12	0.017	0.009	0.02	0.02	0.05	0.01	0.060	0.0543	0.0059	0.0000	0.0063
LADLE	9104	2	0.04	0.32	0.018	0.017	0.01	0.02	0.05	0.01	0.082	0.0773	0.0044	0.0000	0.0053
LADLE	9104	3	0.04	0.35	0.011	0.019	0.03	0.02	0.05	0.02	0.047	0.0459	0.0013	0.0017	0.0060
TUNDISH	9104	1	0.05	0.34	0.010	0.017	0.03	0.02	0.05	0.02	0.032	0.0288	0.0031	0.0011	0.0079
TUNDISH	9104	2	0.05	0.34	0.010	0.017	0.03	0.02	0.05	0.02	0.033	0.0301	0.0029	0.0013	0.0080
TUNDISH	9104	3	0.05	0.34	0.010	0.017	0.03	0.02	0.05	0.02	0.032	0.0298	0.0024	0.0010	0.0079

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1563	20:35	20:25	260 X 335	10	20:40	1596	INTOCAST	32	(STAVERMA-SILICA)		17			17	
1568	21:15	21:20		21	20:55						18			18	
				30	21:05						19			19	
											20			20	
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	9106	1	0.05	0.16	0.029	0.012	0.00	0.03	0.04	0.01	0.667	0.1224	0.5445	0.0033	0.0039
LADLE	9106	1	0.04	0.17	0.022	0.013	0.01	0.03	0.04	0.00	0.112	0.1035	0.0084	0.0000	0.0038
LADLE	9106	2	0.04	0.32	0.018	0.019	0.01	0.03	0.04	0.01	0.076	0.0671	0.0086	0.0000	0.0050
LADLE	9106	3	0.04	0.34	0.010	0.020	0.03	0.03	0.04	0.01	0.051	0.0496	0.0011	0.0015	0.0060
TUNDISH	9106	1	0.05	0.33	0.010	0.018	0.03	0.03	0.04	0.02	0.046	0.0444	0.0012	0.0015	0.0065
TUNDISH	9106	2	0.05	0.33	0.010	0.018	0.03	0.03	0.04	0.01	0.045	0.0409	0.0042	0.0017	0.0068
TUNDISH	9106	3	0.05	0.33	0.012	0.018	0.04	0.03	0.04	0.02	0.046	0.0436	0.0020	0.0015	0.0080

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1564	21:30	21:20	260 X 335	8	21:35	1595	INTOCAST	32	(STAVERMA-SILICA)		17			17	
1570	21:43	22:15		17	21:45						18			18	
1574	22:05			24	21:55						19			19	
										37	20	1		20	
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	9108	1	0.06	0.20	0.037	0.018	0.00	0.02	0.04	0.01	0.397	0.3926	0.0046	0.0023	0.0028
CONVE.	9108	2	0.04	0.15	0.031	0.012	0.00	0.02	0.04	0.01	0.442	0.3719	0.0705	0.0001	0.0034
LADLE	9108	1	0.04	0.16	0.021	0.013	0.02	0.02	0.04	0.00	0.078	0.0758	0.0026	0.0000	0.0053
LADLE	9108	2	0.05	0.33	0.017	0.015	0.02	0.02	0.04	0.00	0.115	0.1129	0.0018	0.0000	0.0048
LADLE	9108	3	0.04	0.34	0.014	0.016	0.03	0.02	0.04	0.00	0.088	0.0837	0.0039	0.0000	0.0052
LADLE	9108	4	0.04	0.35	0.006	0.016	0.06	0.02	0.04	0.00	0.058	0.0581	0.0000	0.0017	0.0058
TUNDISH	9108	1	0.05	0.34	0.006	0.015	0.05	0.02	0.04	0.01	0.042	0.0401	0.0015	0.0013	0.0075
TUNDISH	9108	2	0.05	0.34	0.007	0.016	0.05	0.02	0.04	0.01	0.044	0.0439	0.0002	0.0014	0.0072
TUNDISH	9108	3	0.05	0.34	0.007	0.016	0.05	0.02	0.04	0.01	0.043	0.0413	0.0018	0.0014	0.0069

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1567	22:20	22:15	260 X 335	11	22:30	1595	INTOCAST	32	(STAVERMA-SILICA)		17			17	
1560	22:45	23:05		19	22:40						18			18	
				28	22:50						19			19	
											20			20	
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	9110	1	0.08	0.16	0.036	0.012	0.00	0.02	0.05	0.03	0.977	0.9401	0.0369	0.0003	0.0032
CONVE.	9110	2	0.06	0.11	0.029	0.007	0.00	0.02	0.05	0.02	0.450	0.4482	0.0017	0.0032	0.0034
LADLE	9110	1	0.05	0.12	0.023	0.008	0.01	0.03	0.05	0.02	0.154	0.1505	0.0035	0.0000	0.0041
LADLE	9110	2	0.05	0.27	0.017	0.011	0.01	0.03	0.05	0.02	0.102	0.0967	0.0052	0.0001	0.0058
LADLE	9110	3	0.06	0.28	0.008	0.011	0.04	0.02	0.05	0.02	0.051	0.0498	0.0011	0.0014	0.0056
TUNDISH	9110	1	0.06	0.27	0.007	0.011	0.04	0.02	0.05	0.02	0.050	0.0476	0.0025	0.0012	0.0074
TUNDISH	9110	2	0.06	0.28	0.008	0.011	0.04	0.02	0.05	0.02	0.043	0.0413	0.0016	0.0011	0.0092
TUNDISH	9110	3	0.06	0.27	0.008	0.011	0.04	0.02	0.05	0.02	0.053	0.0513	0.0016	0.0014	0.0070

APPENDIX B

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1577	12:50	12:45	260 X 260	14	13:20	1605	INTOCAST	32	DYSN		13		8,18	13	2
1567	13:05	14:15		25	13:35						14		8,18	14	2
1561	13:20			36	13:50						15		8,18	15	2
1564	13:45									25	16	1	8,18,25	16	3
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2082	1	0.03	0.09	0.044	0.011	0.00	0.02	0.04	0.00	0.426			0.0031	0.0076
CONVE.	2082	2	0.03	0.08	0.037	0.008	0.00	0.02	0.04	0.00	0.477			0.0029	0.0156
LADLE	2082	1	0.02	0.07	0.032	0.007	0.01	0.02	0.04	0.00	0.072	0.0642	0.0073	0.0000	0.0008
LADLE	2082	2	0.04	0.28	0.029	0.010	0.01	0.02	0.04	0.00	0.019	0.0148	0.0040	0.0000	0.0035
LADLE	2082	3	0.06	0.38	0.026	0.013	0.02	0.02	0.04	0.00	0.039	0.0346	0.0041	0.0010	0.0041
LADLE	2082	4	0.06	0.40	0.022	0.016	0.04	0.02	0.04	0.00	0.052	0.0467	0.0054	0.0035	0.0051
TUNDISH	2082	1	0.07	0.39	0.024	0.018	0.03	0.02	0.04	0.00	0.025	0.0204	0.0044	0.0004	0.0023
TUNDISH	2082	2	0.08	0.40	0.023	0.018	0.04	0.02	0.04	0.00	0.029	0.0227	0.0058	0.0010	0.0066
TUNDISH	2082	3	0.07	0.41	0.022	0.017	0.04	0.02	0.04	0.00	0.035	0.0265	0.0082	0.0011	0.0063

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1569	21:30	21:30	260 X 260	10	21:51	1603	INTOCAST	32	DYSN		13		6,29	13	2
1561	21:35	22:45		26	22:14						14		6	14	1
1567	21:43			38	22:30						15		6,22	15	2
1563	22:00										16		6,24	16	2
1559	22:14													LADLE	
1556	22:30														

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2099	1	0.04	0.18	0.026	0.015	0.00	0.02	0.04	0.00	0.451			0.0014	0.0070
LADLE	2099	1	0.03	0.14	0.026	0.009	0.01	0.02	0.04	0.00	0.032	0.0252	0.0065	0.0003	0.0093
LADLE	2099	2	0.05	0.32	0.025	0.011	0.01	0.02	0.04	0.00	0.002	0.0013	0.0009	0.0010	0.0077
LADLE	2099	3	0.05	0.39	0.018	0.015	0.04	0.02	0.04	0.01	0.049	0.0423	0.0063	0.0053	0.0086
TUNDISH	2099	1	0.06	0.41	0.015	0.016	0.03	0.02	0.04	0.01	0.021	0.0170	0.0042	0.0009	0.0070
TUNDISH	2099	2	0.06	0.41	0.017	0.018	0.03	0.02	0.04	0.01	0.017	0.0122	0.0047	0.0005	0.0081
TUNDISH	2099	3	0.05	0.40	0.014	0.016	0.03	0.02	0.04	0.01	0.019	0.0147	0.0039	0.0007	0.0064

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1559	22:50	22:45	260 X 260	13	23:03	1587	INTOCAST	32	DYSN	26	13	1	26	13	1
1563	23:00	0:00		26	23:20					28	14	1	4,28	14	2
1561	23:15			33	23:30						15			15	
1563	23:20										16		24,46	16	2
1558	23:35													LADLE	
1559	23:40														
1555	23:55														
1554	23:58														

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2100	1	0.05	0.20	0.027	0.013	0.00	0.02	0.04	0.01	0.403			0.0011	0.0057
LADLE	2100	1	0.04	0.20	0.026	0.013	0.02	0.02	0.04	0.01	0.009	0.0081	0.0008	0.0000	0.0051
LADLE	2100	2	0.06	0.33	0.024	0.013	0.02	0.02	0.04	0.01	0.001	0.0011	0.0004	0.0000	0.0056
LADLE	2100	3	0.06	0.37	0.023	0.018	0.03	0.02	0.04	0.01	0.052	0.0461	0.0062	0.0030	0.0056
TUNDISH	2100	1	0.06	0.38	0.019	0.018	0.03	0.02	0.04	0.01	0.026	0.0198	0.0064	0.0006	0.0064
TUNDISH	2100	2	0.07	0.39	0.020	0.019	0.03	0.02	0.04	0.01	0.025	0.0215	0.0031	0.0004	0.0083
TUNDISH	2100	3	0.06	0.39	0.019	0.019	0.03	0.02	0.04	0.01	0.029	0.0243	0.0046	0.0007	0.0073

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN		LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED			Oxygen Blowing to Nozzle		
				meter	TIME					meter	canal	number	meter	canal	number
1551	00:10	0:05	260 X 260	16	00:20	1587	INTOCAST	32	DYSN		13		1	13	1
1549	00:20	1:05		26	00:34					38	14	1	22,38	14	2
1545	00:35			32	00:44						15		1,35	15	2
1541	00:50										16			16	
1532	01:00													LADLE	

CHEMICAL COMPOSITION (%)															
TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2101	1	0.05	0.18	0.028	0.011	0.00	0.02	0.04	0.00	0.426			0.0001	0.0043
LADLE	2101	1	0.04	0.14	0.024	0.007	0.01	0.02	0.04	0.00	0.032	0.0280	0.0041	0.0003	0.0092
LADLE	2101	2	0.06	0.32	0.024	0.008	0.01	0.02	0.04	0.00	0.002	0.0013	0.0007	0.0007	0.0064
LADLE	2101	3	0.06	0.35	0.022	0.012	0.03	0.02	0.04	0.01	0.047	0.0404	0.0062	0.0020	0.0099
TUNDISH	2101	1	0.07	0.39	0.023	0.016	0.02	0.02	0.04	0.01	0.011	0.0094	0.0019	0.0000	0.0082
TUNDISH	2101	2	0.07	0.38	0.023	0.016	0.02	0.02	0.04	0.01	0.012	0.0083	0.0032	0.0000	0.0081
TUNDISH	2101	3	0.07	0.38	0.023	0.015	0.02	0.02	0.04	0.01	0.012	0.0079	0.0039	0.0000	0.0090

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN		LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED			Oxygen Blowing to Nozzle		
				meter	TIME					meter	canal	number	meter	canal	number
1565	05:05	5:00	260 X 260	17	05:20	1590	INTOCAST	32	DYSN		13			13	
1564	05:18	6:10		15	05:31					6	14	1		14	
1564	05:25			36	05:46					28	15	1		15	
1566	05:45									29	16	1		16	
1567	05:55													LADLE	

CHEMICAL COMPOSITION (%)															
TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2113	1	0.06	0.21	0.029	0.015	0.00	0.02	0.04	0.00	0.436			0.0001	0.0073
LADLE	2113	1	0.05	0.18	0.027	0.012	0.01	0.02	0.04	0.01	0.002	0.0011	0.0004	0.0000	0.0061
LADLE	2113	2	0.05	0.38	0.028	0.016	0.01	0.02	0.04	0.01	0.066	0.0636	0.0029	0.0000	0.0124
LADLE	2113	3	0.07	0.41	0.020	0.018	0.03	0.02	0.04	0.01	0.062	0.0487	0.0134	0.0044	0.0060
TUNDISH	2113	1	0.07	0.41	0.018	0.020	0.03	0.02	0.04	0.01	0.034	0.0300	0.0042	0.0009	0.0090
TUNDISH	2113	2	0.07	0.41	0.018	0.019	0.03	0.02	0.04	0.01	0.037	0.0327	0.0042	0.0008	0.0092
TUNDISH	2113	3	0.07	0.41	0.018	0.018	0.03	0.02	0.04	0.01	0.039	0.0316	0.0071	0.0012	0.0069

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN		LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED			Oxygen Blowing to Nozzle		
				meter	TIME					meter	canal	number	meter	canal	number
1547	05:47	5:40	260 X 260	15	06:00	1590	INTOCAST	32	DYSN		13		26	13	1
1556	05:55	6:55		30	06:20						14			14	
1551	06:20			43	06:37					41	15	1		15	
1550	06:35									26	16	1		16	
														LADLE	

CHEMICAL COMPOSITION (%)															
TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2159	1	0.03	0.08	0.025	0.006	0.00	0.02	0.04	0.00	0.428			0.0007	0.0043
LADLE	2159	1	0.03	0.08	0.020	0.004	0.02	0.02	0.04	0.00	0.121	0.1151	0.0057	0.0000	0.0064
LADLE	2159	2	0.06	0.39	0.019	0.011	0.02	0.02	0.04	0.00	0.037	0.0343	0.0031	0.0000	0.0051
LADLE	2159	3	0.06	0.41	0.012	0.012	0.05	0.02	0.04	0.00	0.065	0.0621	0.0028	0.0030	0.0050
TUNDISH	2159	1	0.07	0.40	0.015	0.014	0.04	0.02	0.04	0.01	0.049	0.0447	0.0042	0.0018	0.0085
TUNDISH	2159	2	0.07	0.40	0.014	0.013	0.04	0.02	0.04	0.00	0.046	0.0431	0.0033	0.0016	0.0090
TUNDISH	2159	3	0.07	0.40	0.014	0.013	0.04	0.02	0.04	0.00	0.045	0.0404	0.0044	0.0015	0.0089

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN		LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED			Oxygen Blowing to Nozzle		
				meter	TIME					meter	canal	number	meter	canal	number
1549	07:00	6:55	260 X 260	15	07:12	1594	INTOCAST	32	DYSN	24	13	1		13	
1552	07:12	8:05		29	07:30						14			14	
1551	07:35			36	07:40						15			15	
											16			16	
														LADLE	

CHEMICAL COMPOSITION (%)															
TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2161	1	0.04	0.13	0.035	0.008	0.00	0.02	0.04	0.00	0.375			0.0003	0.0086
LADLE	2161	1	0.04	0.14	0.029	0.009	0.02	0.02	0.04	0.00	0.105	0.1038	0.0016	0.0000	0.0056
LADLE	2161	2	0.06	0.34	0.025	0.014	0.02	0.02	0.04	0.00	0.061	0.0530	0.0075	0.0004	0.0067
LADLE	2161	3	0.06	0.40	0.017	0.014	0.04	0.02	0.04	0.00	0.044	0.0414	0.0024	0.0027	0.0062
TUNDISH	2161	1	0.07	0.40	0.016	0.015	0.05	0.02	0.04	0.00	0.037	0.0354	0.0017	0.0044	0.0076
TUNDISH	2161	2	0.07	0.40	0.014	0.015	0.04	0.02	0.04	0.00	0.033	0.0308	0.0020	0.0007	0.0061
TUNDISH	2161	3	0.07	0.40	0.016	0.015	0.04	0.02	0.04	0.00	0.032	0.0288	0.0030	0.0008	0.0059

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1546	08:10	8:05	260 X 260	15	08:22	1593	INTOCAST	32	DYSN		13			13	
1551	08:15	9:20		28	08:45						14			14	
1556	08:25			40	09:00						15			15	
1548	08:45									47	16	1	47	16	1
1549	09:05													LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2164	1	0.06	0.14	0.033	0.009	0.00	0.02	0.04	0.00	0.442			0.0020	0.0044
CONVE.	2164	2	0.04	0.11	0.029	0.006	0.00	0.02	0.04	0.00	0.432			0.0011	0.0036
LADLE	2164	1	0.04	0.10	0.027	0.006	0.01	0.02	0.04	0.00	0.084	0.0777	0.0061	0.0000	0.0059
LADLE	2164	2	0.05	0.30	0.026	0.011	0.01	0.02	0.04	0.00	0.022	0.0156	0.0062	0.0016	0.0068
LADLE	2164	3	0.06	0.37	0.022	0.013	0.03	0.02	0.04	0.00	0.060	0.0575	0.0026	0.0027	0.0065
TUNDISH	2164	1	0.07	0.38	0.022	0.014	0.04	0.02	0.04	0.00	0.049	0.0457	0.0038	0.0012	0.0070
TUNDISH	2164	2	0.07	0.38	0.022	0.014	0.03	0.02	0.04	0.00	0.051	0.0418	0.0094	0.0012	0.0085
TUNDISH	2164	3	0.07	0.38	0.024	0.014	0.03	0.02	0.04	0.00	0.048	0.0426	0.0051	0.0009	0.0086

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1559	15:50	15:45	260 X 260	16	16:10	1600	INTOCAST	32	DYSN		13		10	13	1
1557	15:58	17:20		24	16:21						14		10	14	1
											15			15	
1569	16:20										16		10,40	16	2
												3,5,7,16,21,27,32,34.......		LADLE	17

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2237	1	0.05	0.17	0.037	0.008	0.00	0.02	0.05	0.01	0.425			0.0039	0.0008
CONVE.	2237	2	0.03	0.13	0.030	0.006	0.00	0.02	0.05	0.01	0.419			0.0016	0.0032
LADLE	2237	1	0.03	0.12	0.029	0.006	0.01	0.02	0.05	0.01	0.125	0.1171	0.0083	0.0000	0.0075
LADLE	2237	2	0.04	0.23	0.028	0.013	0.03	0.02	0.04	0.01	0.014	0.0124	0.0021	0.0000	0.0098
TUNDISH	2237	1	0.06	0.35	0.027	0.011	0.02	0.02	0.05	0.01	0.036	0.0252	0.0106	0.0001	0.0065
TUNDISH	2237	2	0.05	0.35	0.028	0.012	0.02	0.02	0.05	0.01	0.036	0.0287	0.0068	0.0001	0.0097

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1556	18:50	18:45	260 X 260	17	19:07	1595	INTOCAST	32	DYSN		13			13	
1559	19:00	19:55		25	19:17						14			14	
1557	19:12			33	19:28						15			15	
1554	19:28										16		3,34	16	2
1552	19:38													LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2243	1	0.03	0.19	0.040	0.015	0.00	0.02	0.04	0.00	0.472			0.0011	0.0025
CONVE.	2243	2	0.03	0.14	0.037	0.010	0.00	0.02	0.04	0.00	0.423			0.0010	0.0085
LADLE	2243	1	0.02	0.14	0.032	0.009	0.01	0.02	0.04	0.00	0.023	0.0176	0.0050	0.0000	0.0076
LADLE	2243	2	0.05	0.38	0.030	0.014	0.03	0.02	0.04	0.00	0.082	0.0781	0.0041	0.0016	0.0093
LADLE	2243	3	0.05	0.40	0.028	0.015	0.03	0.02	0.04	0.00	0.076	0.0731	0.0031	0.0021	0.0078
TUNDISH	2243	1	0.06	0.41	0.028	0.015	0.03	0.02	0.04	0.01	0.059	0.0548	0.0039	0.0010	0.0092
TUNDISH	2243	2	0.05	0.41	0.027	0.015	0.03	0.02	0.04	0.01	0.062	0.0591	0.0026	0.0010	0.0087
TUNDISH	2243	3	0.06	0.41	0.027	0.015	0.03	0.02	0.04	0.01	0.061	0.0589	0.0024	0.0009	0.0100

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1557	20:00	19:55	260 X 260	17	20:17	1595	INTOCAST	32	DYSN	30	13	1	6,30	13	2
1558	20:18	21:15		28	20:33						14		18,48	14	2
1557	20:14			35	20:44					12	15	1	12,47	15	2
1558	20:48									35	16	1	35	16	1
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2244	1	0.02	0.13	0.030	0.009	0.00	0.03	0.04	0.00	0.401			0.0006	0.0014
LADLE	2244	1	0.02	0.13	0.031	0.007	0.01	0.03	0.04	0.00	0.002	0.0014	0.0007	0.0002	0.0095
LADLE	2244	2	0.03	0.14	0.032	0.008	0.01	0.03	0.04	0.01	0.081	0.0664	0.0148	0.0005	0.0094
LADLE	2244	3	0.05	0.36	0.029	0.016	0.03	0.03	0.04	0.01	0.028	0.0262	0.0019	0.0007	0.0095
LADLE	2244	4	0.05	0.39	0.027	0.021	0.02	0.03	0.04	0.01	0.078	0.0743	0.0036	0.0007	0.0081
TUNDISH	2244	1	0.06	0.41	0.026	0.022	0.03	0.03	0.04	0.01	0.065	0.0550	0.0103	0.0003	0.0092
TUNDISH	2244	2	0.06	0.40	0.026	0.022	0.02	0.03	0.04	0.01	0.065	0.0630	0.0021	0.0004	0.0100
TUNDISH	2244	3	0.05	0.40	0.028	0.021	0.02	0.03	0.04	0.01	0.061	0.0571	0.0042	0.0004	0.0086

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1583	17:28	17:25	260 X 260	19	17:59	1605	INTOCAST	32	DYSN		13		4	13	1
1573	17:34	18:40		28	18:12						14		3	14	1
1566	17:42			37	18:24						15		4	15	1
1572	17:48										16		3	16	1
1574	18:03													LADLE	
1573	18:25														

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2282	1	0.06	0.20	0.024	0.014	0.00	0.02	0.03	0.00	0.432			0.0015	0.0021
CONVE.	2282	2	0.05	0.15	0.023	0.008	0.00	0.02	0.03	0.00	0.426			0.0007	0.0027
LADLE	2282	1	0.04	0.15	0.023	0.009	0.02	0.02	0.04	0.00	0.081	0.0675	0.0137	0.0000	0.0092
LADLE	2282	2	0.06	0.39	0.017	0.016	0.04	0.02	0.04	0.00	0.059	0.0543	0.0050	0.0043	0.0049
TUNDISH	2282	1	0.06	0.39	0.017	0.017	0.04	0.02	0.04	0.01	0.044	0.0366	0.0072	0.0022	0.0049
TUNDISH	2282	2	0.06	0.39	0.018	0.018	0.04	0.02	0.04	0.01	0.044	0.0365	0.0076	0.0020	0.0039
TUNDISH	2282	3	0.06	0.39	0.017	0.016	0.04	0.02	0.03	0.00	0.048	0.0383	0.0097	0.0028	0.0032

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1565	18:44	18:40	260 X 260	16	19:00	1595	INTOCAST	32	DYSN		13			13	
1563	18:52	19:50		27	19:15						14			14	
1565	19:05			35	19:26						15			15	
1564	19:15										16			16	
1562	19:26													LADLE	
1558	19:37														

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2283	1	0.04	0.16	0.027	0.010	0.00	0.02	0.04	0.00	0.409			0.0028	0.0062
LADLE	2283	1	0.04	0.19	0.023	0.011	0.04	0.02	0.04	0.01	0.136	0.1358	0.0004	0.0000	0.0061
LADLE	2283	2	0.06	0.39	0.018	0.015	0.04	0.02	0.04	0.01	0.088	0.0851	0.0026	0.0000	0.0061
LADLE	2283	3	0.06	0.41	0.011	0.016	0.05	0.02	0.04	0.01	0.069	0.0650	0.0039	0.0031	0.0046
TUNDISH	2283	1	0.06	0.40	0.011	0.015	0.05	0.02	0.04	0.01	0.055	0.0502	0.0050	0.0015	0.0082
TUNDISH	2283	2	0.06	0.39	0.011	0.015	0.05	0.02	0.04	0.01	0.047	0.0408	0.0063	0.0010	0.0071
TUNDISH	2283	3	0.06	0.41	0.010	0.015	0.05	0.02	0.04	0.01	0.057	0.0531	0.0037	0.0017	0.0092

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1553	19:55	19:50	260 X 260	16	20:12	1595	INTOCAST	32	DYSN		13			13	
1561	20:00	21:05		24	20:24						14			14	
1566	20:11			36	20:40						15			15	
1561	20:23										16		37	16	1
1558	20:35													LADLE	
1556	20:45														

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2286	1	0.03	0.16	0.027	0.012	0.00	0.02	0.03	0.00	0.459			0.0029	0.0060
LADLE	2286	1	0.03	0.16	0.025	0.011	0.01	0.02	0.04	0.00	0.103	0.0930	0.0098	0.0000	0.0071
LADLE	2286	2	0.05	0.41	0.020	0.017	0.03	0.02	0.03	0.01	0.070	0.0607	0.0092	0.0030	0.0062
TUNDISH	2286	1	0.07	0.40	0.018	0.017	0.03	0.02	0.03	0.01	0.045	0.0363	0.0084	0.0015	0.0093
TUNDISH	2286	2	0.06	0.40	0.018	0.017	0.03	0.02	0.03	0.01	0.046	0.0415	0.0050	0.0014	0.0095
TUNDISH	2286	3	0.05	0.40	0.017	0.017	0.03	0.02	0.03	0.01	0.044	0.0387	0.0051	0.0013	0.0092

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1579	23:42	23:40	260 X 260	16	00:10	1605	INTOCAST	32	DYSN		13		6	13	1
1560	23:55	1:00		31	00:30						14		8	14	1
1557	00:02			40	00:42						15		8	15	1
1568	00:18										16		5	16	1
1566	00:30													LADLE	
1563	00:41														
1560	00:50														
1550	00:55														

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2296	1	0.04	0.13	0.024	0.008	0.00	0.02	0.04	0.00	0.397			0.0012	0.0039
LADLE	2296	1	0.05	0.39	0.010	0.013	0.03	0.02	0.04	0.00	0.034	0.0279	0.0062	0.0029	0.0072
TUNDISH	2296	1	0.06	0.41	0.010	0.013	0.04	0.02	0.04	0.00	0.029	0.0245	0.0044	0.0009	0.0058
TUNDISH	2296	2	0.06	0.40	0.011	0.014	0.04	0.02	0.04	0.01	0.027	0.0221	0.0046	0.0009	0.0064
TUNDISH	2296	3	0.06	0.40	0.011	0.014	0.04	0.02	0.04	0.00	0.025	0.0221	0.0032	0.0011	0.0064

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1564	02:25	2:15	260 X 260	15	02:40	1597	INTOCAST	32	DYSN		13			13	
1566	02:35	3:20								5	14	1	9	14	1
										3	15	1	3	15	1
											16			16	
											17,18,19,20,21,37			LADLE	6

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2303	1	0.07	0.14	0.018	0.005	0.00	0.02	0.03	0.00	0.408			0.0004	0.0056
LADLE	2303	1	0.06	0.14	0.016	0.005	0.01	0.02	0.03	0.00	0.012	0.0100	0.0016	0.0003	0.0036
LADLE	2303	2	0.06	0.27	0.018	0.008	0.03	0.02	0.03	0.00	0.013	0.0107	0.0027	0.0010	0.0052
LADLE	2303	3	0.07	0.38	0.015	0.015	0.03	0.02	0.03	0.01	0.035	0.0269	0.0080	0.0020	0.0076
TUNDISH	2303	1	0.06	0.38	0.016	0.015	0.03	0.02	0.03	0.01	0.020	0.0133	0.0066	0.0007	0.0072

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1553	04:48	4:35	260 X 260	10	04:52	1594	INTOCAST	32	DYSN		13			13	
1553	05:00	5:50		30	05:17						14			14	
1551	05:30			40	05:31						15			15	
											16			16	
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2307	1	0.05	0.19	0.020	0.010	0.00	0.03	0.03	0.00	0.409			0.0001	0.0025
LADLE	2307	1	0.04	0.18	0.018	0.010	0.01	0.03	0.04	0.00	0.163	0.1587	0.0048	0.0000	0.0039
LADLE	2307	2	0.05	0.35	0.016	0.012	0.01	0.02	0.04	0.00	0.107	0.1064	0.0009	0.0000	0.0069
LADLE	2307	3	0.06	0.38	0.012	0.013	0.04	0.03	0.04	0.00	0.109	0.1085	0.0008	0.0029	0.0066
TUNDISH	2307	1	0.06	0.37	0.011	0.013	0.03	0.03	0.04	0.00	0.091	0.0874	0.0035	0.0014	0.0062
TUNDISH	2307	2	0.06	0.37	0.011	0.013	0.03	0.02	0.03	0.00	0.087	0.0835	0.0036	0.0014	0.0062
TUNDISH	2307	3	0.06	0.38	0.012	0.014	0.03	0.02	0.04	0.00	0.085	0.0851	0.0000	0.0012	0.0059

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1565	07:10	7:05	260 X 260	12	07:21	1595	INTOCAST	32	DYSN		13			13	
1563	07:20	8:15		22	07:35						14			14	
1560	07:32			38	07:55						15			15	
1558	07:55										16			16	
1556	08:10													LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
LADLE	2310	1	0.02	0.14	0.016	0.007	0.02	0.02	0.03	0.00	0.127	0.1197	0.0068	0.0000	0.0039
LADLE	2310	2	0.05	0.39	0.015	0.015	0.01	0.02	0.03	0.00	0.034	0.0312	0.0030	0.0003	0.0053
LADLE	2310	3	0.06	0.44	0.011	0.018	0.03	0.02	0.03	0.00	0.054	0.0525	0.0018	0.0019	0.0091
TUNDISH	2310	1	0.07	0.46	0.012	0.018	0.03	0.02	0.04	0.01	0.050	0.0477	0.0025	0.0009	0.0078
TUNDISH	2310	2	0.07	0.45	0.011	0.017	0.03	0.02	0.04	0.01	0.050	0.0479	0.0018	0.0011	0.0075
TUNDISH	2310	3	0.07	0.45	0.012	0.017	0.03	0.02	0.04	0.01	0.053	0.0471	0.0059	0.0013	0.0075

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1559	08:20	8:15	260 X 260	10	08:30	1593	INTOCAST	32	DYSN	21	13	1	21	13	1
1556	08:30	9:25		21	08:45					30	14	1	30	14	1
1558	08:40			34	08:50					30	15	1	30	15	1
1551	08:55									34	16	1	34	16	1
1546	09:05													LADLE	
1549	09:15														

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2311	1	0.06	0.11	0.020	0.004	0.00	0.02	0.03	0.00	0.394			0.0020	0.0006
LADLE	2311	1	0.05	0.11	0.018	0.004	0.01	0.02	0.03	0.00	0.164	0.1579	0.0061	0.0001	0.0068
LADLE	2311	2	0.05	0.35	0.017	0.006	0.01	0.02	0.03	0.00	0.090	0.0866	0.0033	0.0000	0.0064
LADLE	2311	3	0.06	0.41	0.012	0.012	0.02	0.02	0.03	0.00	0.025	0.0241	0.0007	0.0024	0.0044
TUNDISH	2311	1	0.06	0.41	0.014	0.012	0.02	0.02	0.03	0.00	0.023	0.0167	0.0062	0.0013	0.0081
TUNDISH	2311	2	0.06	0.41	0.016	0.014	0.02	0.02	0.03	0.00	0.020	0.0171	0.0027	0.0013	0.0069
TUNDISH	2311	3	0.07	0.41	0.016	0.013	0.02	0.02	0.03	0.00	0.017	0.0135	0.0039	0.0011	0.0071

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1570	10:45	10:35	260 X 260	11	10:50	1595	INTOCAST	32	DYSN		13			13	
1572	11:00	11:45		22	11:05					23	14	1	23	14	1
1569	11:10			33	11:20						15			15	
1563	11:25									2	16	1	2	16	1
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2313	1	0.05	0.16	0.036	0.008	0.00	0.02	0.03	0.00	0.398			0.0034	0.0040
CONVE.	2313	2	0.04	0.10	0.023	0.005	0.00	0.02	0.04	0.00	0.419			0.0013	0.0043
LADLE	2313	1	0.03	0.11	0.022	0.005	0.01	0.02	0.03	0.00	0.055	0.0445	0.0100	0.0002	0.0060
LADLE	2313	2	0.05	0.31	0.022	0.010	0.01	0.02	0.04	0.00	0.034	0.0293	0.0051	0.0000	0.0069
LADLE	2313	3	0.06	0.38	0.019	0.012	0.02	0.02	0.03	0.01	0.059	0.0575	0.0016	0.0022	0.0077
TUNDISH	2313	1	0.07	0.39	0.016	0.012	0.03	0.02	0.04	0.01	0.052	0.0469	0.0049	0.0014	0.0081
TUNDISH	2313	2	0.06	0.39	0.017	0.013	0.02	0.02	0.04	0.01	0.050	0.0443	0.0061	0.0010	0.0084
TUNDISH	2313	3	0.07	0.39	0.018	0.013	0.02	0.02	0.04	0.01	0.048	0.0452	0.0033	0.0012	0.0084

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1559	11:55	11:45	260 X 260	9	12:00	1594	INTOCAST	32	DYSN	19	13	1		13	
1562	12:05	13:00		21	12:16						14			14	
1558	12:15			32	12:30						15			15	
1557	12:25										16			16	
1556	12:40													LADLE	
1554	12:45														

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2314	1	0.06	0.19	0.026	0.008	0.00	0.02	0.03	0.00	0.421			0.0003	0.0095
LADLE	2314	1	0.05	0.20	0.022	0.011	0.01	0.02	0.03	0.00	0.123	0.1220	0.0014	0.0000	0.0064
LADLE	2314	2	0.05	0.33	0.021	0.013	0.01	0.02	0.03	0.00	0.081	0.0803	0.0011	0.0000	0.0094
LADLE	2314	3	0.06	0.40	0.015	0.014	0.03	0.02	0.03	0.01	0.077	0.0743	0.0025	0.0025	0.0072
TUNDISH	2314	1	0.06	0.40	0.013	0.013	0.03	0.02	0.03	0.01	0.053	0.0479	0.0049	0.0008	0.0080
TUNDISH	2314	2	0.06	0.40	0.012	0.013	0.03	0.02	0.03	0.01	0.054	0.0488	0.0051	0.0007	0.0076
TUNDISH	2314	3	0.06	0.41	0.014	0.014	0.03	0.02	0.03	0.01	0.054	0.0507	0.0035	0.0009	0.0077

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1558	14:25	14:20	260 X 260	8	14:31	1596	INTOCAST	32	DYSN		13			13	
1561	14:40	15:25		17	14:40						14			14	
1560	14:50			35	15:05						15			15	
1557	15:03										16			16	
1558	15:15													LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2318	1	0.06	0.14	0.032	0.007	0.00	0.02	0.03	0.00	0.316			0.0024	0.0086
LADLE	2318	1	0.04	0.12	0.027	0.007	0.02	0.02	0.03	0.00	0.112	0.1119	0.0002	0.0000	0.0074
LADLE	2318	2	0.06	0.31	0.023	0.009	0.01	0.02	0.03	0.00	0.056	0.0533	0.0031	0.0000	0.0094
LADLE	2318	3	0.06	0.38	0.016	0.009	0.04	0.02	0.03	0.00	0.074	0.0723	0.0015	0.0024	0.0094
TUNDISH	2318	1	0.08	0.39	0.013	0.009	0.04	0.02	0.03	0.01	0.050	0.0490	0.0010	0.0009	0.0091
TUNDISH	2318	2	0.07	0.39	0.011	0.009	0.04	0.02	0.04	0.01	0.049	0.0450	0.0039	0.0009	0.0095
TUNDISH	2318	3	0.08	0.39	0.013	0.010	0.04	0.02	0.04	0.01	0.045	0.0430	0.0024	0.0009	0.0089

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1559	16:40	16:35	260 X 260	18	17:00	1595	INTOCAST	32	DYSN	11	13	1		13	
1568	16:53	17:50		26	17:11					11	14	1		14	
1570	17:03			35	17:24					20	15	1		15	
1568	17:15									20	16	1		16	
1563	17:32													LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2320	1	0.08	0.20	0.033	0.011	0.00	0.02	0.03	0.00	0.396			0.0026	0.0057
CONVE.	2320	2	0.07	0.16	0.026	0.007	0.00	0.02	0.03	0.00	0.469			0.0028	0.0068
LADLE	2320	1	0.06	0.32	0.022	0.010	0.00	0.02	0.04	0.00	0.000	0.0001	0.0000	0.0000	0.0067
LADLE	2320	2	0.06	0.37	0.020	0.011	0.01	0.02	0.04	0.00	0.050	0.0446	0.0053	0.0012	0.0055
TUNDISH	2320	1	0.08	0.38	0.018	0.013	0.02	0.02	0.03	0.01	0.048	0.0405	0.0077	0.0007	0.0082
TUNDISH	2320	2	0.08	0.38	0.018	0.012	0.02	0.02	0.03	0.01	0.049	0.0438	0.0052	0.0009	0.0066
TUNDISH	2320	3	0.07	0.38	0.020	0.013	0.02	0.02	0.03	0.00	0.046	0.0378	0.0078	0.0006	0.0073

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	canal	number	Oxygen Blowing to Nozzle meter	canal	number
1568	19:10	19:05	260 X 260	16	19:25	1595	INTOCAST	32	DYSN		13			13	
1562	19:15	20:15		26	19.35						14			14	
1570	19:25			37	19:50						15			15	
1568	19:35										16			16	
1564	19:54													LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2322	1	0.07	0.16	0.027	0.006	0.00	0.02	0.03	0.00	0.377			0.0001	0.0049
LADLE	2322	1	0.04	0.14	0.021	0.010	0.02	0.02	0.04	0.00	0.088	0.0838	0.0037	0.0000	0.0098
LADLE	2322	2	0.06	0.39	0.010	0.011	0.05	0.02	0.04	0.01	0.059	0.0557	0.0035	0.0029	0.0076
TUNDISH	2322	1	0.08	0.38	0.011	0.012	0.05	0.02	0.04	0.01	0.048	0.0447	0.0033	0.0015	0.0084
TUNDISH	2322	2	0.07	0.39	0.010	0.012	0.05	0.02	0.04	0.01	0.050	0.0479	0.0023	0.0015	0.0075
TUNDISH	2322	3	0.08	0.38	0.012	0.012	0.05	0.02	0.04	0.01	0.048	0.0453	0.0024	0.0011	0.0044

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	canal	number	Oxygen Blowing to Nozzle meter	canal	number
1559	20:25	20:15	260 X 260	15	20:36	1600	INTOCAST	32	DYSN		13		42	13	1
1568	20:35	21:15		23	20:47						14		7,42	14	2
1568	20:46			33	21:00						15			15	
1569	20:59										16		7,19	16	2
1565	21:07												46	LADLE	1

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2326	1	0.04	0.14	0.034	0.008	0.00	0.02	0.03	0.00	0.492			0.0001	0.0070
CONVE.	2326	2	0.04	0.12	0.028	0.006	0.00	0.02	0.03	0.00	0.472			0.0012	0.0076
LADLE	2326	1	0.03	0.12	0.019	0.007	0.01	0.02	0.03	0.00	0.145	0.1364	0.0087	0.0000	0.0100
LADLE	2326	2	0.05	0.32	0.019	0.007	0.01	0.02	0.04	0.00	0.068	0.0587	0.0093	0.0000	0.0059
TUNDISH	2326	1	0.08	0.39	0.016	0.011	0.03	0.02	0.04	0.00	0.033	0.0279	0.0052	0.0006	0.0072
TUNDISH	2326	2	0.08	0.38	0.016	0.011	0.03	0.02	0.03	0.00	0.031	0.0250	0.0062	0.0006	0.0078
TUNDISH	2326	3	0.06	0.39	0.015	0.011	0.03	0.02	0.03	0.00	0.039	0.0262	0.0129	0.0006	0.0079

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	canal	number	Oxygen Blowing to Nozzle meter	canal	number
1548	21:30	21:25	260 X 260	16	21:46	1594	INTOCAST	32	DYSN		13			13	
1549	21:40	22:30		25	21:57						14			14	
1553	21:52			34	21:08						15			15	
1550	22:01									2	16	1	2	16	1
1548	22:16													LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2328	1	0.06	0.10	0.022	0.004	0.00	0.02	0.03	0.00	0.384			0.0007	0.0057
LADLE	2328	1	0.05	0.11	0.021	0.004	0.01	0.02	0.03	0.00	0.144	0.1383	0.0056	0.0000	0.0040
LADLE	2328	2	0.06	0.39	0.015	0.009	0.03	0.02	0.03	0.00	0.066	0.0621	0.0036	0.0029	0.0023
TUNDISH	2328	1	0.07	0.40	0.015	0.010	0.03	0.02	0.03	0.00	0.058	0.0517	0.0062	0.0017	0.0077
TUNDISH	2328	2	0.08	0.40	0.017	0.011	0.03	0.02	0.03	0.00	0.051	0.0463	0.0045	0.0011	0.0057
TUNDISH	2328	3	0.07	0.40	0.016	0.011	0.03	0.02	0.03	0.00	0.055	0.0457	0.0096	0.0016	0.0050

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	canal	number	Oxygen Blowing to Nozzle meter	canal	number
1556	22:38	22:30	260 X 260	15	22:50	1591	INTOCAST	32	DYSN		13		4,27	13	2
1559	22:49	23:35		24	23:04						14		27,33	14	2
1562	22:59										15		27	15	1
											16		16,27,32	16	3
1557	23:15												24,27,38	LADLE	3

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2329	1	0.06	0.15	0.024	0.008	0.00	0.02	0.03	0.00	0.379			0.0008	0.0032
LADLE	2329	1	0.04	0.12	0.021	0.006	0.01	0.02	0.03	0.00	0.132	0.1233	0.0087	0.0000	0.0047
LADLE	2329	2	0.05	0.37	0.018	0.010	0.03	0.02	0.03	0.00	0.070	0.0617	0.0080	0.0024	0.0063
TUNDISH	2329	1	0.07	0.39	0.017	0.010	0.04	0.02	0.03	0.01	0.044	0.0388	0.0055	0.0006	0.0060
TUNDISH	2329	2	0.06	0.38	0.019	0.010	0.03	0.02	0.03	0.01	0.029	0.0232	0.0060	0.0005	0.0082

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1579	23:43	23:40	260 X 260	14	00:07	1630	INTOCAST	32	DYSN		13		7	13	1
1570	00:07	0:55		27	00:25					8	14	1	8	14	1
1566	00:25			36	00:36						15		3	15	1
1566	00:36										16		7	16	1
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2330	1	0.02	0.08	0.030	0.008	0.00	0.02	0.03	0.00	0.447			0.0003	0.0038
LADLE	2330	1	0.05	0.37	0.015	0.013	0.04	0.02	0.03	0.00	0.050	0.0438	0.0062	0.0053	0.0077
TUNDISH	2330	1	0.06	0.36	0.013	0.013	0.03	0.02	0.03	0.00	0.026	0.0195	0.0063	0.0005	0.0085
TUNDISH	2330	2	0.06	0.36	0.015	0.013	0.03	0.02	0.03	0.00	0.027	0.0221	0.0044	0.0005	0.0071
TUNDISH	2330	3	0.06	0.36	0.015	0.013	0.04	0.02	0.03	0.00	0.029	0.0231	0.0055	0.0010	0.0084

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1558	00:56	0:55	260 X 260	12	01:10	1592	INTOCAST	32	DYSN		13			13	
1554	01:10	2:05		20	01:20						14			14	
1550	01:20			32	01:35						15			15	
1544	01:35										16			16	
1546	01:47													LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2332	1	0.03	0.11	0.027	0.006	0.00	0.02	0.04	0.00	0.449			0.0000	0.0065
LADLE	2332	1	0.03	0.13	0.027	0.008	0.02	0.02	0.04	0.00	0.074	0.0687	0.0054	0.0000	0.0071
LADLE	2332	2	0.05	0.36	0.027	0.012	0.01	0.02	0.04	0.00	0.025	0.0254	0.0000	0.0054	0.0090
LADLE	2332	3	0.06	0.38	0.018	0.014	0.04	0.02	0.03	0.00	0.076	0.0744	0.0020	0.0025	0.0125
TUNDISH	2332	1	0.06	0.39	0.014	0.013	0.04	0.02	0.04	0.01	0.067	0.0657	0.0013	0.0014	0.0099
TUNDISH	2332	2	0.06	0.38	0.015	0.013	0.04	0.02	0.04	0.01	0.062	0.0584	0.0041	0.0014	0.0094
TUNDISH	2332	3	0.06	0.38	0.016	0.013	0.04	0.02	0.04	0.01	0.061	0.0605	0.0000	0.0015	0.0095

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1558	02:10	2:05	260 X 260	12	02:20	1598	INTOCAST	32	DYSN	14	13	1	14	13	1
1565	02:20	3:15		24	02:34					35	14	1		14	
1564	02:33			31	02:45						15			15	
1555	03:00										16			16	
1557	03:10													LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2334	1	0.03	0.17	0.024	0.013	0.00	0.02	0.03	0.00	0.351			0.0000	0.0051
LADLE	2334	1	0.04	0.15	0.021	0.010	0.00	0.02	0.03	0.00	0.019	0.0135	0.0054	0.0009	0.0091
LADLE	2334	2	0.06	0.36	0.019	0.018	0.01	0.02	0.03	0.01	0.066	0.0536	0.0126	0.0000	0.0089
LADLE	2334	3	0.06	0.40	0.014	0.023	0.03	0.02	0.03	0.01	0.059	0.0568	0.0022	0.0024	0.0090
TUNDISH	2334	1	0.06	0.41	0.013	0.023	0.03	0.02	0.03	0.01	0.041	0.0348	0.0067	0.0009	0.0098
TUNDISH	2334	2	0.08	0.41	0.014	0.024	0.03	0.02	0.03	0.01	0.038	0.0319	0.0063	0.0007	0.0091
TUNDISH	2334	3	0.07	0.41	0.013	0.023	0.03	0.02	0.03	0.01	0.040	0.0338	0.0061	0.0009	0.0095

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1556	03:20	3:15	260 X 260	11	03:28	1594	INTOCAST	32	DYSN		13			13	
1563	03:28	4:30		27	03:50						14			14	
1559	03:40			35	04:01						15			15	
1560	03:55										16			16	
1557	04:15													LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2336	1	0.05	0.20	0.037	0.014	0.00	0.02	0.03	0.00	0.502			0.0002	0.0065
LADLE	2336	1	0.04	0.18	0.032	0.012	0.00	0.02	0.03	0.01	0.096	0.0890	0.0072	0.0000	0.0096
LADLE	2336	2	0.05	0.35	0.028	0.015	0.01	0.02	0.03	0.01	0.059	0.0498	0.0093	0.0000	0.0106
LADLE	2336	3	0.06	0.37	0.022	0.016	0.02	0.02	0.03	0.01	0.049	0.0483	0.0007	0.0029	0.0093
TUNDISH	2336	1	0.07	0.38	0.020	0.018	0.02	0.02	0.03	0.01	0.037	0.0342	0.0028	0.0013	0.0076
TUNDISH	2336	2	0.07	0.38	0.019	0.016	0.02	0.02	0.04	0.01	0.040	0.0362	0.0034	0.0013	0.0070
TUNDISH	2336	3	0.06	0.38	0.018	0.016	0.02	0.02	0.03	0.01	0.039	0.0370	0.0027	0.0017	0.0068

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1560	04:35	4:30	260 X 260	13	04:47	1584	INTOCAST	32	DYSN	26	13	1		13	
1563	04:47	5:45		23	05:00					24	14	1		14	
1564	05:00			32	05:15					26	15	1		15	
1555	05:20										16			16	
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2338	1	0.07	0.23	0.023	0.013	0.00	0.02	0.03	0.00	0.374			0.0001	0.0147
LADLE	2338	1	0.04	0.15	0.021	0.008	0.01	0.02	0.04	0.00	0.053	0.0440	0.0091	0.0000	0.0095
LADLE	2338	2	0.06	0.34	0.021	0.013	0.01	0.02	0.03	0.01	0.035	0.0273	0.0073	0.0002	0.0094
LADLE	2338	3	0.06	0.39	0.017	0.015	0.03	0.02	0.03	0.01	0.059	0.0548	0.0046	0.0026	0.0069
TUNDISH	2338	1	0.07	0.41	0.016	0.015	0.03	0.02	0.03	0.01	0.042	0.0369	0.0046	0.0012	0.0063
TUNDISH	2338	2	0.08	0.40	0.016	0.015	0.03	0.02	0.03	0.01	0.038	0.0332	0.0049	0.0012	0.0076
TUNDISH	2338	3	0.07	0.40	0.016	0.015	0.03	0.02	0.03	0.01	0.038	0.0327	0.0055	0.0011	0.0076

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1583	12:58	12:55	260 X 260	10	13:17	1605	INTOCAST	32	DYSN	3	13	1	3,22	13	2
1568	13:05	14:00		25	13:40						14		5	14	1
1566	13:15			36	13:50					3	15	1	3	15	1
1563	13:35										16			16	
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2354	1	0.07	0.14	0.032	0.007	0.00	0.02	0.03	0.00	0.363			0.0013	0.0101
CONVE.	2354	2	0.05	0.11	0.023	0.005	0.00	0.02	0.03	0.00	0.435			0.0017	0.0099
LADLE	2354	1	0.04	0.11	0.026	0.007	0.01	0.02	0.04	0.01	0.029	0.0218	0.0069	0.0000	0.0141
LADLE	2354	2	0.06	0.32	0.025	0.009	0.01	0.02	0.04	0.01	0.000	0.0000	0.0000	0.0000	0.0097
LADLE	2354	3	0.07	0.42	0.019	0.011	0.03	0.02	0.04	0.01	0.075	0.0713	0.0038	0.0048	0.0098
TUNDISH	2354	1	0.06	0.40	0.012	0.010	0.03	0.02	0.03	0.01	0.037	0.0289	0.0085	0.0005	0.0046
TUNDISH	2354	2	0.08	0.42	0.012	0.010	0.03	0.02	0.04	0.01	0.039	0.0362	0.0027	0.0005	0.0058
TUNDISH	2354	3	0.07	0.41	0.013	0.010	0.03	0.02	0.04	0.01	0.037	0.0263	0.0109	0.0007	0.0057

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1552	15:15	15:10	260 X 260	10	15:27	1591	INTOCAST	32	DYSN		13			13	
1558	15.40	16:20		23	15:43						14			14	
1548	15:55			33	15:56					40	15	1		15	
1546	16:05										16			16	
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
LADLE	2358	2	0.06	0.38	0.021	0.012	0.02	0.02	0.04	0.01	0.025	0.0237	0.0012	0.0000	0.0018
LADLE	2358	3	0.06	0.39	0.012	0.011	0.04	0.02	0.04	0.01	0.069	0.0573	0.0118	0.0031	0.0063
TUNDISH	2358	1	0.07	0.39	0.010	0.011	0.04	0.02	0.03	0.01	0.039	0.0351	0.0042	0.0000	0.0091
TUNDISH	2358	2	0.07	0.39	0.011	0.011	0.04	0.02	0.03	0.01	0.040	0.0378	0.0022	0.0000	0.0095
TUNDISH	2358	3	0.06	0.38	0.012	0.011	0.04	0.02	0.03	0.01	0.041	0.0390	0.0021	0.0000	0.0080

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1553	16.24	16:20	260 X 260	13	16:38	1595	INTOCAST	32	DYSN		13		23	13	1
1564	16:34	17:40		25	16:55						14		22	14	1
1566	16:48			32	17:03						15		28	15	1
1563	17:00										16			16	
1558	17:15													LADLE	
1554	17:30														

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2360	1	0.05	0.15	0.024	0.008	0.00	0.02	0.04	0.00	0.415			0.0006	0.0000
LADLE	2360	1	0.03	0.13	0.018	0.006	0.01	0.02	0.03	0.00	0.044	0.0418	0.0022	0.0000	0.0006
LADLE	2360	3	0.06	0.36	0.020	0.009	0.03	0.02	0.03	0.00	0.059	0.0581	0.0011	0.0023	0.0056
TUNDISH	2360	1	0.07	0.38	0.016	0.009	0.02	0.02	0.03	0.00	0.040	0.0334	0.0064	0.0009	0.0065
TUNDISH	2360	2	0.06	0.38	0.015	0.009	0.02	0.02	0.03	0.00	0.039	0.0316	0.0074	0.0011	0.0062
TUNDISH	2360	3	0.06	0.38	0.016	0.009	0.02	0.02	0.03	0.00	0.043	0.0332	0.0097	0.0011	0.0053

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1570	17:48	17:45	260 X 260	15	18:15	1615	INTOCAST	32	DYSN		13		2	13	1
1559	17:56	19:00		25	18:28						14		2	14	1
1565	18:08			33	18:39						15		2	15	1
1570	18:16										16		2	16	1
1572	18:31													LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2361	1	0.04	0.17	0.026	0.009	0.00	0.02	0.04	0.00	0.474			0.0012	0.0014
LADLE	2361	1	0.03	0.17	0.024	0.009	0.03	0.02	0.04	0.01	0.026	0.0211	0.0048	0.0000	0.0069
LADLE	2361	2	0.05	0.38	0.024	0.014	0.02	0.02	0.04	0.01	0.003	0.0018	0.0007	0.0000	0.0070
LADLE	2361	3	0.05	0.43	0.016	0.016	0.04	0.02	0.04	0.01	0.066	0.0626	0.0038	0.0055	0.0087
TUNDISH	2361	1	0.06	0.43	0.018	0.018	0.04	0.02	0.03	0.01	0.047	0.0373	0.0102	0.0016	0.0124
TUNDISH	2361	2	0.06	0.43	0.018	0.017	0.04	0.02	0.03	0.01	0.048	0.0428	0.0055	0.0018	0.0062
TUNDISH	2361	3	0.06	0.43	0.017	0.017	0.04	0.02	0.03	0.01	0.050	0.0448	0.0054	0.0016	0.0081

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1548	20:15	20:10	260 X 260	14	20.30	1596	INTOCAST	32	DYSN		13		25	13	1
1549	20:20	21:30		23	20:41						14		26	14	1
1554	20:30			33	20:53						15		28	15	1
1552	20:41										16			16	
1548	21:02													LADLE	
1550	21:14														

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2367	1	0.04	0.17	0.027	0.008	0.00	0.03	0.03	0.00	0.504			0.0014	0.0065
LADLE	2367	1	0.03	0.15	0.027	0.008	0.01	0.03	0.04	0.00	0.049	0.0417	0.0069	0.0000	0.0085
LADLE	2367	2	0.05	0.35	0.025	0.011	0.01	0.03	0.03	0.00	0.026	0.0184	0.0072	0.0004	0.0095
LADLE	2367	3	0.05	0.37	0.021	0.015	0.02	0.03	0.03	0.01	0.066	0.0594	0.0068	0.0033	0.0094
TUNDISH	2367	1	0.06	0.36	0.017	0.014	0.02	0.03	0.04	0.01	0.038	0.0327	0.0053	0.0008	0.0079
TUNDISH	2367	2	0.08	0.36	0.017	0.013	0.02	0.03	0.04	0.01	0.034	0.0273	0.0072	0.0009	0.0065
TUNDISH	2367	3	0.06	0.36	0.018	0.014	0.02	0.03	0.04	0.01	0.034	0.0304	0.0039	0.0006	0.0067

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1559	21.38	21:30	260 X 260	14	21:49	1596	INTOCAST	32	DYSN	40	13	1	40	13	1
1555	21:48	22:50		23	22:01					42	14	1	12,42	14	2
1554	22:05			33	22:13					10	15	1	6	15	1
1551	22:20										16		10	16	1
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2369	1	0.04	0.14	0.048	0.010	0.00	0.02	0.03	0.00	0.508			0.0001	0.0058
CONVE.	2369	2	0.03	0.11	0.035	0.007	0.00	0.02	0.03	0.00	0.407			0.0005	0.0073
LADLE	2369	1	0.03	0.10	0.030	0.007	0.01	0.02	0.03	0.00	0.130	0.1195	0.0105	0.0000	0.0066
LADLE	2369	3	0.05	0.34	0.027	0.012	0.03	0.02	0.03	0.00	0.062	0.0556	0.0063	0.0030	0.0086
TUNDISH	2369	1	0.06	0.35	0.022	0.010	0.03	0.02	0.04	0.01	0.031	0.0251	0.0055	0.0006	0.0095
TUNDISH	2369	2	0.06	0.34	0.023	0.011	0.03	0.02	0.04	0.01	0.031	0.0264	0.0043	0.0007	0.0086
TUNDISH	2369	3	0.06	0.34	0.022	0.010	0.03	0.02	0.04	0.01	0.038	0.0324	0.0058	0.0012	0.0086

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1586	22.58	22:55	260 X 260	19	23:31	1596	INTOCAST	32	DYSN		13		5	13	1
1569	23:08	0:10		28	23:42						14		5,17	14	2
1573	23:20										15		5,17	15	2
1577	23:34										16		5,46	16	2
1567	23:55													LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2373	1	0.05	0.11	0.034	0.006	0.00	0.02	0.03	0.00	0.409			0.0002	0.0146
LADLE	2373	1	0.04	0.11	0.021	0.004	0.01	0.02	0.04	0.00	0.055	0.0452	0.0101	0.0001	0.0058
LADLE	2373	2	0.06	0.34	0.022	0.007	0.01	0.02	0.04	0.00	0.024	0.0192	0.0045	0.0000	0.0080
LADLE	2373	3	0.07	0.39	0.016	0.008	0.03	0.02	0.04	0.01	0.045	0.0318	0.0130	0.0044	0.0061
TUNDISH	2373	1	0.07	0.38	0.018	0.011	0.03	0.02	0.04	0.01	0.023	0.0171	0.0061	0.0006	0.0054
TUNDISH	2373	2	0.08	0.39	0.017	0.011	0.03	0.02	0.04	0.01	0.027	0.0204	0.0063	0.0005	0.0052
TUNDISH	2373	3	0.07	0.37	0.018	0.011	0.03	0.02	0.04	0.01	0.020	0.0133	0.0071	0.0002	0.0056

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN		LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED			Oxygen Blowing to Nozzle		
				meter	TIME					meter	canal	number	meter	canal	number
1564	00:25	0:15	260 X 260	13	00:30	1598	INTOCAST	32	DYSN	29	13	1		13	
1562	00:35	1:30		25	00:50					39	14	1		14	
1558	01:05			40	01:13					30	15	1		15	
1557	01:15										16			16	
														LADLE	

CHEMICAL COMPOSITION (%)														
TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2376	1	0.07	0.16	0.039	0.008	0.00	0.02	0.03	0.00	0.478			0.0026	0.0019
CONVE.	2376	2	0.05	0.13	0.028	0.006	0.00	0.02	0.04	0.00	0.420			0.0015	0.0051
LADLE	2376	1	0.04	0.12	0.029	0.008	0.01	0.02	0.04	0.00	0.063	0.0575	0.0052	0.0000	0.0054
LADLE	2376	2	0.06	0.35	0.026	0.011	0.01	0.02	0.03	0.00	0.028	0.0246	0.0033	0.0000	0.0065
LADLE	2376	3	0.06	0.36	0.017	0.010	0.03	0.02	0.03	0.00	0.062	0.0595	0.0025	0.0030	0.0074
TUNDISH	2376	1	0.07	0.39	0.015	0.011	0.04	0.02	0.04	0.01	0.051	0.0458	0.0052	0.0009	0.0047
TUNDISH	2376	2	0.07	0.39	0.014	0.011	0.04	0.02	0.04	0.01	0.050	0.0477	0.0021	0.0008	0.0025
TUNDISH	2376	3	0.07	0.39	0.013	0.011	0.04	0.02	0.04	0.01	0.047	0.0458	0.0014	0.0003	0.0022

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN		LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED			Oxygen Blowing to Nozzle		
				meter	TIME					meter	canal	number	meter	canal	number
1566	01:40	1:30	260 X 260	15	01:52	1595	INTOCAST	32	DYSN		13		14	13	1
1558	01:50	2:45		24	02:05					11	14	1	11,31	14	2
1559	02:05			31	02:12					11	15	1	11	15	1
1557	02:15									26	16	1	26,47	16	2
1551	02:30													LADLE	

CHEMICAL COMPOSITION (%)														
TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2381	1	0.05	0.23	0.030	0.015	0.01	0.02	0.03	0.00	0.483			0.0011	0.0000
CONVE.	2381	2	0.04	0.18	0.025	0.009	0.00	0.02	0.03	0.00	0.507			0.0006	0.0028
LADLE	2381	1	0.03	0.17	0.022	0.009	0.01	0.02	0.04	0.00	0.106	0.0989	0.0072	0.0000	0.0014
LADLE	2381	1	0.05	0.33	0.025	0.014	0.01	0.02	0.03	0.00	0.035	0.0260	0.0086	0.0002	0.0000
LADLE	2381	3	0.06	0.40	0.020	0.014	0.02	0.02	0.04	0.00	0.057	0.0537	0.0034	0.0022	0.0050
TUNDISH	2381	1	0.06	0.40	0.016	0.013	0.02	0.02	0.04	0.01	0.028	0.0178	0.0098	0.0003	0.0037
TUNDISH	2381	2	0.06	0.41	0.016	0.013	0.01	0.02	0.04	0.01	0.034	0.0265	0.0071	0.0006	0.0028
TUNDISH	2381	3	0.09	0.39	0.019	0.015	0.01	0.02	0.04	0.01	0.023	0.0183	0.0051	0.0003	0.0051

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN		LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED			Oxygen Blowing to Nozzle		
				meter	TIME					meter	canal	number	meter	canal	number
1560	04:12	4:00	260 X 260	12	04:21	1593	INTOCAST	32	DYSN		13			13	
1562	04:20	5:15		26	04:38						14			14	
1562	04:30			34	04:50						15			15	
1562	04:40										16			16	
1560	04:55													LADLE	

CHEMICAL COMPOSITION (%)														
TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2386	1	0.06	0.17	0.024	0.006	0.00	0.02	0.04	0.00	0.414			0.0000	0.0037
LADLE	2386	1	0.05	0.17	0.014	0.005	0.02	0.02	0.04	0.00	0.105	0.0992	0.0059	0.0000	0.0061
LADLE	2386	2	0.05	0.38	0.018	0.011	0.04	0.02	0.04	0.00	0.066	0.0659	0.0005	0.0011	0.0070
LADLE	2386	3	0.05	0.42	0.012	0.013	0.03	0.02	0.04	0.00	0.062	0.0582	0.0037	0.0027	0.0097
TUNDISH	2386	1	0.06	0.43	0.009	0.011	0.03	0.02	0.04	0.01	0.040	0.0368	0.0029	0.0015	0.0068
TUNDISH	2386	2	0.06	0.42	0.008	0.010	0.04	0.02	0.04	0.01	0.038	0.0308	0.0076	0.0009	0.0073
TUNDISH	2386	3	0.06	0.43	0.009	0.011	0.03	0.02	0.04	0.01	0.040	0.0377	0.0041	0.0010	0.0066

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN		LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED			Oxygen Blowing to Nozzle		
				meter	TIME					meter	canal	number	meter	canal	number
1577	05:35	5:30	260 X 260	10	06:00	1610	INTOCAST	32	DYSN		13		7	13	1
1565	05:40	6:50		20	06:12						14		6	14	1
1570	06:25			36	06:30						15		4	15	1
1574	06:40										16		4	16	1
														LADLE	

CHEMICAL COMPOSITION (%)														
TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2389	1	0.05	0.18	0.028	0.007	0.00	0.02	0.04	0.00	0.457			0.0013	0.0013
LADLE	2389	1	0.04	0.16	0.020	0.005	0.02	0.02	0.04	0.01	0.076	0.0690	0.0069	0.0000	0.0077
LADLE	2389	2	0.06	0.40	0.016	0.012	0.01	0.02	0.04	0.01	0.054	0.0500	0.0044	0.0032	0.0083
LADLE	2389	3	0.07	0.41	0.009	0.011	0.04	0.02	0.04	0.01	0.032	0.0239	0.0080	0.0031	0.0076
TUNDISH	2389	1	0.08	0.43	0.010	0.014	0.04	0.02	0.04	0.01	0.022	0.0199	0.0018	0.0006	0.0055
TUNDISH	2389	2	0.07	0.42	0.009	0.013	0.04	0.02	0.04	0.01	0.023	0.0197	0.0031	0.0006	0.0057
TUNDISH	2389	3	0.07	0.40	0.009	0.013	0.03	0.02	0.04	0.01	0.018	0.0087	0.0053	0.0004	0.0061

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN		LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED			Oxygen Blowing to Nozzle		
				meter	TIME					meter	canal	number	meter	canal	number
1566	06:55	6:50	260 X 260	10	07:02	1594	INTOCAST	32	DYSN		13			13	
1566	07:20	8:00		20	07:15						14			14	
1557	07:27			32	07:30						15			15	
1554	07:40										16			16	
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2393	1	0.06	0.21	0.039	0.009	0.00	0.02	0.04	0.01	0.381			0.0002	0.0089
CONVE.	2393	2	0.04	0.13	0.025	0.005	0.00	0.02	0.04	0.00	0.306			0.0003	0.0074
LADLE	2393	1	0.03	0.14	0.018	0.004	0.02	0.02	0.04	0.00	0.161	0.1565	0.0050	0.0000	0.0069
LADLE	2393	2	0.05	0.36	0.015	0.007	0.03	0.02	0.04	0.00	0.098	0.0977	0.0000	0.0000	0.0058
LADLE	2393	3	0.06	0.36	0.004	0.006	0.09	0.02	0.04	0.00	0.064	0.0640	0.0000	0.0031	0.0079
TUNDISH	2393	1	0.07	0.38	0.008	0.010	0.08	0.02	0.04	0.01	0.050	0.0492	0.0008	0.0007	0.0028
TUNDISH	2393	2	0.06	0.36	0.006	0.009	0.09	0.02	0.04	0.01	0.056	0.0556	0.0007	0.0006	0.0030
TUNDISH	2393	3	0.07	0.36	0.006	0.009	0.08	0.02	0.04	0.01	0.051	0.0498	0.0010	0.0006	0.0026

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN		LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED			Oxygen Blowing to Nozzle		
				meter	TIME					meter	canal	number	meter	canal	number
1558		8:00	260 X 260	10	08:13	1595	INTOCAST	32	DYSN		13			13	
1554	08:22	9:10		20	08:26						14			14	
1553	08:40			30	08:40						15			15	
1551	09:00										16			16	
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2395	1	0.05	0.17	0.020	0.005	0.00	0.02	0.04	0.00	0.297			0.0009	0.0004
LADLE	2395	1	0.04	0.16	0.020	0.006	0.01	0.02	0.04	0.01	0.097	0.0967	0.0000	0.0000	0.0106
LADLE	2395	2	0.06	0.37	0.015	0.009	0.01	0.02	0.04	0.01	0.073	0.0710	0.0018	0.0014	0.0096
LADLE	2395	3	0.06	0.40	0.006	0.008	0.04	0.02	0.04	0.01	0.059	0.0564	0.0026	0.0025	0.0074
TUNDISH	2395	1	0.06	0.40	0.009	0.010	0.05	0.02	0.04	0.01	0.053	0.0478	0.0056	0.0004	0.0018
TUNDISH	2395	2	0.06	0.40	0.010	0.011	0.05	0.02	0.04	0.01	0.051	0.0497	0.0009	0.0003	0.0009
TUNDISH	2395	3	0.07	0.40	0.007	0.009	0.05	0.02	0.04	0.01	0.044	0.0423	0.0022	0.0003	0.0010

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN		LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED			Oxygen Blowing to Nozzle		
				meter	TIME					meter	canal	number	meter	canal	number
1554	09:17	9:10	260 X 260	11	09:25	1595	INTOCAST	32	DYSN		13			13	
1557	09:25	10:30		22	09:40					29	14	1		14	
1556	09:45			33	09:55					29	15	1		15	
1554	10:03									29	16	1		16	
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2398	1	0.06	0.13	0.019	0.004	0.00	0.02	0.04	0.00	0.395			0.0012	0.0033
LADLE	2398	1	0.05	0.13	0.016	0.006	0.01	0.03	0.03	0.00	0.106	0.1023	0.0042	0.0000	0.0071
LADLE	2398	2	0.06	0.38	0.008	0.008	0.04	0.03	0.03	0.00	0.054	0.0355	0.0185	0.0020	0.0058
TUNDISH	2398	1	0.06	0.38	0.009	0.009	0.04	0.02	0.03	0.01	0.061	0.0600	0.0013	0.0004	0.0030
TUNDISH	2398	2	0.06	0.38	0.009	0.009	0.04	0.03	0.03	0.01	0.069	0.0690	0.0004	0.0003	0.0036
TUNDISH	2398	3	0.06	0.38	0.009	0.009	0.04	0.03	0.03	0.01	0.065	0.0630	0.0020	0.0004	0.0045

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN		LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED			Oxygen Blowing to Nozzle		
				meter	TIME					meter	canal	number	meter	canal	number
1571	10:37	10:35	260 X 260	13	11:00	1607	INTOCAST	32	DYSN	10	13	1		13	
1555	11:00	11:50		22	11:15					9	14	1		14	
1559	11:15			27	11:22					9	15	1		15	
1559	11:23									9	16	1		16	
1563	11:40													LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2400	1	0.05	0.23	0.030	0.013	0.00	0.02	0.04	0.01	0.418			0.0011	0.0032
LADLE	2400	1	0.04	0.19	0.022	0.009	0.02	0.02	0.04	0.01	0.105	0.0986	0.0064	0.0000	0.0014
LADLE	2400	2	0.06	0.35	0.019	0.011	0.02	0.02	0.04	0.01	0.070	0.0691	0.0008	0.0000	0.0008
LADLE	2400	3	0.06	0.40	0.016	0.014	0.06	0.02	0.04	0.01	0.104	0.1039	0.0005	0.0027	0.0044
LADLE	2400	4	0.06	0.40	0.009	0.013	0.06	0.02	0.04	0.01	0.071	0.0682	0.0029	0.0010	0.0024
TUNDISH	2400	1	0.06	0.40	0.008	0.013	0.06	0.02	0.04	0.01	0.038	0.0342	0.0034	0.0005	0.0071
TUNDISH	2400	2	0.07	0.40	0.005	0.012	0.06	0.02	0.04	0.01	0.040	0.0374	0.0022	0.0008	0.0082
TUNDISH	2400	3	0.06	0.40	0.006	0.012	0.06	0.02	0.04	0.01	0.044	0.0426	0.0013	0.0008	0.0073

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1553	11:55	11:50	260 X 260	11	12:03	1593	INTOCAST	32	DYSN		13			13	
1554	12:01	12:55		23	12:20						14			14	
1549	12:20			30	12:28						15			15	
1542	12:42										16			16	
1544	12:50													LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2402	1	0.03	0.16	0.043	0.012	0.00	0.02	0.03	0.00	0.463			0.0004	0.0001
CONVE.	2402	2	0.03	0.14	0.037	0.008	0.00	0.02	0.03	0.00	0.163			0.0001	0.0005
CONVE.	2402	3	0.03	0.11	0.027	0.006	0.00	0.02	0.04	0.00	0.385			0.0000	0.0026
LADLE	2402	1	0.03	0.11	0.031	0.007	0.01	0.02	0.04	0.00	0.190	0.1812	0.0092	0.0000	0.0079
LADLE	2402	2	0.05	0.37	0.023	0.010	0.01	0.02	0.04	0.00	0.084	0.0770	0.0068	0.0002	0.0047
LADLE	2402	3	0.05	0.41	0.016	0.011	0.03	0.02	0.04	0.01	0.066	0.0636	0.0022	0.0040	0.0063
TUNDISH	2402	1	0.06	0.42	0.015	0.011	0.03	0.02	0.04	0.01	0.047	0.0453	0.0015	0.0016	0.0075
TUNDISH	2402	2	0.06	0.42	0.011	0.011	0.04	0.02	0.04	0.01	0.044	0.0425	0.0011	0.0011	0.0067
TUNDISH	2402	3	0.06	0.41	0.009	0.010	0.03	0.02	0.04	0.01	0.038	0.0347	0.0029	0.0014	0.0071

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1560		12:55	260 X 260	15	13:15	1595	INTOCAST	32	DYSN	15	13	1	15	13	1
1565	13:30	14:15		25	13:30					15	14	1	15	14	1
				32	13:45					7	15	1	7	15	1
1559	14:00									7	16	1	7	16	1
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2404	1	0.05	0.16	0.044	0.008	0.00	0.02	0.03	0.00	0.498			0.0001	0.0004
CONVE.	2404	2	0.05	0.13	0.030	0.004	0.00	0.02	0.04	0.00	0.474			0.0041	0.0006
LADLE	2404	1	0.05	0.13	0.025	0.004	0.01	0.02	0.04	0.00	0.148	0.1471	0.0008	0.0000	0.0093
LADLE	2404	2	0.06	0.38	0.019	0.008	0.01	0.02	0.04	0.00	0.058	0.0567	0.0014	0.0000	0.0092
LADLE	2404	3	0.06	0.40	0.014	0.008	0.03	0.02	0.04	0.00	0.052	0.0304	0.0213	0.0036	0.0090
TUNDISH	2404	1	0.07	0.40	0.005	0.005	0.02	0.02	0.04	0.01	0.012	0.0104	0.0012	0.0008	0.0065
TUNDISH	2404	2	0.07	0.40	0.006	0.006	0.02	0.02	0.04	0.01	0.014	0.0124	0.0013	0.0008	0.0059
TUNDISH	2404	3	0.06	0.40	0.007	0.006	0.02	0.02	0.04	0.01	0.017	0.0136	0.0030	0.0008	0.0061

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1555	14:20	14:15	260 X 260	11	14:30	1593	INTOCAST	32	DYSN		13			13	
1559	14:25	15:30		18	14:39						14			14	
1560	14:45			32	14:57						15			15	
1561	14:55										16			16	
1559	15:16													LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	2406	1	0.05	0.22	0.035	0.011	0.00	0.02	0.03	0.00	0.479			0.0002	0.0103
LADLE	2406	1	0.04	0.17	0.023	0.007	0.01	0.02	0.03	0.00	0.051	0.0465	0.0048	0.0001	0.0030
LADLE	2406	2	0.04	0.18	0.026	0.010	0.00	0.02	0.03	0.01	0.019	0.0143	0.0043	0.0000	0.0066
LADLE	2406	3	0.05	0.41	0.020	0.011	0.02	0.02	0.03	0.01	0.071	0.0640	0.0071	0.0034	0.0040
TUNDISH	2406	1	0.07	0.42	0.013	0.010	0.03	0.02	0.03	0.01	0.036	0.0295	0.0070	0.0013	0.0089
TUNDISH	2406	2	0.06	0.41	0.015	0.010	0.02	0.02	0.03	0.01	0.036	0.0325	0.0031	0.0008	0.0086
TUNDISH	2406	3	0.06	0.41	0.013	0.010	0.02	0.02	0.03	0.01	0.042	0.0356	0.0067	0.0015	0.0078

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1562	19:12	19:05	260 X 335	14	19:23	1590	INTOCAST	32	IFGL		17			17	
1560	19:30	20:00		24	19:35						18		31	18	1
1561	19:41			34	19:48						19			19	
1558	19:49									13	20	1	13	20	1
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	6745	1	0.05	0.14	0.029	0.008	0.00	0.02	0.02	0.01	0.532	0.4818	0.0500	0.0009	0.0033
LADLE	6745	1	0.02	0.13	0.026	0.009	0.01	0.02	0.03	0.00	0.096	0.0925	0.0040	0.0000	0.0049
LADLE	6745	2	0.05	0.36	0.017	0.012	0.04	0.02	0.03	0.00	0.055	0.0526	0.0019	0.0018	0.0050
TUNDISH	6745	1	0.07	0.36	0.009	0.011	0.03	0.02	0.02	0.01	0.031	0.0265	0.0048	0.0005	0.0070
TUNDISH	6745	2	0.07	0.36	0.010	0.011	0.03	0.02	0.02	0.01	0.032	0.0272	0.0052	0.0006	0.0067
TUNDISH	6745	3	0.07	0.36	0.010	0.011	0.03	0.02	0.02	0.01	0.034	0.0309	0.0033	0.0008	0.0066

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1578	17:45	17:35	260 X 335	11	17:50	1594	INTOCAST	32	IFGL		17			17	
	17:46	18:30		22	18:05						18			18	
1572	17:55			32	18:15						19			19	
1571	18:15										20			20	
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7364	1	0.09	0.26	0.024	0.017	0.00	0.03	0.03	0.01	0.577	0.5589	0.0184	0.0007	0.0003
CONVE.	7364	2	0.04	0.12	0.017	0.009	0.00	0.03	0.03	0.01	0.411	0.3461	0.0649	0.0005	0.0032
LADLE	7364	1	0.02	0.11	0.015	0.007	0.03	0.03	0.04	0.00	0.082	0.0743	0.0075	0.0000	0.0040
LADLE	7364	2	0.04	0.28	0.017	0.009	0.02	0.03	0.04	0.00	0.017	0.0129	0.0041	0.0000	0.0052
LADLE	7364	3	0.04	0.32	0.013	0.011	0.08	0.03	0.04	0.01	0.053	0.0481	0.0052	0.0017	0.0065
TUNDISH	7364	1	0.05	0.32	0.010	0.011	0.09	0.03	0.03	0.01	0.110	0.1077	0.0027	0.0009	0.0069
TUNDISH	7364	2	0.05	0.32	0.011	0.011	0.09	0.03	0.03	0.01	0.070	0.0684	0.0018	0.0009	0.0054
TUNDISH	7364	3	0.05	0.32	0.010	0.011	0.09	0.03	0.03	0.01	0.090	0.0883	0.0021	0.0010	0.0062

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1578	17:45	17:35	260 X 335	11	17:50	1594	INTOCAST	32	IFGL		17			17	
	17:46	18:30		22	18:05						18			18	
1572	17:55			32	18:15						19			19	
1571	18:15										20			20	
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7366	1	0.07	0.12	0.016	0.005	0.00	0.03	0.03	0.00	0.753	0.7408	0.0118	0.0004	0.0025
LADLE	7366	1	0.04	0.10	0.016	0.005	0.01	0.03	0.03	0.00	0.097	0.0888	0.0080	0.0001	0.0058
LADLE	7366	2	0.04	0.30	0.017	0.009	0.04	0.03	0.03	0.00	0.014	0.0095	0.0043	0.0001	0.0054
LADLE	7366	3	0.04	0.31	0.016	0.011	0.03	0.03	0.03	0.00	0.005	0.0030	0.0019	0.0000	0.0058
LADLE	7366	4	0.04	0.34	0.012	0.011	0.07	0.03	0.03	0.00	0.055	0.0543	0.0012	0.0023	0.0065
TUNDISH	7366	1	0.06	0.34	0.010	0.010	0.07	0.03	0.03	0.01	0.053	0.0517	0.0008	0.0010	0.0069
TUNDISH	7366	2	0.05	0.34	0.010	0.010	0.07	0.03	0.03	0.01	0.071	0.0698	0.0025	0.0011	0.0061
TUNDISH	7366	3	0.05	0.34	0.010	0.010	0.07	0.03	0.03	0.01	0.064	0.0630	0.0011	0.0010	0.0062

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1566	05:27	5:20	260 X 335	15	05:40	1593	INTOCAST	32	IFGL		21			21	
1565	05:39	6:15		30	05:58						22			22	
1565	06:00			40	06:10						23			23	
											24			24	
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7431	1	0.06	0.12	0.024	0.008	0.00	0.03	0.03	0.01	0.456	0.4244	0.0314	0.0005	0.0029
LADLE	7431	1	0.04	0.11	0.018	0.007	0.01	0.03	0.03	0.00	0.062	0.0553	0.0069	0.0000	0.0083
LADLE	7431	2	0.04	0.26	0.015	0.011	0.06	0.03	0.03	0.00	0.056	0.0504	0.0056	0.0030	0.0092
TUNDISH	7431	1	0.07	0.31	0.015	0.011	0.07	0.03	0.03	0.01	0.047	0.0443	0.0024	0.0012	0.0052
TUNDISH	7431	2	0.05	0.30	0.015	0.012	0.06	0.03	0.03	0.01	0.049	0.0438	0.0050	0.0013	0.0050
TUNDISH	7431	3	0.06	0.30	0.015	0.012	0.06	0.03	0.03	0.01	0.050	0.0458	0.0046	0.0013	0.0048

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1578	06:21	6:15	260 X 335	15	06:35	1594	INTOCAST	32	IFGL	38	21	1		21	
1581	06:41	7:15		25	06:49						22			22	
1577	07:03			35	07:02					23	23	1		23	
										3	24	1		24	
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7433	1	0.08	0.16	0.024	0.009	0.00	0.02	0.03	0.01	0.450	0.2865	0.1634	0.0048	0.0043
LADLE	7433	1	0.04	0.11	0.018	0.006	0.02	0.02	0.03	0.00	0.050	0.0443	0.0056	0.0000	0.0054
LADLE	7433	2	0.04	0.34	0.017	0.009	0.06	0.02	0.03	0.01	0.047	0.0430	0.0044	0.0026	0.0054
TUNDISH	7433	1	0.05	0.34	0.016	0.009	0.06	0.02	0.03	0.01	0.035	0.0297	0.0049	0.0015	0.0061
TUNDISH	7433	2	0.05	0.34	0.016	0.009	0.06	0.02	0.03	0.01	0.035	0.0290	0.0058	0.0014	0.0059
TUNDISH	7433	3	0.06	0.34	0.016	0.010	0.06	0.02	0.03	0.02	0.036	0.0298	0.0060	0.0013	0.0059

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1577	07:25	7:15	260 X 335	15	07:38	1594	INTOCAST	32	IFGL		21		5	21	1
1578	07:40	8:15		21	07:51						22		5	22	1
1575	07:53			32	08:03						23		20	23	1
1578	08:06										24			24	
													34	LADLE	1

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	7434	1	0.05	0.11	0.026	0.008	0.00	0.02	0.03	0.01	0.437	0.3861	0.0509	0.0003	0.0028
LADLE	7434	1	0.03	0.11	0.020	0.007	0.02	0.02	0.03	0.00	0.051	0.0445	0.0067	0.0000	0.0049
LADLE	7434	2	0.05	0.30	0.019	0.011	0.06	0.02	0.03	0.00	0.039	0.0326	0.0067	0.0036	0.0056
TUNDISH	7434	1	0.07	0.32	0.018	0.012	0.05	0.02	0.03	0.01	0.019	0.0146	0.0045	0.0005	0.0090
TUNDISH	7434	2	0.07	0.32	0.018	0.012	0.05	0.02	0.03	0.01	0.017	0.0137	0.0037	0.0002	0.0074
TUNDISH	7434	3	0.06	0.31	0.018	0.012	0.05	0.02	0.03	0.01	0.020	0.0134	0.0063	0.0006	0.0079

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1573	02:40	2:30	260 X 335	15	02:46	1590	INTOCAST	32	IFGL		17			17	
1575	02:55	3:20		25	02:57						18			18	
1575	03:10			30	03:03						19			19	
										5	20	1		20	
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	8623	1	0.04	0.20	0.022	0.018	0.00	0.02	0.04	0.00	0.564	0.4811	0.0825	0.0000	0.0041
LADLE	8623	1	0.02	0.18	0.019	0.016	0.03	0.02	0.04	0.00	0.107	0.1027	0.0047	0.0000	0.0068
LADLE	8623	2	0.05	0.38	0.012	0.018	0.03	0.02	0.04	0.00	0.043	0.0399	0.0027	0.0000	0.0075
LADLE	8623	3	0.06	0.38	0.008	0.018	0.05	0.02	0.04	0.00	0.025	0.0188	0.0066	0.0012	0.0079
TUNDISH	8623	1	0.09	0.37	0.009	0.018	0.06	0.02	0.04	0.01	0.022	0.0199	0.0019	0.0009	0.0069
TUNDISH	8623	2	0.08	0.37	0.009	0.017	0.06	0.02	0.04	0.01	0.024	0.0225	0.0012	0.0008	0.0060
TUNDISH	8623	3	0.08	0.37	0.009	0.018	0.06	0.02	0.04	0.01	0.022	0.0200	0.0021	0.0010	0.0061

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1566	03:25	3:20	260 X 335	11	03:34	1591	INTOCAST	32	IFGL		17			17	
1560	03:50	4:15		19	03:42					14	18	1		18	
1554	04:05			26	03:50						19			19	
											20		11	20	1
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	8625	1	0.05	0.07	0.023	0.005	0.00	0.02	0.04	0.00	0.553	0.5227	0.0299	0.0008	0.0047
LADLE	8625	1	0.03	0.09	0.016	0.005	0.02	0.02	0.04	0.00	0.093	0.0845	0.0084	0.0000	0.0067
LADLE	8625	2	0.05	0.31	0.017	0.007	0.02	0.02	0.04	0.00	0.060	0.0552	0.0047	0.0001	0.0072
LADLE	8625	3	0.06	0.38	0.016	0.008	0.04	0.02	0.04	0.00	0.055	0.0525	0.0028	0.0013	0.0057
TUNDISH	8625	1	0.07	0.38	0.015	0.008	0.05	0.02	0.04	0.01	0.039	0.0364	0.0026	0.0006	0.0073
TUNDISH	8625	2	0.07	0.38	0.014	0.008	0.05	0.02	0.04	0.01	0.039	0.0355	0.0036	0.0006	0.0075
TUNDISH	8625	3	0.07	0.38	0.015	0.008	0.05	0.02	0.04	0.01	0.038	0.0369	0.0013	0.0005	0.0074

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1571	04:20	4:15	260 X 335	15	04:33	1595	INTOCAST	32	IFGL	2,30	17	2	17,30	17	2
1568	04:35	5:00		26	04:50					25	18	1	8,18,25	18	3
1560	04:55									2,21	19	2	6,21	19	2
										8	20	1	8,24	20	2
													30	LADLE	1

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	8626	1	0.05	0.13	0.020	0.007	0.00	0.02	0.04	0.00	0.498	0.4428	0.0556	0.0001	0.0039
LADLE	8626	1	0.03	0.15	0.015	0.008	0.02	0.02	0.04	0.00	0.092	0.0839	0.0081	0.0000	0.0061
LADLE	8626	2	0.04	0.33	0.017	0.013	0.01	0.02	0.04	0.00	0.019	0.0158	0.0032	0.0000	0.0066
LADLE	8626	3	0.05	0.37	0.015	0.015	0.03	0.02	0.04	0.00	0.029	0.0265	0.0029	0.0008	0.0065
TUNDISH	8626	1	0.05	0.38	0.016	0.015	0.03	0.02	0.04	0.01	0.024	0.0140	0.0098	0.0004	0.0064
TUNDISH	8626	2	0.05	0.38	0.016	0.015	0.03	0.02	0.04	0.01	0.022	0.0184	0.0036	0.0003	0.0067
TUNDISH	8626	3	0.05	0.37	0.017	0.015	0.03	0.02	0.04	0.01	0.023	0.0141	0.0086	0.0003	0.0067

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1569	06:05	5:55	260 X 335	13	06:13	1590	INTOCAST	32	IFGL		17			17	
1564	06:15	7:00		20	06:22					15	18	1		18	
1562	06:25			27	06:31					9	19	1	24	19	1
1564	06:30									16	20	1	16	20	1
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	8630	1	0.05	0.12	0.017	0.007	0.00	0.02	0.04	0.00	0.479	0.4085	0.0707	0.0019	0.0041
LADLE	8630	1	0.03	0.12	0.013	0.006	0.01	0.02	0.04	0.00	0.155	0.1486	0.0065	0.0000	0.0061
LADLE	8630	2	0.05	0.33	0.012	0.011	0.03	0.02	0.04	0.00	0.070	0.0671	0.0030	0.0012	0.0066
LADLE	8630	3	0.05	0.38	0.009	0.012	0.04	0.02	0.04	0.00	0.057	0.0432	0.0141	0.0017	0.0063
TUNDISH	8630	1	0.06	0.40	0.010	0.012	0.04	0.02	0.04	0.01	0.042	0.0379	0.0040	0.0007	0.0061
TUNDISH	8630	2	0.06	0.40	0.010	0.012	0.04	0.02	0.04	0.01	0.043	0.0359	0.0067	0.0007	0.0067
TUNDISH	8630	3	0.06	0.39	0.010	0.012	0.04	0.02	0.04	0.01	0.043	0.0376	0.0054	0.0006	0.0068

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1580	16:23	16:20	260 X 335	10	16:41	1618	INTOCAST	32	IFGL	7	17	1	7,13,18	17	3
1561	16:46	17:30		15	16:50						18		8,19	18	2
1565	17:12			25	17:04						19			19	
										9	20	1	8,9,23	20	3
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	8648	1	0.03	0.11	0.027	0.009	0.00	0.02	0.04	0.00	0.452	0.4043	0.0475	0.0001	0.0050
LADLE	8648	1	0.03	0.13	0.022	0.009	0.02	0.02	0.04	0.01	0.114	0.1002	0.0136	0.0004	0.0069
LADLE	8648	2	0.07	0.43	0.012	0.014	0.05	0.02	0.04	0.01	0.059	0.0564	0.0024	0.0022	0.0086
LADLE	8648	3	0.07	0.40	0.022	0.014	0.02	0.02	0.04	0.01	0.032	0.0291	0.0034	0.0000	0.0083
LADLE	8648	4	0.07	0.42	0.015	0.014	0.05	0.02	0.04	0.01	0.046	0.0447	0.0009	0.0023	0.0084
TUNDISH	8648	1	0.07	0.41	0.011	0.014	0.05	0.02	0.04	0.02	0.038	0.0297	0.0084	0.0005	0.0079
TUNDISH	8648	2	0.07	0.41	0.011	0.014	0.05	0.02	0.04	0.02	0.037	0.0269	0.0105	0.0005	0.0100
TUNDISH	8648	3	0.07	0.41	0.012	0.014	0.05	0.02	0.04	0.02	0.036	0.0280	0.0076	0.0005	0.0088

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1558	17:37	17:30	260 X 335	14	17:48	1551	INTOCAST	32	IFGL		17			17	
1558	17:49	18:25		25	18:01						18			18	
1557	18:00			35	18:12						19			19	
1557	18:15										20			20	
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	8650	1	0.05	0.10	0.026	0.005	0.00	0.02	0.04	0.00	0.388	0.3508	0.0376	0.0000	0.0038
LADLE	8650	1	0.04	0.12	0.023	0.006	0.01	0.02	0.04	0.00	0.042	0.0402	0.0019	0.0000	0.0054
LADLE	8650	2	0.05	0.31	0.021	0.008	0.01	0.02	0.04	0.00	0.053	0.0501	0.0024	0.0000	0.0055
LADLE	8650	3	0.07	0.41	0.019	0.011	0.05	0.02	0.04	0.00	0.034	0.0314	0.0024	0.0033	0.0068
TUNDISH	8650	1	0.07	0.44	0.016	0.011	0.05	0.02	0.04	0.01	0.022	0.0201	0.0022	0.0006	0.0063
TUNDISH	8650	2	0.08	0.43	0.016	0.011	0.05	0.02	0.04	0.01	0.023	0.0201	0.0025	0.0006	0.0082
TUNDISH	8650	3	0.07	0.42	0.015	0.010	0.04	0.02	0.04	0.01	0.022	0.0190	0.0033	0.0008	0.0075

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1563	18:43	18:25	260 X 335	15	18:48	1592	INTOCAST	32	IFGL	20	17	1	4,14,20,27	17	4
1565	18:58	19:40		25	19:07					36	18	1	18,26,36,37	18	4
1557	19:15			30	19:18					26	19	1	4,18,26,40	19	4
										26,36	20	2	18,26,36,37	20	4
													4	LADLE	1

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	8652	1	0.03	0.13	0.031	0.014	0.00	0.02	0.04	0.01	0.576	0.4915	0.0841	0.0043	0.0047
LADLE	8652	1	0.03	0.15	0.026	0.014	0.02	0.02	0.04	0.00	0.068	0.0651	0.0025	0.0000	0.0063
LADLE	8652	2	0.05	0.36	0.024	0.015	0.02	0.02	0.04	0.01	0.050	0.0490	0.0014	0.0000	0.0080
LADLE	8652	3	0.05	0.38	0.016	0.014	0.05	0.02	0.04	0.01	0.069	0.0677	0.0014	0.0034	0.0065
TUNDISH	8652	1	0.06	0.36	0.015	0.014	0.05	0.02	0.04	0.01	0.040	0.0333	0.0069	0.0002	0.0088
TUNDISH	8652	2	0.06	0.35	0.015	0.014	0.05	0.02	0.04	0.01	0.040	0.0353	0.0045	0.0002	0.0071
TUNDISH	8652	3	0.06	0.35	0.015	0.014	0.05	0.02	0.04	0.01	0.037	0.0297	0.0073	0.0001	0.0071

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1544	19:48	19:40	260 X 335	15	20:00	1592	INTOCAST	32	IFGL		17			17	
1551	20:11	20:45		24	20:12					12	18	1	12	18	1
1547	20:28			33	20:29						19		29	19	1
										37	20	1	37	20	1
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	**8654**	1	0.03	0.14	0.027	0.019	0.00	0.02	0.04	0.01	0.415	0.2905	0.1243	0.0006	0.0049
LADLE	**8654**	1	0.02	0.16	0.024	0.016	0.01	0.02	0.04	0.00	0.013	0.0087	0.0040	0.0002	0.0054
LADLE	**8654**	2	0.04	0.36	0.023	0.018	0.01	0.02	0.04	0.00	0.037	0.0343	0.0031	0.0000	0.0060
LADLE	**8654**	3	0.05	0.39	0.020	0.021	0.04	0.02	0.04	0.00	0.045	0.0412	0.0034	0.0029	0.0057
LADLE	**8654**	4	0.05	0.41	0.020	0.022	0.04	0.02	0.04	0.00	0.037	0.0296	0.0072	0.0017	0.0053
TUNDISH	**8654**	1	0.06	0.41	0.021	0.024	0.03	0.02	0.04	0.01	0.023	0.0187	0.0046	0.0004	0.0068
TUNDISH	**8654**	2	0.07	0.40	0.021	0.023	0.03	0.02	0.04	0.01	0.021	0.0141	0.0072	0.0004	0.0072
TUNDISH	**8654**	3	0.06	0.41	0.022	0.023	0.04	0.02	0.04	0.01	0.024	0.0200	0.0037	0.0006	0.0080

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1565	21:50	21:40	260 X 335	15	21:58	1600	INTOCAST	32	IFGL		17			17	
1568	21:58	22:40		28	22:14						18			18	
1568	22:30										19			19	
											20			20	
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	**8658**	1	0.03	0.17	0.019	0.015	0.03	0.02	0.04	0.00	0.581	0.3155	0.2653	0.0304	0.0083
LADLE	**8658**	1	0.03	0.17	0.018	0.014	0.00	0.02	0.04	0.00	0.079	0.0706	0.0086	0.0000	0.0062
LADLE	**8658**	2	0.05	0.39	0.018	0.016	0.01	0.02	0.04	0.00	0.047	0.0432	0.0043	0.0000	0.0062
LADLE	**8658**	3	0.05	0.41	0.015	0.019	0.03	0.02	0.04	0.00	0.038	0.0348	0.0036	0.0023	0.0071
TUNDISH	**8658**	1	0.07	0.42	0.014	0.018	0.03	0.02	0.04	0.01	0.035	0.0296	0.0054	0.0018	0.0086
TUNDISH	**8658**	2	0.07	0.42	0.016	0.020	0.03	0.02	0.04	0.01	0.031	0.0260	0.0051	0.0014	0.0083
TUNDISH	**8658**	3	0.07	0.42	0.016	0.020	0.03	0.02	0.04	0.01	0.030	0.0270	0.0031	0.0014	0.0088

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1578	22:48	22:45	260 X 335	15	23:13	1614	INTOCAST	32	IFGL		17		4	17	1
1578	22:59	23:45		26	23:28						18			18	
1572	23:14			30	23:43						19			19	
1572	23:42										20			20	
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	**8660**	1	0.05	0.13	0.026	0.009	0.00	0.02	0.03	0.00	0.474	0.4154	0.0586	0.0006	0.0034
LADLE	**8660**	1	0.03	0.14	0.021	0.009	0.01	0.02	0.04	0.00	0.126	0.1149	0.0114	0.0000	0.0058
LADLE	**8660**	2	0.06	0.38	0.019	0.013	0.01	0.02	0.04	0.00	0.079	0.0752	0.0043	0.0000	0.0054
LADLE	**8660**	3	0.06	0.41	0.015	0.015	0.05	0.02	0.04	0.00	0.057	0.0544	0.0030	0.0039	0.0058
TUNDISH	**8660**	1	0.07	0.41	0.014	0.015	0.04	0.02	0.03	0.01	0.039	0.0338	0.0048	0.0009	0.0078
TUNDISH	**8660**	2	0.06	0.42	0.014	0.016	0.04	0.02	0.04	0.01	0.039	0.0375	0.0017	0.0015	0.0077
TUNDISH	**8660**	3	0.06	0.42	0.013	0.016	0.04	0.02	0.04	0.01	0.041	0.0377	0.0036	0.0012	0.0069

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1560	23:58	23:45	260 X 335	14	00:03	1596	INTOCAST	32	IFGL		17			17	
1562	00:23	0:40		30	00:24						18			18	
1558	00:31			38	00:34						19			19	
											20			20	
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	**8661**	1	0.04	0.16	0.020	0.011	0.00	0.02	0.03	0.00	0.682	0.6424	0.0394	0.0010	0.0028
LADLE	**8661**	1	0.04	0.15	0.015	0.009	0.01	0.02	0.04	0.00	0.087	0.0814	0.0053	0.0000	0.0059
LADLE	**8661**	2	0.06	0.42	0.012	0.015	0.04	0.02	0.04	0.00	0.052	0.0494	0.0030	0.0025	0.0069
TUNDISH	**8661**	1	0.07	0.43	0.012	0.016	0.04	0.02	0.04	0.01	0.040	0.0379	0.0034	0.0015	0.0068
TUNDISH	**8661**	2	0.07	0.43	0.012	0.016	0.04	0.02	0.04	0.01	0.040	0.0356	0.0040	0.0015	0.0066
TUNDISH	**8661**	3	0.07	0.43	0.012	0.016	0.04	0.02	0.04	0.01	0.041	0.0361	0.0045	0.0014	0.0067

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN		LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED			Oxygen Blowing to Nozzle		
				meter	TIME					meter	canal	number	meter	canal	number
1571	00:45	0:40	260 X 335	16	01:00	1595	INTOCAST	32	IFGL		17			17	
1571	00:54	1:40		23	01:08					37	18	1		18	
1567	01:11			38	01:27					34	19	1		19	
1563	01:30										20			20	
														LADLE	
CHEMICAL COMPOSITION (%)															
TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	8663	1	0.04	0.14	0.024	0.013	0.01	0.02	0.04	0.00	0.437	0.4284	0.0089	0.0087	0.0063
LADLE	8663	1	0.02	0.14	0.019	0.011	0.01	0.02	0.04	0.00	0.110	0.1049	0.0055	0.0000	0.0061
LADLE	8663	2	0.05	0.40	0.020	0.015	0.01	0.02	0.04	0.00	0.053	0.0488	0.0040	0.0000	0.0046
LADLE	8663	3	0.05	0.43	0.015	0.017	0.04	0.02	0.04	0.00	0.053	0.0514	0.0015	0.0028	0.0050
TUNDISH	8663	1	0.06	0.44	0.014	0.016	0.04	0.02	0.04	0.01	0.043	0.0367	0.0065	0.0025	0.0061
TUNDISH	8663	2	0.05	0.44	0.014	0.016	0.04	0.02	0.04	0.01	0.043	0.0363	0.0068	0.0020	0.0064
TUNDISH	8663	3	0.05	0.44	0.014	0.016	0.04	0.02	0.04	0.01	0.042	0.0327	0.0098	0.0019	0.0063

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN		LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED			Oxygen Blowing to Nozzle		
				meter	TIME					meter	canal	number	meter	canal	number
1563	01:51	1:40	260 X 335	14	01:52	1590	INTOCAST	32	IFGL		17		26	17	1
1559	02:07	2:50		30	02:17						18		17	18	1
				37	02:26						19		22,33	19	2
											20			20	
													13,20,25,27,36,42,46,52	LADLE	8
CHEMICAL COMPOSITION (%)															
TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	8665	1	0.03	0.09	0.021	0.008	0.00	0.02	0.04	0.00	0.483	0.4010	0.0824	0.0068	0.0042
LADLE	8665	1	0.02	0.09	0.019	0.007	0.01	0.02	0.04	0.00	0.116	0.1097	0.0064	0.0000	0.0064
LADLE	8665	2	0.03	0.35	0.018	0.011	0.03	0.02	0.04	0.00	0.049	0.0419	0.0067	0.0021	0.0057
TUNDISH	8665	1	0.04	0.34	0.021	0.013	0.02	0.02	0.04	0.01	0.015	0.0101	0.0046	0.0002	0.0081
TUNDISH	8665	2	0.05	0.34	0.021	0.013	0.02	0.02	0.04	0.01	0.015	0.0083	0.0063	0.0003	0.0088
TUNDISH	8665	3	0.05	0.34	0.022	0.014	0.02	0.02	0.04	0.01	0.014	0.0076	0.0064	0.0002	0.0088

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN		LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED			Oxygen Blowing to Nozzle		
				meter	TIME					meter	canal	number	meter	canal	number
1575	01:27	1:25	260 X 335	10	01:45	1615	INTOCAST	32	IFGL		17			17	
1563	01:40	2:20		18	01:55						18			18	
1572	01:55			24	02:05						19			19	
											20			20	
														LADLE	
CHEMICAL COMPOSITION (%)															
TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	8938	1	0.05	0.18	0.025	0.014	0.00	0.02	0.04	0.01	0.495	0.4953	0.0000	0.0118	0.0019
LADLE	8938	1	0.03	0.19	0.025	0.018	0.03	0.02	0.04	0.01	0.109	0.1032	0.0056	0.0000	0.0052
LADLE	8938	2	0.05	0.34	0.017	0.020	0.03	0.02	0.04	0.01	0.065	0.0581	0.0065	0.0000	0.0048
LADLE	8938	3	0.05	0.34	0.011	0.019	0.04	0.02	0.04	0.01	0.032	0.0317	0.0008	0.0000	0.0052
LADLE	8938	4	0.05	0.36	0.006	0.020	0.07	0.02	0.04	0.01	0.046	0.0445	0.0015	0.0015	0.0042
TUNDISH	8938	1	0.07	0.36	0.004	0.019	0.08	0.02	0.04	0.02	0.033	0.0262	0.0067	0.0008	0.0058
TUNDISH	8938	2	0.06	0.36	0.004	0.018	0.08	0.02	0.04	0.02	0.036	0.0306	0.0057	0.0011	0.0064
TUNDISH	8938	3	0.07	0.35	0.004	0.018	0.08	0.02	0.04	0.02	0.036	0.0360	0.0003	0.0010	0.0071

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN		LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED			Oxygen Blowing to Nozzle		
				meter	TIME					meter	canal	number	meter	canal	number
1555	13:25	13:20	260 X 335	15	13:44	1592	INTOCAST	32	IFGL		17		1,7,31	17	3
1560	13:55	14:35		25	13:55						18			18	
1557	14:15										19			19	
										1	20	1	1,13	20	2
														LADLE	
CHEMICAL COMPOSITION (%)															
TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	9047	1	0.04	0.11	0.026	0.012	0.00	0.02	0.08	0.02	0.434	0.0213	0.4128	0.0058	0.0016
LADLE	9047	1	0.03	0.12	0.021	0.010	0.02	0.02	0.09	0.02	0.044	0.0299	0.0140	0.0004	0.0034
LADLE	9047	2	0.04	0.26	0.021	0.014	0.01	0.02	0.09	0.02	0.001	0.0004	0.0009	0.0012	0.0050
LADLE	9047	3	0.05	0.30	0.019	0.018	0.03	0.02	0.09	0.02	0.038	0.0319	0.0063	0.0021	0.0057
TUNDISH	9047	1	0.06	0.30	0.019	0.017	0.03	0.02	0.08	0.03	0.021	0.0151	0.0060	0.0010	0.0069
TUNDISH	9047	2	0.06	0.30	0.019	0.016	0.03	0.02	0.09	0.03	0.022	0.0155	0.0061	0.0010	0.0078

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TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1562	14:47	14:35	260 X 335	15	14:55	1605	INTOCAST	32	IFGL		17			17	
1560	14:55	15:20		31	15:18					1	18	1	1	18	1
											19			19	
											20			20	
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	9049	1	0.05	0.13	0.026	0.010	0.00	0.02	0.04	0.02	0.472	0.3994	0.0730	0.0000	0.0043
LADLE	9049	1	0.03	0.13	0.015	0.009	0.03	0.02	0.05	0.01	0.175	0.1689	0.0063	0.0001	0.0045
LADLE	9049	2	0.05	0.33	0.008	0.010	0.04	0.02	0.05	0.01	0.103	0.1015	0.0011	0.0000	0.0050
LADLE	9049	3	0.05	0.34	0.005	0.010	0.08	0.02	0.05	0.01	0.077	0.0769	0.0001	0.0029	0.0070
TUNDISH	9049	1	0.06	0.34	0.005	0.010	0.08	0.02	0.05	0.02	0.066	0.0651	0.0011	0.0015	0.0072
TUNDISH	9049	2	0.06	0.33	0.008	0.012	0.07	0.02	0.05	0.03	0.049	0.0478	0.0012	0.0012	0.0085

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1574	17:04	17:00	260 X 335	15	17:30	1608	INTOCAST	32	IFGL		17			17	
1561	17:09	18:05		20	17:37					25	18	1		18	
1572	17:30										19		10	19	1
1570	17:51										20			20	
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	11274	1	0.06	0.18	0.031	0.012	0.00	0.03	0.04	0.01	0.429	0.3884	0.0409	0.0031	0.0034
LADLE	11274	1	0.04	0.15	0.021	0.009	0.01	0.03	0.05	0.01	0.118	0.1158	0.0017	0.0000	0.0052
LADLE	11274	2	0.06	0.34	0.015	0.009	0.02	0.03	0.04	0.01	0.087	0.0856	0.0013	0.0001	0.0063
LADLE	11274	3	0.07	0.34	0.010	0.009	0.06	0.03	0.05	0.01	0.060	0.0593	0.0005	0.0029	0.0084
TUNDISH	11274	1	0.06	0.39	0.007	0.009	0.06	0.03	0.05	0.01	0.037	0.0354	0.0019	0.0009	0.0065
TUNDISH	11274	2	0.07	0.38	0.007	0.009	0.06	0.03	0.04	0.01	0.035	0.0332	0.0017	0.0008	0.0062

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1543	19:20	19:15	260 X 335	18	19:38	1603	INTOCAST	32	IFGL		17		19,30	17	2
1547	19:30	20:30		30	19:56						18			18	
1550	19:38										19			19	
1554	19:53										20		30,43	20	2
1545	20:23													LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	11277	1	0.05	0.19	0.025	0.009	0.01	0.02	0.04	0.01	0.657	0.5721	0.0850	0.0028	0.0056
LADLE	11277	1	0.03	0.14	0.023	0.008	0.02	0.02	0.05	0.00	0.041	0.0325	0.0088	0.0011	0.0091
LADLE	11277	2	0.04	0.31	0.025	0.009	0.02	0.02	0.05	0.00	0.019	0.0151	0.0039	0.0000	0.0053
LADLE	11277	3	0.06	0.38	0.025	0.011	0.05	0.03	0.05	0.00	0.059	0.0576	0.0013	0.0014	0.0041
TUNDISH	11277	1	0.08	0.42	0.020	0.012	0.04	0.03	0.05	0.01	0.036	0.0311	0.0045	0.0009	0.0062
TUNDISH	11277	2	0.08	0.42	0.020	0.012	0.05	0.02	0.05	0.01	0.034	0.0279	0.0062	0.0009	0.0075

TUNDISH TEMP(°C)	TIME	Casting Time (Start/Finish)	DIMENSION (mm)	CONTINUE SAMPLE TAKEN meter	CONTINUE SAMPLE TAKEN TIME	LADLE TEMP(°C)	Casting Powder	DIA.OF NOZZLE	NOZZLE TYPE	NOZZLE CHANGED meter	NOZZLE CHANGED canal	NOZZLE CHANGED number	Oxygen Blowing to Nozzle meter	Oxygen Blowing to Nozzle canal	Oxygen Blowing to Nozzle number
1559	20:36	20:30	260 X 335	19	20:51	1603	INTOCAST	32	IFGL		17			17	
1566	20:50	21:40		30	21:03						18			18	
1560	21:15										19			19	
1555	21:22									3	20	1		20	
														LADLE	

CHEMICAL COMPOSITION (%)

TASK	HEAT NO	SAMP.NO	C	Mn	S	P	Si	Cu	Ni	Cr	Al	Al sol	Al oxy	Ca	N
CONVE.	11279	1	0.04	0.17	0.029	0.016	0.00	0.03	0.04	0.01	0.500	0.4998	0.0000	0.0022	0.0027
LADLE	11279	1	0.03	0.18	0.027	0.016	0.01	0.03	0.05	0.00	0.068	0.0658	0.0027	0.0000	0.0027
LADLE	11279	2	0.05	0.36	0.025	0.016	0.01	0.03	0.05	0.01	0.047	0.0458	0.0015	0.0000	0.0033
TUNDISH	11279	1	0.06	0.38	0.020	0.016	0.05	0.03	0.05	0.01	0.045	0.0403	0.0048	0.0019	0.0070
TUNDISH	11279	2	0.07	0.38	0.020	0.016	0.05	0.03	0.05	0.01	0.045	0.0424	0.0029	0.0017	0.0073