Vpliv aluminijevega nitrida na vročo duktilnost malolegiranih jekel. Opazovanja v elektronskem mikroskopu (Rezime)

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Raziskovali smo pogoje za zmanjšanje duktilnosti med 800 in 1100 °C, ki se v splošnem pripisuje prisotnosti aluminijevega nitrida v malolegiranih jeklih, v zlitinah železo-aluminij-dušik, železo-aluminij in železo-dušik z vročimi raztržnimi preizkusi. Prisotnost aluminijevega nitrida AlN, ki je bila potrjena z opazovanji v elektronskem mikroskopu, je izgleda potreben pogoj za degradacijo duktilnosti; nekateri rezultati pa kažejo, da to ni zadosten pogoj.

PRIPOMBA.

G. D. Funnell, TI Research Laboratories

V Tube Investments Research Laboratories smo raziskovali mehanizem vpliva AlN na vročo predelovalnost jekla s kombinacijo opazovanj na avstenitnih in na ogljikovih jeklih. To delo dovoljuje sklep, da se vpliv AlN lahko raztolmači z blokiranjem avstenitnih mej. Majhni izločki AlN ($\leq 0.1\,\mu m$) blokirajo avstenitne meje in so vzrok za majhno duktilnost, ob prisotnosti večjih izločkov ($\geq 0.2\,\mu m$), ali manjših volumskih delov AlN, se vrši migracija kristalnih mej relativno lahko in je vzrok za večjo duktilnost.

Podobno, kjer se uporablja obdelava s titanom, da bi se preprečili problemi zaradi AlN, se doseže uspeh le, če so precipitati titanovega nitrida zadosti veliki, da ne morejo učinkovito blokirati avstenitnih kristalnih mej.

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Influence du nitrure d'alluminium sur la ductilité a chaud des aciers faiblement alliés. Observations au microscope éléctronique (Resumé)

Les conditions de la baisse de ductilité entre 800 et 1100 °C, généralement attribuée à la présence de nitrure d'aluminium, ont été recherchées dans des aciers faiblement alliés, ainsi que dans des alliages fer-aluminium-azote, fer-aluminium et fer-azote, par des essais de tracion à shaud. La présence de nitrure d'aluminium AlN, confirmée par microscopie électronique, apparait bien comme une condition nécessaire de dégradation de la ductilité; certains résultats permettent cependant de penser qu'elle n'en constitue pas une condition suffisante.

COMMENT.

Concerning the mechanism by vhich AlN influences the hot workability of steel, this has been studied at Tube Investment Research Laboratories by combining observations on fully austenitic alloys with those made on plain carbon steels. This work suggests that the influence of AlN can be explained in terms of austenitic grain boundary pinning. Small AlN particles ($\leq 0.1\,\mu m$) which pin the austenitic grain boundaries cause poor ductility, whilst in the presence of coarse particles ($\geq 0.2\,\mu m$) or low volume fraction of AlN, grain boundary migration occurs relatively easily resulting in superior ductility.

Similarly, where titanium treatment is used to avoid problems due to AlN, success will be only achieved if the titanium nitride particles are sufficiently coarse so than they do not effectively pin austenitic grain boundaries.

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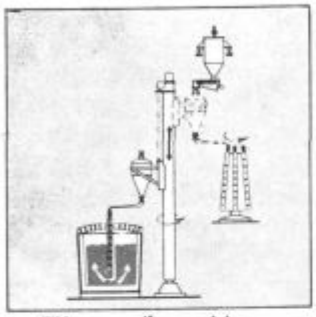
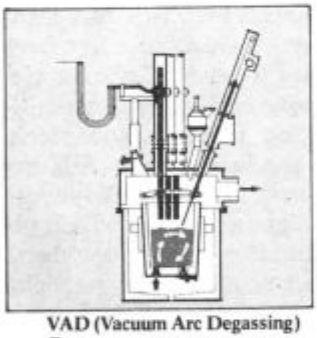
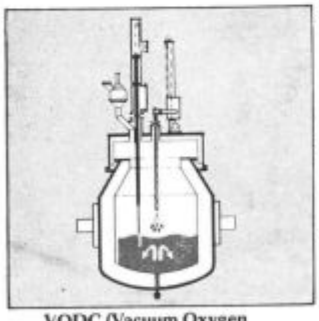
METALLURGICAL KNOWHOW



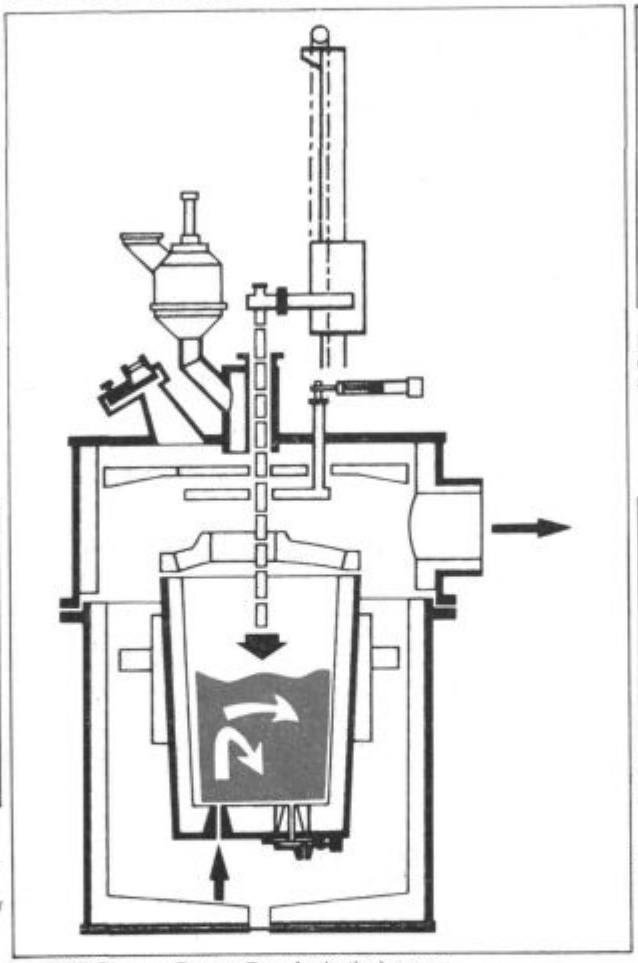
TN process (for precision desulphurizing and deoxidation)
By immersed lance blowing of alkaline earth metals, extremely low contents of sulphur and oxygen are produced in a few minutes, considerably improving the mechanical properties.



VAD (Vacuum Arc Degassing) Process
Satisfies all requirements for greater productivity and higher quality. Heating, degassing, refining and alloy addition take place under vacuum.



VODC (Vacuum Oxygen Decarburization Converter) process
This process combines the proven VOD method with BOF converter practice. This results in little chromium slag with correspondingly low consumption of reducing agents, inert gas (argon) and phosphorizing substances.



VOD (Vacuum Oxygen Decarburization) process
VOD is used in making stainless steels, decarburization of high chromium alloyed qualities to ELC grades with highest chromium yield.

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Whether you make steel or talk steel the wealth of practical experience behind Standard-Messo is impressive. The wide range of steel processing systems described above have been proven time and time again.

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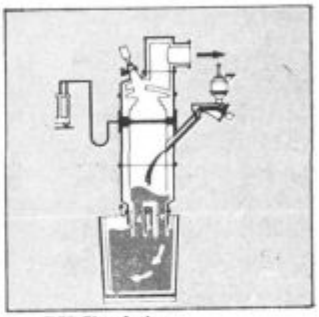
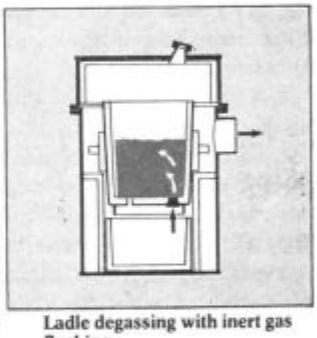
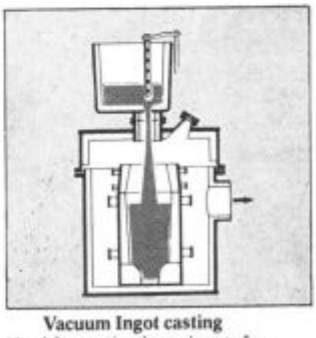


RH Circulation
Minimum heat loss, excellent degassing—close tolerance alloying, assured quality every time.



Ladle degassing with inert gas flushing
Simple, reliable affording a large reaction area.



Vacuum Ingot casting
Used for casting large ingots for forging. Castings weighing more than 500 t are now feasible. The low hydrogen content shortens annealing times. Vacuum ingot casting is a reliable casting process in which deleterious effects of the atmosphere are completely excluded.