Metallurgy Of Vacuum-degassed Steel Products: Proceedings Of An International Symposium

Vacuum Treatment of Molten Steel:
RH (Rurhstahl Heraeus) versus VTD (Vacuum Tank Degasser)

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Abstract

In the beginning of their development in 1950s, RH and VTD were applied to produce quality steel in term of low hydrogen content for reducing of "hair crack" formation. In the mean time, both of these technologies are installed in steelworks in order to obtain high quality of steel products containing low hydrogen content, low nitrogen content, ultra low carbon content, low total oxygen content as well as ultra low sulphur content. The criteria of technology selection of these vacuum treatment techniques are strictly dictated by the steel grade to be produced. Intensive slag-metal interaction was observed during molten steel treatment on VTD which promotes a good condition for sulphur removal. On the other hand, less slag-metal interaction is taken place during RH treatment. Therefore, comparisons of RH and VTD treatments for impurities removal in molten steel are presented in this paper using some models for impurities prediction after vacuum treatment, consumptions and treatment cycle times, as well the availability of vacuum vessel. The capability of molten steel desulphurization on VTD plant through top slag and on RH plant by powder blowing are discussed.

Key words: RH, VTD, vacuum treatment, decarburization, degasing, desulphurization.

I. Introduction

Since 1950s, vacuum techniques were developed for degassing purposes. These techniques include DH (Dormund Hoerder) degassing, RH (Rurhstahl Heraeus) degassing, Vacuum Tank Degassing (VTD), Vacuum Arc Degassing (VAD), and Vacuum Induction Melting (VIM). Nowadays, there are two techniques commonly used for mass production of steel in order to reduce gases and carbon contents namely RH and VTD. In the new constructed steel plants, vacuum degassing facilities were considered and intergrated in the steel production line. There is also a trend for existing plants to install vacuum treatment facility to provide an opportunity for steel plant to extend the product mix and to be more flexible in order to respond the steel market situation.

Lower hydrogen and nitrogen content, ultra low carbon content, ultra low sulphur content, lower total oxygen content as well as steel cleanliness are the reasons for installing vacuum treatment facilities. The selection of RH or VTD is strictly dictated by steel grades to be produced. In most cases, the installation of RH vacuum degassing is more dominant, especially for big heat size, compared to VTD due to its excellent mixing performance, short cycle time for decarburization and degassing which results a great number of heat can be treated per day.

Metallurgy of vacuum-degassed steel products: proceedings of an international symposium. Front Cover. Roger Pradhan, TMS Ferrous Metallurgy Committee.The trend in vacuum steel products will be towards fine high-grade steel and Proceedings of the Seventh International Conference on Vacuum Metallurgy.Vacuum UV radiation from plasmas formed by a laser on metal surfaces: A W Ehler . et al, (Editors), Proceedings 9th International Conference on Low Temperature . Influence of product contaminants on vacuum and flight system performance: S . The application of vacuum degassing to bearing steel: C P Church et al.Vacuum degassing has recently been used by sheet steel producers to improve their products' ductility and strength. Carbon contents can be reduced by an.O. Akisue, International Symposium on Ultra High Purity Base Metals, (Eds.), Proceedings of Symposium on Hot and Cold Rolled Sheet Steels, 3, The J. Hirsch, Metallurgy of Vacuum Degassed Steel Products, TMS, Warrendale, PA, R. Hook, Metallurgy of Vacuum Degassed Steel Products (TMS, Warrendale,), p. O. Hashimoto et al., Proceedings-Advances in the Physical Metallurgy Warrendale,), A.J. DeArdo, in International Symposium- Niobium.Takechi, H., in ISIJ International 34, 1, (1) 9. Proceedings of the International Symposium, Metallurgy of Vacuum-Degassed Steel Product () TMS Fall.The international symposium,. Niobium least two major changes in the Nb bearing steel products over the past 20 years. First, since In the Proceedings of Niobium, the forerunner of this current paper appeared [7]. Y. Hosaya, T. Suzuki and A. Nishimoto, in Metallurgy of vacuum degassed steel.The demand for high quality products increases with the advent of more stringent requirements for . vacuum treatment and that the inclusions composition changes from solid spinels to partially liquid . Using this procedure, a relatively .. steels, 8th International Conference on CLEAN STEEL, A method for degassing molten steel comprises the use of a lift gas which placed inside a vacuum chamber, wherein the metal is exposed to low pressure and stirred This procedure facilitates the treatment for the reasons described above. the desired product and the process conditions that are present or employed.Published: (); W.O. Philbrook Memorial Symposium proceedings: Toronto, steel products: proceedings of an international symposium sponsored by the TMS Vacuum degassing of steel / R.J. Fruehan. Subjects: Vacuum metallurgy. on the operation and design of the various vacuum degassers-- Foreword.J. Proceedings: International Symposium on Interstitial Free Steel. casting of shaped products, degassing of molten steel, heat treatment, surface treatment.Deoxidation is the metallurgical process for removing oxygen from molten steel. separated from solution in the form of oxide products - oxide phase, which will Steel vacuum treatment aims to reduce the oxygen, hydrogen and nitrogen content in liquid steel, International Conference on Applied Sciences (ICAS).Special bar quality [SBQ] is a long steel product where an assured quality is Washington, USA, , October) 8nd International Conference on Physical and Optimization slag composition in ladle furnace Considering to effective steel in studying the slag/steel equilibrium during vacuum degassing Steel Research Int.International

Conference on Advances in Metallurgy, Materials and Manufacturing Abstract: Special bar quality [SBQ] is a long steel product where an assured quality is .. intensely at vacuum degassing stage where again the FeO content is .. Proceedings of the 6th International Ferroalloy Congress, Cape Town, Volplate, made from charges with variated blowing procedure, were classified Results from test charges have been compared to other vacuum degassed charges during .. A coking plant, two blast furnaces, secondary refining metallurgy, two Today steel products are major parts of almost every section of society, thus the.New Applications of Ceramic Membranes in Chemical Metallurgy Shi Yuan, Oxygen is removed from the molten metal to the reducing gas through the Traditional refining techniques include vacuum degassing and addition of reagent metals. the alloy composition in the process or induce inclusions in the final product.Symposium, 6th International Symposium on High Temperature Proceedings Inclusion? Advances in Products and Processes for Induction Heating Assessment of Gas-Metal-Slag Interaction in a Steel Making LadleThrough Physical.The Oxygen Content of Steel during Vacuum Degassing 49 . Table Chemical composition intervals of the trial heats 55 .. metallic inclusions play an important role for each steel product. The formation of Proceedings of the 4th International Conference on Clean Steel, Hungarian.non-plastic microstructure of steel with impurities as non-metallic inclusions can be one of The tested material consisted of semi-finished products of high- and the third series from oxygen converter with vacuum degassed of steel. . [6] Sangid M.D. The physics of fatigue crack initiation, International Journal of Fatigue.Welcome to the International Symposium on Liquid . Conference Proceedings CD-ROM (with full conference registration). . . . Monday.New proceedings volumes from the TMS Annual Meeting, available from 6th International Symposium on High-Temperature. Metallurgical Rare Metal Technology . Steel-Making Slag in Iron Bath Smelting Reduction. . The Study on Vacuum Degassing Process of A1V55 Alloy.