Siemens VAI starts up vertical slab caster at Baosteel, China – Casting of highest alloyed-steel grades for special-product applications

In the Spring of 2009, Siemens VAI Metals Technologies started up and commissioned a new vertical slab caster at Baosteel's Special Steel Branch in Shanghai, China. This solution enables a wide range of highly critical steel grades to be continuously cast, which would otherwise not be possible to produce in a conventional bow-type caster. Due to the special design features of the machine and the installation of a full array of technological packages, slabs are produced with the highest surface and internal quality. Steel production in the existing ingot casting route could also be partially substituted with the new caster.

The new single-strand vertical slab caster installed at Baosteel's Special Steel Branch is capable of producing up to approximately 270,000 t/a of a wide range of high- and ultra-high-alloyed carbon, special and stainless steel grades. These include medium- to high-carbon, alloyed and high-alloyed steel grades (e.g., up to 80% alloying elements comprising nickel, chromium, manganese, molybdenum and aluminum) and stainless-steel grades of the 300 and 400 series. The caster itself has a vertical height of 40 m and a metallurgical length of 13.6 m. Slabs are cast in thicknesses of 150 and 200 mm and at widths between 600 and 1,300 mm. Depending on the steel grade and the slab thickness to be cast, the casting speed varies between 0.7 and 1.3 m/min.

For this project Siemens VAI provided basic and detail engineering for the main caster components, special equipment such as the mold, electromagnetic stirring device, the torch-cutting machine, technological packages, electrics and also Level 1 and Level 2 automation. The installed technological packages included the LevCon mold-level-control system equipped with the autostart casting function, Mold Expert for strand-shell friction monitoring and strand-breakout prediction, DynaFlex for the online control of the mold-oscillation parameters and improved strand-surface quality, as well as the Dynacs secondary-cooling model capable of calculating the strand-
temperature profile at any position along the strand and the point of final strand solidification. The strand-guidance system is equipped with Smart Segments which, in combination with the DynaGap Soft Reduction technology package and input data from the Dynacs system, enable dynamic soft reduction to be carried out to minimize centerline segregation for highest internal strand quality. With consideration to highest surface and internal quality demands of the critical steel grades produced at Baosteel Special Steel Branch, as well as to improve the casting flexibility, “dry casting” is practiced in the lower strand section to prevent strand overcooling. This is made possible employing internally peripherally cooled rollers of the so-called “revolver type.” The installed Level 2 quality control system is another key factor for the production of the highest quality slabs at Baosteel.

For this unique continuous casting machine, a number of new and special design features were required. These included a secondary cooling-water deflection system in order to fully remove water from the caster area and to keep the casting pit dry. This was necessary because of machine-protection reasons. Furthermore, an innovative segment-exchange system was developed to enable the segments to be replaced in the horizontal direction. A novel withdrawal unit was installed in addition to a completely new slab-discharge system. During slab cutting, the slabs are clamped by a second withdrawal unit and transferred through the casting pit by means a specially designed equipment system to the caster run-out area.

The Siemens VAI scope of supply was rounded off by advisory service for co-manufacturing, erection, start-up and commissioning in addition to personnel training. This caster is the first vertical slab caster commissioned by Siemens VAI.

Further information about solutions for steel works, rolling mills and processing lines is available at http://www.siemens.com/metals

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