

Accurate prediction of the blowing endpoint in oxygen steelmaking with the Simetal<sup>CS</sup> Dynacon process-optimization system

# No More Crystal Ball

Extensive cost savings in oxygen steelmaking can be achieved through the exact determination of the blowing endpoint. This is made possible by the application of the Simetal<sup>CS</sup> Dynacon automation solution and the integrated Lomas system. This allows the consumption of oxygen and deoxidation agents to be reduced with a simultaneous increase in productivity and personnel safety

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On the basis of the experience acquired from the implementation of more than 100 converter automation projects worldwide, Siemens VAI provides solutions that meet the tough demands for optimized performance, quality steelmaking and competitive production in oxygen steelmaking. One such solution is the Dynacon process-optimization system. Installed worldwide in both new plants as part of a turnkey project, or embedded within the automation environment of existing plants, it allows producers to improve their temperature and carbon-hitting rates, reduce the oxygen reblow rates, and lower operating and maintenance expenses accordingly.

The key to process optimization in LD (BOF) steelmaking is the exact determination of the blowing endpoint. In a conventional approach, the steel temperature and composition is measured towards the end of a production cycle on the basis of samples taken from the converter. Predictions are made with respect to the final temperature and carbon content, enabling the required oxygen quantities and the duration of the end blow phase to be approximately calculated. However, this means an interruption in the steelmaking process and, in most cases, necessitates corrective oxygen reblowing. The result is longer heat cycles, lower productivity, possible disruptions in production scheduling and even higher production costs.

## System description

Dynacon is a unique Level 2 process-optimization system that Siemens VAI introduced to the market in 1997. It works in conjunction with Lomas (Low Maintenance Analyzing System), which continuously analyses the converter offgas to provide real-time dynamic control of the entire converter process. This extends from the ordering of hot metal and scrap up to alloying during



tapping. By means of the Steel Expert Prediction model, belonging to a suite of advanced metallurgical models from Siemens VAI, the steelmaking process can be imaged and fully optimized. Complete precalculations are performed covering the entire blowing procedure, including the required quantities of input materials such as hot metal, scrap, ore, alloying compounds, additives, the volume of stirring gas and blowing oxygen as well as any other additions to the converter and tapping ladle. The metallurgical and thermal processes are monitored by the Steel Expert Supervision model. The result is highly accurate blow-end control to achieve the targeted temperature and carbon content of the steel. With this highly advanced system solution, valuable minutes are saved in the steelmaking process, leading to a higher production output.

#### Project example

In November 2007, Qinhuangdao ShouQin Metals Material Co., located 270 km east of Beijing, awarded Siemens VAI a contract for the supply and installation of Dynacon, including the Lomas off-gas analysis system, for their converter steelmaking plant equipped with three 100-ton LD converters. Within only 13 months after the kick-off meeting, Siemens VAI received the Final Acceptance Certificate (FAC) for the Dynacon system, demonstrating successful fulfillment of the performance-guarantee figures. The test was carried out on the one hand with intermediate blowing interruption and intermediate partial deslagging, and on the other hand with straightforward blowing without any interruptions. In both cases, the hitting rate for the steel bath temperature and the carbon content was over 85 percent. The application of Dynacon allowed the quantities of blowing oxygen and aluminum for deoxidation to be significantly reduced with a simultaneous improvement in productivity. ■

#### References

To date, more than 30 Dynacon systems and 130 Lomas units have been installed or are currently being supplied to producers worldwide. Dynacon customers since the year 2005 include:

- SAIL Bhilai, India; start-up: 2011
- Shougang Qiangang, China; start-up: 2010
- NLMK, Steel Plant No. 2, Russia; start-up: 2010
- NLMK, Steel Plant No. 1, Russia; start-up: 2009
- CSA, Brazil; start-up: 2009
- AHMSA, Mexico; start-up: 2008
- Qinhuangdao Shouqin Metals Material Co. Ltd., China; start-up: 2008
- Tangshan Iron & Steel Co., China; start-up: 2008
- Salzgitter Flachstahl, Germany; start-up: 2007
- Lian Yuan Iron and Steel Co., China; start-up: 2007
- Panzihua Iron & Steel Co., China; start-up: 2006
- Maanshan Iron & Steel, China; start-up: 2005

#### Main Benefits

- Automatic blow-end control and avoidance of overblowing
- Improved hitting ratio of targeted carbon and temperature values
- Continuous online calculation of steel and slag properties
- Fewer reblows required
- Reduced Fe content in slag
- Reduced Al consumption for deoxidation
- Elimination of manual sampling of steel bath, increasing personnel safety

#### Author

Rudolf Hubmer

#### Contact

automation.metals@siemens.com