

The Simetal^{CIS} VAiron Expert System for fully optimized blast-furnace performance

It Runs by Itself (Nearly)

Hot-metal production is the dominant cost factor in any integrated steel plant. From both a cost perspective and a production point of view, optimized operation is necessary to reach peak performance in the blast furnace. This affects not only a steel company's bottom line, but helps to generate a reasonable return on investment in the current challenging business environment. The Simetal VAiron Blast Furnace Optimization package from Siemens VAI provides the automated and optimized blast-furnace operation needed to achieve all these goals. The authors explain why.



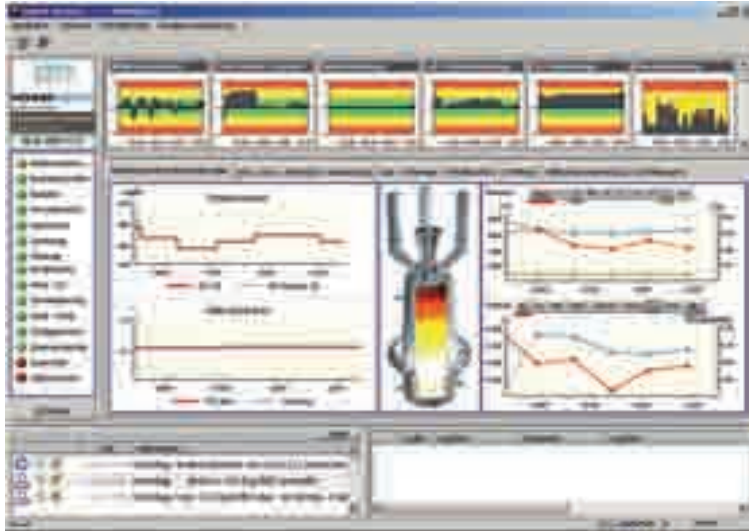
The decisive advantages of the well-proven VAiron expert system have been confirmed in more 70 blast furnaces worldwide.

Solidly based on advanced process models, artificial intelligence, a closed-loop expert system as well as enhanced software applications and operational expertise, Simetal VAiron continuously performs a complete diagnosis of all process conditions to be expected during blast-furnace operations while the built-in closed-loop control system executes corrective action, as the need arises. Detailed descriptions of the decision-making process ensure transparent operating conditions. This enables fully automatic and stable blast-furnace operations with

consistent hot-metal quality at significantly lower production costs.

Robust data management, comprehensive process models, innovative expert system

Simetal VAiron comprises three parts: The first involves Process Data Management. This component is arranged around a database used to store all process data as well as operator inputs or model parameters. Data is retrieved from the Level 1 system, laboratory, Level 3 system, and elsewhere and stored or presented to



**Clear and informative
Simetal VAiron user
interface**

the operator or engineer via graphical user interfaces. Internet-based visualization is also supported. Production and other reports are included in this part of VAiron.

The second part comprises a broad collection of process models, including:

- **Burden Control Model**
The operator uses this model to calculate the burden composition based on raw-material chemistry, the targeted reducing-agents rate and the targeted slag basicity. During standard operation, the input parameters are controlled by the expert system in closed-loop control without operator interaction.
- **Burden Distribution Model**
Major burden distribution changes are visualized by this model. Under normal conditions, the model adjusts the burden distribution automatically in closed-loop operation.
- **Stove Control Model**
The model automatically controls the fuel-gas set-points during each gas cycle in a closed-loop process so that the desired blast temperature is achieved with a minimum amount of fuel.
- **Hearth Wear Model**
Based on a finite element method, this model calculates the wear line in the hearth.

The expert system is the third and final part of Simetal VAiron. In fact, this is the very first blast-furnace expert system to control the furnace without any operator intervention. This technology employs a number of process models to perform additional calculations, observes the blast furnace on a continuous basis and changes various operational parameters.

This includes modification of the fuel rate, changes in the burden composition and distribution, and changes in steam additions.

Recent references

As a testament to its advanced capabilities, Simetal VAiron is now in operation at more than 70 blast furnaces worldwide, currently supporting over 10 percent of the world's hot-metal production. Recent examples of successful installations include BF No. 4 and BF No. 5 of Ahmsa, Mexico; Severstal North America, U.S.; Nanjing Iron & Steel, China; BF No. 3 of JSW Steel, India; Ilva/Riva Group, Italy; and Isdemir, Turkey.

Impressive cost and energy savings

In blast-furnace installations equipped with Simetal VAiron, producers benefit from reduced fuel consumption (typically 10 kg/t hot-metal savings); enhanced productivity; stable product quality; elimination of heavy control actions; and avoidance of critical process situations.

Taking into account a medium-sized blast furnace with an annual output of 2,000,000 tons of hot metal, a fuel-rate savings of 10 kg/t hot metal and an estimated coke price of €180/ton, a yearly reduction of some €3.6 million can be achieved in operating costs. These cost savings are truly significant, enabling Simetal VAiron to pay for itself in six months or less of operation. ■

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