

It pays to invest in cokemaking process-control systems from Siemens VAI

Small Investments, Big Returns

Now is the right time to focus on smaller investments that offer quick and sizeable returns. One such example is the latest control technology for cokemaking plants. The project value fits well within a tight budget and execution is relatively fast so that producers can be ready on time for increased productivity demands combined with substantial cost savings.

The main targets in cokemaking are to keep the process stable and fault-free and to produce coke of the highest quality. These objectives all have to be met while taking particular care to minimize energy costs, ensure a high level of productivity, a maximum battery service life and low environmental emissions. This can be achieved by applying Simetal^{CIS} Coke products from Siemens VAI, which are state-of-the-art Level 2 control systems designed for the demanding conditions of a cokemaking environment.

Advanced process-control systems

Dynamic scheduling of coke-oven machine operations and optimized heating control of the coke-oven battery are decisive factors for producing coke of excellent quality and meeting the productivity demands of blast furnaces. Reliable positioning and interlocking of coke-oven machines by means of the well-proven RaDiPoSi tool from Siemens VAI is an important part of the integrated control system.

Various process-related calculations are performed

by the Coking Process Management System (CPMS) developed by Siemens VAI. After each coke-pushing procedure, the dynamic scheduling model of the system calculates and sends the next pushing time to the coke-oven machines, taking into consideration the respective oven number in the pushing sequence. The heat-energy input into the battery is optimized by means of the heating-control model. The control system aims for a uniform end temperature of the coke within the entire battery. Required heat adjustments are calculated after each gas-reversing sequence in the battery.

At the steel producer Rautaruukki Oyj, Finland, proper heating control has reduced variations in the coke end temperature and, partly as a consequence, considerably decreased the required energy input over the same time period (see graphs).

Payback considerations

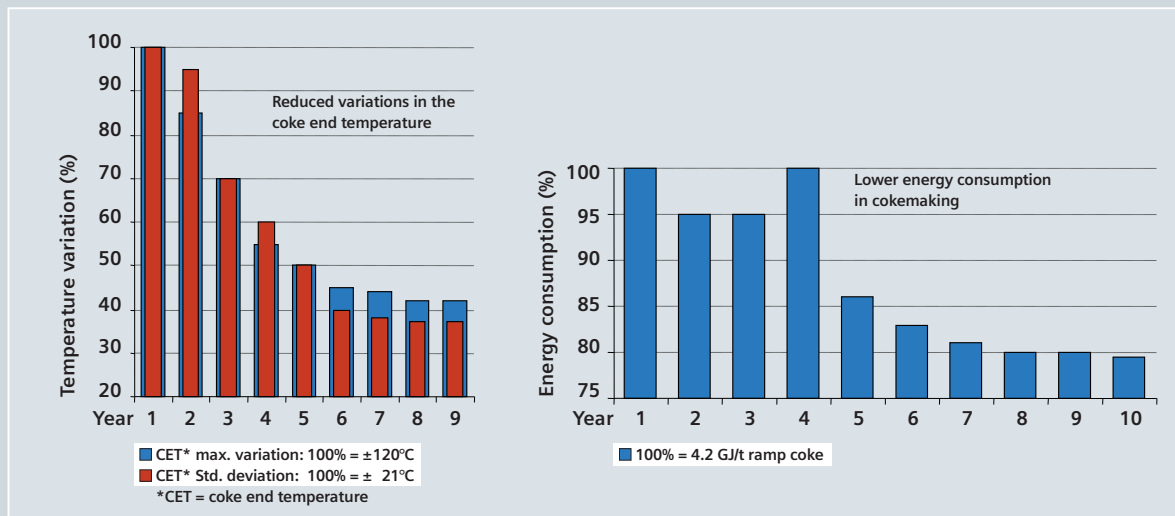
The payback time for an automation investment can be estimated by taking into account the cost savings from reduced external energy requirements, increased



State-of-the-art cokemaking facilities at Rautaruukki Oyj, Finland



Pushing of coke from a coke-oven battery



Improved cokemaking at Rautaruukki Oyj, Finland, with the application of advanced process control systems

productivity and the benefits of postponed battery maintenance and upgrading. Consider the following: Within an integrated iron and steelworks, coke-oven gas (COG) is typically used in reheating furnaces, coke-oven batteries, the power plant and in lime kilns. The value of COG may be considered to be the same as the purchase price of the respective fuels for these consumers, including natural gas, light oil and heavy oil. With the application of an advanced process-control system in cokemaking, approximately 5 percent less energy is required for battery heating. For the production of one million tons of coke, this means an extra 6.5 million Nm³ of COG that is available for other heating applications, as proven under actual plant operations. About 16 MJ of energy is available per standard cubic meter of COG. Assuming an energy price in the range of €8 to €15 per GJ, this is equivalent to a payback of €750,000 to €1,500,000 per year!

The benefit of additional coke production lies in the compensation rate for converting coal to coke – which is typically €20 per ton for the amortization of the battery investment – or the sales margin of the coke-oven plant (COP), which may be multiple of €20 per ton of coke. Considering a realistic 2 percent to 3 percent productivity increase and the above compensation figure of €20, the payback for each one million tons of produced coke is €400,000 to €600,000 yearly. When the sales margin is used as the basis for a calculation, the figure even increases to €3 million in the market situation of 2008.

Smooth cokemaking operations are undoubtedly a factor for a prolonged battery service life. For example, the cokemaking batteries at Rautaruukki Oyj were controlled by an automation system from the start of their operations. Experts from the Japanese steel producer Nippon Steel Corporation evaluated these facilities seven years after their start-up. The result was that the batteries appeared to be two years

younger than their actual age. Delaying the rebuilding of a battery by three years after 20 years of service life pays back an additional €600,000 per year at a 5 percent interest rate.

Experience and references

With references in more than 30 countries worldwide, Siemens VAI Finland has a wealth of experience at its disposal for the expert engineering and supply of automation and process technologies for the iron and steel industries.

Rautaruukki Oyj, for example, has fully utilized the advantages of the Siemens VAI Simetal^{CIS} Coke solutions, in particular CPMS for its coke-oven batteries for more than 20 years with outstanding results. Thanks to the excellent quality of the produced coke, the blast furnaces of the company rank among the best blast furnaces in operation worldwide.

Since 1989, Siemens VAI has successfully commissioned complete CPMS systems for various coke-battery sizes and designs worldwide. Six new installations are currently underway in India and these are scheduled for start-up between 2010 and 2012. ■

Main benefits of Simetal^{CIS} Coke solutions

- Reduced heating-energy costs
- Increased production rate
- Uniform final coke temperature resulting in improved coke quality
- Increased coke-oven battery service life
- Optimized process control of coke-oven battery
- Highly user-friendly for process operators

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