GMC-I GOSSEN METRAWATT

Safety through Competence

Special Edition

Power Peaks are Avoidable

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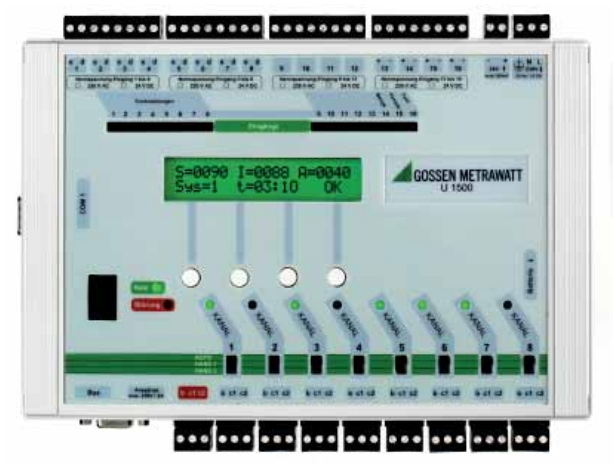
Energy Management at Thüringen Steel Mill with Optimizing Computers from GMC-I Gossen-Metrawatt

Prices for electrical power and gas continue to rise. Despite liberalization of the energy markets, prices have increased sharply in recent years, and drastic escalation of the oil price is aggravating this development in a lasting fashion. Industrial enterprises are attempting to counteract this trend with intelligent energy management systems, and thereby reduce their energy costs. Steel Mill Thüringen GmbH have also modernized their existing system, and have placed their faith in equipment and competence offered by GMC-I Gossen Metrawatt, a renowned equipment manufacturer in the field of measuring and control technology.

Above all, it was Steel Mill Thüringen's objective to optimize load management, i.e. level off power demand and reduce peak loads. "Due to the fact that peak loads have a negative effect on the price of electrical power, we're able to reduce our energy costs in this way", says qualified engineer Jürgen Ermer, maintenance manager at Steel Mill Thüringen. As a rule, differentiation is made amongst energy costs for current consumption and power costs for the maximum power value where electrical power prices for customers with special contracts are concerned – i.e. for most industrial companies. Power optimization assumes that starting up consumers which draw large amounts of power can frequently be postponed for a few minutes without significantly effecting operations. This applies in particular to power consumers which are capable of storing energy to a certain extent. These opportunities are taken advantage of by Gossen-Metrawatt's U1500 optimizing system in order to minimize power consumption, and in turn power costs, through the efficient use of all power consumers. Beyond this, integrated timer programs can also reduce energy costs and optimize operating sequences.

"For Steel Mill Thüringen, it's important for cost reasons to adhere to specified budget values for energy import", says Detlef Spließ, sales engineer at GMC-I Gossen Metrawatt. U1500 energy management devices are used to this end at two decisive points within the production process. On the one hand, there's a 220 kV control loop into which the electrical oven (see below) with a transformer power rating of 120 MVA is incorporated. Quarter-hourly demand for 220 kV supply is currently limited to 90 MW. "The GMC devices assure that this maximum power value is not exceeded by appropriately influencing transformer power before the quarter hour has expired", explains maintenance manager Ermer.

On the other hand, quarter-hourly demand for 110 kV supply is also limited, currently to 13 MW. This applies above all to the profile rolling mill at Steel Mill Thüringen, which is one of the most modern systems of its type in Europe. The steel beam blanks processed in the rolling mill must first be heated up to a rolling temperature of roughly 1200 degrees Celsius. This is accomplished by means of a pusher furnace fired with natural gas. The capacity of the rolling line lies within a range of 80 to 180 tons per hour, depending upon the shape and size of the respective profile. "Thus the rolling mill is continuously supplied with blanks from the pusher furnace for full capacity utilization. Up to three blanks can be processed simultaneously in the rolling line", reports Ermer. GMC-I's task at this point within the process was not just maximum optimization, but rather a forecast calculation for production energy consumption as well. It was thus possible to determine the best time for stopping withdrawal from the pusher furnace. "The objective is to stop feeding new blanks precisely when the rolling process for material in progress can be completed without any loss and, at the same time, the power limit can be precisely adhered to. And this is quite difficult to calculate due to the numerous different profiles and changing ancillary conditions", says Ermer.



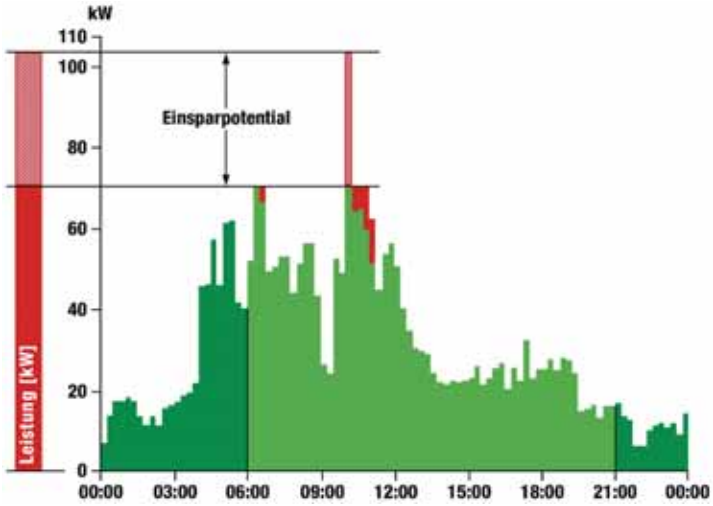
The steel mill's new energy management system also ensures that production planning provides detailed quarter-hourly prognosis tables at a database server as a guideline for consumption control. The U1500 optimizing computer supplied by GMC-I makes use of these values and controls electrical operating equipment such that electrical energy can be used in an optimized manner. A special trend and extrapolation procedure, as well as differentiated control strategies, assure that maximized savings are obtained, and that production processes are effected only minimally. The various power consumers within the production process are controlled individually, and minimum and maximum on and off-times are adhered to. As opposed to conventional maximum value monitors, this makes it possible take advantage of potential savings offered by the liberalized electrical power market.

When changes occur within the production process at Steel Mill Thüringen, new quarter-hourly prognosis tables are entered to the database server. This step can be executed at any desired point in time. “We make sure that these tables are read and processed immediately, and that only future limit values are utilized – past and current limit values are no longer used”, explains sales engineer Spließ. When the limit value for the current measuring period is changed, this is immediately taken into consideration by the U1500 optimizing computer. This assures that the customer has a direct influence on control performance during the current measuring period after limit value changes. Experience shows that production related changes to the prognosis tables at the steel mill occur each month.

However, the limit values for adhering to budgeted energy consumption at Steel Mill Thüringen are not only transferred to the U1500 station, they’re also archived at the U1600 summator. Storage and preprocessing of individual power and energy consumption values takes place at these stations. The transferred quarter-hourly prognoses, as well as actually consumed power/energy, are acquired and saved to memory. A comparison of target and actual values can thus be created every 15 minutes. “We’ve provided for a common interface which allows for ideal interaction between the two stations”, says Spließ.

The U1600 summator processes up to 24 pulse-shaped signals and digital statuses. This allows for logging, visualization, optimization and cost center related billing of all electrical and non-electrical energy media. 32 processing channels are available for the 24 input signals. Meter pulses are logged over predefined periods of time at a programmable interval and summated. Work (energy) and power are ascertained for each channel and are calculated and saved to memory as a load profile along with the associated maximum values. The optimization computer and the summator are configured and operated directly at the device with the help of an LCD and keys, or via the serial interface with optional MS Windows software.

Of course Steel Mill Thüringen also takes advantage of the load management system as an information system for production planning and production control. Ermer: “Data obtained during electrical energy logging are important. We want to know where and when energy consumption is too high. This is the only way for us to influence the limit values, and to assure favorable contract conditions for our company in future negotiations with energy suppliers.”



Steel Mill Thüringen GmbH

Unterwellenborn has been a traditional location for iron and steel production in Thüringen since 1872. At the heart of the Maxhütte industrial region, Steel Mill Thüringen produces steel girders in accordance with national and international standards. in 1992, the ARBED group acquired the core divisions of Maxhütte. Steel Mill Thüringen GmbH was founded on the 1st of July, 1992. At the same time, comprehensive modernization of the the steel producing facilities in Unterwellenborn was begun. The new electric steel mill with continuous strand casting was started up in February 1995. €112 million were invested in the electric steel mill with continuous strand casting, and in the necessary peripheral systems such as a scrap yard, electrical power supply and infrastructure. Steel Mill Thüringen GmbH has been owned by the Alfonso Gallardo Group since January 2007, Spain’s largest producer of structural steel with approximately 3000 employees, and an important European importer of steel shapes.

The Electric Arc Furnace

Scrap is the primary raw material for the electric arc furnace. The oven is fed with two baskets of scrap for each heat, from which it generates 120 tons of liquid crude steel in roughly 50 minutes. It functions in accordance with the DC electric arc oven principle. An electric arc is generated between a graphite electrode with a diameter of 750 mm and the floor of the oven which serves as an anode, and the resulting energy melts the scrap. The energy from six natural gas / oxygen burners is utilized as well. Installed electrical power for oven operation amounting to 120 MVA (megavolt amperes) corresponds roughly to the electrical power demand for a city with a population of 120,000. Upon completion of the heat, crude steel at a temperature of 1600 degrees Celsius is tapped off from the casting ladle located underneath the oven. Further metallurgical processing of the steel begins here as well.

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