

CASE STUDY

Energy efficiency program at a European mega steel plant: reducing electricity cost by ~13% p.a.



SITUATION

An integrated mega steel plant (11.5 million tons of output p.a.) had a rather poor electricity consumption performance following a lack of attention over the years.

APPROACH

A team of Steel Hub experts and plant management staff compiled a centralized catalogue of electricity consumption reduction initiatives. Mapping their technical impacts to financial impacts allowed a cost-benefit analysis across initiatives and their prioritization. Plant management decision-taking was moved from operator to plant management level to organize the leadership of the reduction program centrally.

RESULTS

The project made plant electricity consumption drop from 541 to 499 MW p.a. In financial terms, electricity cost was reduced from 280 to 244 million € p.a., or -13%.

STEEL HUB SERVICE PORTFOLIO

STEEL ADVISORY

- Process Intelligence
- Product Range Expansion
- Operational CAPEX Support

PERFORMANCE IMPROVEMENT

- Performance Diagnostics
- Production Process Optimisation
- Defects Troubleshooting and Solutions
- Change Management for Operational Transformation

DUE DILIGENCE

- Operational Due Diligence
- Commercial Due Diligence

Situation

The integrated steel plant we served is one of the largest plants in the EU. At the beginning of our work, its output reached 11.5 million tons p.a. Products manufactured included high-quality pipes required for submarine high pressure gas transport and used by world-leading automotive companies such as BMW, FIAT and SEAT. The plant created an operating profit of 0.7 billion € from ~5 billion € in revenues, or an operating margin of ~14%.

For several years, the plant had had a strong focus on expanding production through large capex investments. At the same time, the energy efficiency of the plant received only limited attention. Energy consumption was perceived as fixed cost by plant management, and initiatives to reduce it were not organized centrally, but carried out autonomously by operators deciding on a case-by-case basis.

Electricity consumption especially posed a problem, which cost item ranked second among all cost items (only behind raw material cost). Prior to the resource management optimization program, the plant consumed 541 MWh p.a.

Approach

A joint team was set up composed by both client and Steel Hub experts. From the client side, the project was supported by the former plant director, the head of the electric steel plant workshop and the head of the accounting control unit. It was vital that the project was backed by the Board, authorizing the team to analyze any area of potential electricity waste.

The project was broadly organized in three phases:

1. Initial review

Steel Hub experts started the joint effort by compiling plant data and examining the different plant areas for the collection of additional data. It turned out that sometimes electricity consumption data were not accurate due to wrong internal assignment. During interviews with both plant managers and operators, existing electricity consumption reduction initiatives were reviewed.

2. Analysis

In the following, information gained from data and interviews were analyzed by Steel Hub experts. Improvement initiatives were divided into two categories: operations management initiatives that mostly targeted at more efficient handling of operations by the operators, and design initiatives that required capex investment into plant equipment and/or layout. A major milestone was reached by translating the reduction impacts from technical terms into financial impact; this allowed a cost-benefit analysis across initiatives and a prioritization of the various measures on the table.

Implementation

The cost-benefit analysis with potential electricity consumption reduction measures was presented to the project Steering Committee as well as Plant Area Managers to decide on the initial set of improvement measures to be implemented. These included (non-exhaustive):

Operations management initiatives

- Upgrade and retrofit electricity consumption monitoring systems
- Run staff awareness campaigns on electricity consumption
- Conduct staff training programs on implementation of electricity savings measures
- Install a plant electricity consumption dashboard monitored by the plant management
- Enable live monitoring of electricity consumption, with immediate reporting of outliers and an alert system

Total electricity savings attributable to operations management initiatives: ~9-18 MW

Process design initiatives

- Installed inverters on large motors (air suction in steel mills and sinter plant). Attributable electricity savings: ~10 MW
- Optimized the production of oxygen and blast furnace blowers, by initiatives that allowed the shutdown of some machines and a higher flexibility of operations owing to piping modifications and the introduction of valves that allowed more flexibility of operations. Attributable electricity savings: ~5 MW
- Introduced inverters for a large number of medium-sized motors serving modulating machines (mainly pumps and fans). Attributable electricity savings: 5-10 MW (100-50 kW savings per motor implies that 50-200 motors were successfully modified) Install a plant electricity consumption dashboard monitored by the plant management
- Optimized the production and consumption of compressed air, with research into leaks, rationalization of the network, and monitoring of consumption patterns (interception of the network when the plant is stationary), and replacement of fixed-speed compressors with modulating machines. Attributable electricity savings: 3-5 MW
- Replaced old mercury and metal halide lamps, especially for outdoor use and introduce lighting control systems (twilight, timer, etc.). Attributable electricity savings: 1-3 MW (200 W savings per lamp is equivalent to 5000-15.000 lamps)

Total electricity savings attributable to operations management initiatives: ~9-18 MW

Results

Following the implementation and after about a year, most of both operations management and design initiatives were coming into effect. The project made plant electricity consumption drop from 541 to 499 MW p.a., or by -8%. The most significant savings could be generated in the pig iron, steel shop and services areas. In financial terms, electricity cost were reduced by 36 million € from 280 to 244 million € p.a., or by -13%. This implied an increase of operating profit from 14 to 14.7% in this well-established European plant.

The program was considered to be one of the most effective projects delivered in the last few years. The success of the project was owed mainly to the approach that integrated technical expertise with strict management control procedures. A further key success factor was frequent communication with the plant management.

