

Case Study



Automating furnace operations for an Aluminum major to save energy & reduce losses

Overview

'The client' is a leading aluminum manufacturer involved in mining, refining, smelting, fabricating and recycling of aluminum. It serves varied industries like Aerospace, Automotive, Packaging, and brings with it design, engineering, production and other capabilities. It wanted to automate its melting furnace operations to help reduce energy consumption, minimize wastage, improve the quality of its products and cut costs. It therefore sought the help of Infosys to implement an industrial automation solution that would streamline its ingot operations and lay the foundation for implementation of industry best practices across manufacturing functions.

Business Need

The primary business objective of „the client’ was to increase the efficiency of its furnace operations by automating it thereby reducing human error, reduce energy usage, decrease melt loss and improve the quality of ingot. Apart from creating new improved systems and processes, the initiative aimed to develop software solutions that would enable knowledge capture and process optimization.

The Challenges

Like other traditional manufacturing organizations, „the client’ was facing a number of technology and business challenges. The lack of integrated process control and automation ingot operations was resulting in wasted energy, loss of molten metal and sub-optimized throughput. These presented opportunities to improve margins and reduce operating costs. ‘The client’ by virtue of its legacy, had a huge repository of knowledge embedded within its people although their experience with application of new technologies like WSN was limited. They also had limited infrastructure for implementation of this knowledge in melting furnaces through process control..

What did Infosys do?

Besides its technical expertise in implementing plant automation solutions, Infosys brought with it an in-depth knowledge and experience in process automation. This helped in understanding and clearly defining the business issues that had to be resolved.

Among the functional areas that needed improvement, Infosys identified about 12 key aspects including furnace content weight, temperature control, degasser control, and melt homogeneity among others. The areas representing the melting process were chosen as they led to a high RoI for the organization. The solution implementation started with a combination of plant automation, systematic business processes, knowledge management and technology application. Keeping in view the company’s immediate and future needs, the project was implemented in a systematic manner through stages of observation, assessment, recommendation and customization.

Phase 1 Business Case Development

During the first phase, Infosys conducted an in-depth study of the company’s Ingot Casting Process. During this process, Infosys thoroughly documented the existing manufacturing process and identified several areas of opportunity. A business case was developed during this phase for all potential opportunities.

Assessment & Observation

Infosys and ‘the client’ assessed the Ingot Casting Operations and came up with the following observations:

- 50% cost of ingot casting is attributed to melting operations.
- Waste in the melting process compounds downstream.
- Variability in practice execution adds cost to the manufacturing chain down stream.
- Deploying control architecture will improve consistency and eliminate waste.
- Furnace operations being highly energy intensive had maximum scope for improvement.

Recommendation

Following recommendations were made for improvement:

- Enforce adherence to best practices by instrumentation and measurement.
- Time, Temperature, Transformation are the key features to be controlled.
- Explore scientific approach based control schemes for ingot casting.
- Process Information Systems (PIS) concepts to be deployed for line balancing and plant balancing.
- Set high operational benchmarks and monitor cast house performance through PIS.

Phase 2 Implementation

As part of the pilot implementation, Infosys designed and developed a *SCADA-based solution to automate the melting furnace operations. One of the main drawbacks of the existing setup was that the weight of charge put into the furnace was not measured. Since the actual charge weight was not known, the calculation of amount of energy and time spent on heating the charge was based on guesswork. This led to unnecessary wastage of energy and overheating of metal due to excessive burner operation. Infosys worked with 'the client' and its third-party vendor to integrate a forklift mounted real-time weight measurement system that used WSN technology to feed the charge weight into the control system. Visual signal displays were developed for forklift operators to indicate loading completion based on furnace capacity. The system was also designed to measure several parameters like gas flow to the burner, flue gas temperature, bath temperature etc.

*SCADA: Supervisory Control and Data Acquisition (SCADA) is a system that allows an operator at a master facility that co-ordinates processes among various remote sites.

A properly designed SCADA system saves time and money by eliminating the need for service personnel to visit each site for inspection, data collection/logging or make adjustments. Real-time monitoring, system modifications, troubleshooting, increased equipment life, automatic report generating. These are just few of the benefits that come with SCADA system.

The SCADA system incorporated algorithms that 'the client' had developed based on experience to compensate for complexities like melt-temperature variation etc. Based on the charge weight and other input parameters, the SCADA system could accurately calculate melting cycle time and provide appropriate burner control set-points for improved temperature control.

The system was developed in a standardized manner, which would enable 'the client' to deploy the solution to all its melting furnaces rapidly without major infrastructure changes. Significant emphasis was laid on measurements and performance monitoring, with provision for first-level optimization and line balancing. Recommendations for improvement of the existing PLC burner control logic were also made to improve operational efficiency. The solution covered all the critical areas in the manufacturing process that needed focus: Energy optimization, labor cost reduction, quality enhancement, recovery improvement and EHS compliance. Automation of key manufacturing and business functions facilitated documentation and knowledge transfer by enabling the capture of knowledge within the control systems. Apart from implementing the existing proven technologies and industry best practices, integration of new technologies such as WSN with the client and its third party vendor enabled rapid deployment and completion.

Key Benefits

The first phase of the initiative has already been implemented and a number of business benefits are already in sight:

Financial

Automation of furnace operations is expected to show significant ongoing savings. With a large number of furnaces (100+), the company hopes to save millions of dollars as the solution gets implemented across all units. The investment is expected to pay back in around eighteen months.

Energy conservation

Keeping in sync with its "go green" approach, the solution significantly reduces energy consumption. Reduction in burner operations reduces stack emissions.

Productivity & Quality

Visual signaling and running timers reduce overall cycle time. The implementation of industry best practices and business processes will lead to consistency in processes.

Knowledge Management

The documentation and capture of process knowledge within the control systems will create a knowledge repository for 'the client'.

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Reputation Institute's Global Reputation Pulse 2009 ranked Infosys among the world's top 50 most respected companies.



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For more information, contact askus@infosys.com
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