ITC INFOTECH
Business-friendly Solutions

Data Analytics Unlocks Substantial Energy Savings for a Leading Carbon Black Manufacturer

SITUATION

Energy costs accounted for a significant fifteen percent of the industry's operational expenditure and increased market competition implied squeezing of profit margins. Of all the cost heads, the company's management found getting a grip on energy costs to be a challenge. The existing automation/control and ERP solutions aided in smoother operations but did not help in solving the big energy efficiency puzzle. The liability for non-compliance to future emission caps or efficiency regulations was also a concern.

IMPACT

Decision making on energy cost control was hampered due to lack of real-time analysis, absence of information on financial implications due to energy loss and incoherent reporting mechanisms. This led to lower revenues due to lower sale of waste gas power, higher auxiliary power consumption costs, no pre-emptive diagnostic analysis, poor maintenance and spares planning and inconsistent equipment uptime.

RESOLUTION

ITC Infotech deployed a customized real-time intelligent and dynamic Energy Analytics Dashboard software for the unit. Optimized benchmarks were developed by applying advanced statistical tools to historic data. The reporting of Opportunity Costs due to energy losses helped in meaningful understanding for the top management. Secured cloud based infrastructure and mobility solutions through smartphones provided information access on the go and overall greater accountability.

The Customer

The customer is a leading carbon black manufacturing multinational company. Headquartered in Houston, Texas, U.S.A, it has six production facilities all over the world and manufactures furnace-grade carbon black material.

Carbon Black is an engineered carbon that is primarily used as reinforcing filler in rubber compounding. The input for manufacturing carbon black is coal tar and fuel oil and the end product is largely consumed by tire, automotive and manufacturing industries.

The carbon black manufacturing unit at the customer's India facility was experiencing a modest growth in sales. However, increased market competition necessitated reining in of costs to protect profit margins. Energy sources, comprising mainly fuel oil, accounted for a significant 15 percent of total costs. The management strongly believed that its waste gas based 15 MW power plant could generate and sell more power thus reducing overall plant energy costs. However, varying production grades and process conditions, obscure technical reasons of line staff and desegregated data meant that the under performance of power plant continued over time.

The Need

At the plant, the equipment supplier's Distributed Control System (DCS) aided only in automation/control for smoother operations, whereas the ERP IT system addressed purchase and inventory issues. There was no intelligent system that solved the big energy efficiency puzzle. Tons of data was being collected but only superficially monitored on a daily/monthly basis, and with no precise accountability. The plant personnel were busy engaged in 24/7 running of the unit and efficiency evaluation was regarded as technically complex and laborious, and hence side-lined. At the same time, the management also realized that Detailed Energy Audit is a one-time effort, as process conditions keep changing for different carbon black grades.

As each manufacturing plant is slightly unique in configuration and the raw material types used, benchmarking against external competitors was also found as an incorrect yardstick. Lastly, such energy intensive plants were increasingly coming under energy efficiency targets and emission caps and needed to prepare for stricter regulations.

Challenges

Business Challenges:

- Plant efficiency optimization
- Maximizing asset performance
- Real-time financial implication of energy losses
- Energy flow tracking
- Identifying underperforming areas for quick action
- Better maintenance and spares planning

System Challenges:

- Existing IT applications of DCS were operations specific, had legacy challenges and were not modified to suit latest MIS needs on energy efficiency analysis.
- Conventional spreadsheet (Excel) based analysis had limitations such as being non-interactive and considerable time and effort was required each time to generate prompt reports for different functional heads

Illustrative

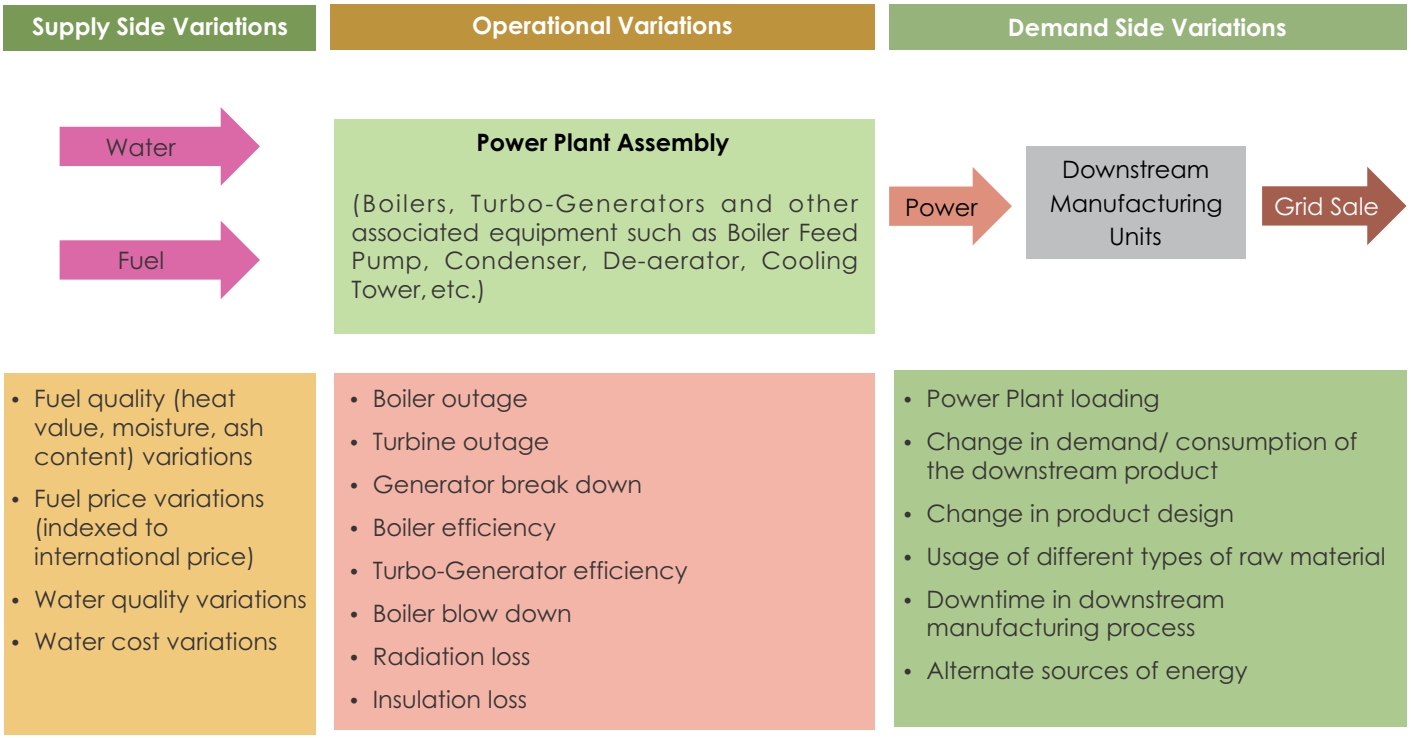

Fig. 1: Typical factors affecting power plant performance

The Solution

ITC Infotech deployed a customized, real-time Energy Analytics IT solution that analyzed efficiency parameters for different process conditions (for example, gas availability, calorific value, etc.). Data from DCS and daily reports was used to compute energy efficiency using heat and mass balance as well as U.S. Department of Energy (DOE) and ISO50001 guidelines. Benchmarks were created by applying advanced statistical tools for shift-wise historical data of five years. These benchmarks were projected in the form of "efficiency bands", which mapped a variable such as gas availability to plant efficiency; this helped understand the gap in plant performance at any point in time. This gap was the "opportunity cost" (i.e. hidden revenue potential) to the firm as a result of lower energy sales. The cause-effect pattern analysis for select critical variables was assessed and optimized energy efficiency bands for 15 different process combinations were computed. The shortfall in power generation due to difference between actual and optimized values and the resulting financial loss, i.e. the opportunity costs, was computed in real-time. The monetary loss identified by this exercise was an eye-opener for the top management.

Armed with this interactive and predictive analytics tool, the management was able to continuously supervise operations closely, find where the problems could lie, greatly improvise maintenance practices and even easily decide for retrofits/upgrades. These measures helped in arresting the deteriorating plant performance-all with minimum/no capex investment.

Application

The above solution can be offered across energy-intensive sectors such as cement, steel, aluminium, oil and gas, pulp and paper and power. As each manufacturing plant's configuration is unique with its own distinctive mass and energy flows, customized Energy Analytics Dashboard solutions can be offered.

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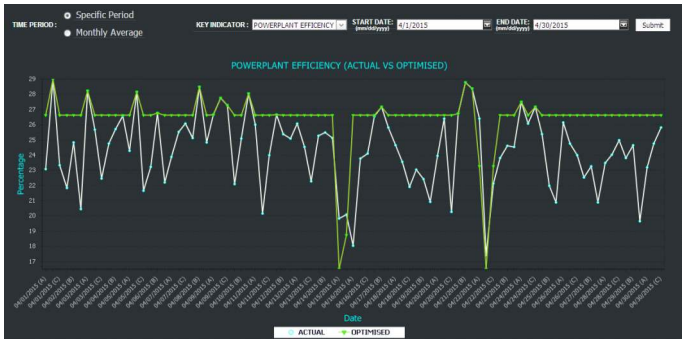

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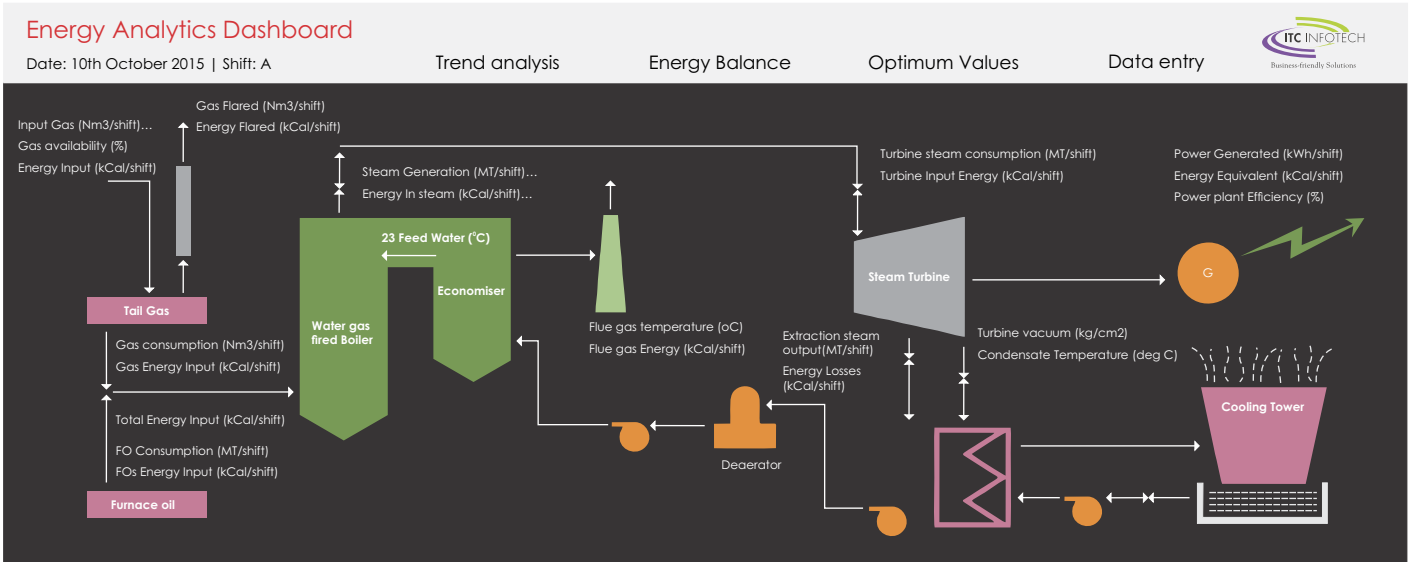

	Key Indicators for the shift	Units	Actual Value	Optimised Value	Remarks	
	Average Turbine Load	MW	6.5	-		
	Tail Gas Availability	%	95	-		
	Boiler Efficiency	%	82	85		
	Turbine – generator Efficiency	%	20	24		
	Overall Power Plant Efficiency	%	22	28		
	Power Generated	kWh/shift	60,000	-		
	Shortfall in electricity generation	kWh/shift	15000			
	Opportunity cost	$ /shift	1050			

Fig. 2: Dashboard for power plant

Business Benefits

- Helped achieve substantial additional revenue by sale of power by operating closer to the optimum efficiency levels. This amounted to monetary benefit of around 200,000 USD/year
- The improvement measures were undertaken with minimum/no capital investment; and only by close monitoring, analyzing existing data and quicker corrective actions
- Major savings identified through this exercise were poor turbine condenser and cooling tower performance, fluctuating excess air levels in boiler, intermittent gas (fuel) flaring and lower economizer performance. Special attention was paid to these areas subsequently.
- Comparison with optimized energy efficiency bands helped provide clarity as to where the performance stood, irrespective of the wide variability in process conditions
- The tool is similar to getting an Energy Audit result every shift
- The power plant team is now held more accountable for their operational performance resulting in better equipment maintenance, instrumentation and closer monitoring
- Cloud based infrastructure and secured mobility solutions (on user smartphones) was provided for 24/7 information access on the go. Remote real-time access greatly improved overall accountability
- Carbon emissions reductions (~ 3000 tons of CO2 equivalent /year) in the grid were achieved
- An appropriate mix of big data, analytics, cloud, IT and energy expertise helped convert complex datasets into meaningful and quick actionable decisions

About ITC Infotech Business Consulting Group

The Business Consulting Group (BCG) at ITC Infotech is a converging point for business & IT solutions. We aim to transform business performance, bringing a strategic perspective on process improvement and IT enablement. Our team blends domain experts and consultants, bringing unique capabilities to discover and resolve business concerns of the day.

Our expertise spans Consumer Goods, Retail, Process Industry, Logistics & Transportation, across key business functions such as product development, production, supply chain management, sales and marketing management, field force management, and customer relationship management.

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