

AspenTech's Integrated Solutions for Energy Management and Asset Optimization at BPCL's Mumbai Refinery



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CATEGORY: PROJECT SUCCESS STORY

About the Client: Bharat Petroleum Mumbai Refinery (BPCL-MR) is in Mahul, India and has the capacity to process 12 million metric tons of crude oil per year. At present, the refinery is undergoing configuration changes to comply with 2017 Auto fuel Policy mandate for motor spirit (MS) and high-speed diesel. The refinery has processed 76 different types of crude in five decades of its operations, making it one of the most flexible refineries in the country; it also complies to various global standards (quality, environment etc.) and was one of the first refineries to have got accredited with ISO 50001 (Energy Management System) in 2014.

The Backdrop: Oil refining is an energy-intensive activity, accounting for a major portion of all the energy consumed by the entire oil and gas industry. In a world that has become increasingly environment-conscious it is necessary to reduce the energy intensity of a process or activity so that less energy is utilized to achieve the same result. In line with global expectations, India has enforced strict regulations for all refining companies to reduce energy and water consumption.

Energy is often the single largest operating expense after raw materials for refining and petrochemicals, frequently starting out at over 50 percent of operating costs prior to energy reduction programs. Managing and optimizing these energy costs are critical capabilities for a refinery to meet profitability and sustainability targets. At the same time, companies need to improve and streamline the way they source, trade and use energy in an increasingly unpredictable market, a fallout of: energy price volatility, increasing refining complexity, the liberalization of world energy markets, emission taxes, and carbon trading.

The Challenge: The challenge BPCL-MR faces is to operate the utilities system with minimum cost and maximum reliability, while taking into consideration the constantly changing environmental, organizational, and technical constraints. Changing the configuration of the refinery requires additional power and steam from the existing utilities system, which poses increasing challenges in day-to-day utilities planning. These involve everyday decisions, such as how to optimize fuel mix; how much power to import from the open grid; how to view steam balance and reconciliation in real time etc. In addition, there are more stringent emission regulations, as well as complex power supply and tariff arrangements, all of which influence utility choices. The change in configurations also places increasing pressure on the overall utilities and refinery operating margins.



To address these challenges and achieve optimal optimization, BPCL-MR were looking for a tool/solution that could model the complexity of the utility supply, pricing, and constraints. After evaluating the available options in the market, they chose AspenTech to deploy a powerful model-based decision support system for utilities planning and optimization.

The Solution: AspenTech addressed the utility problem through an integrated combination of several of the company's innovative energy management and asset optimization software solutions:

- Aspen Utilities Planner was used for supply-side utilities modeling, reconciliation and optimization, based on linear programming methods
- Aspen OnLine was used for the real-time online deployment of such models, automating the sequencing of data reconciliation and model runs
- Aspen InfoPlus.21, a real time "process historian" plant database, was used for Big Data storage and retrieval, and to scale and support modeling and analytics
- Aspen Process Explorer was used for web-based visualization of model and data key performance indicators (KPIs) useful for decision-makers, engineers, and operators

The project was started in March 2016 and in January 2017, the system went live and was implemented as part of the refinery's daily business process. Designed to run both online and offline, the application facilitates the optimization of power plant operations and steam, heat and electric power utilization across the site, and energy purchasing decisions. At any given time, depending on the energy pricing of each source and its availability and the demands of each equipment, the most efficient operating choice is made.

Tangible Benefits: The twin goals of minimum cost and maximum reliability in operating the utilities system was achieved simultaneously with the implementation of an integrated energy management and asset optimization system, linking both business and operational objectives. For example, in terms of money - a shift to steam load from boilers to HRSGs (heat recovery steam generators) by 300 metric tons per day, resulted in savings of \$2030 (the approximate equivalent of 132,000 rupees) per day in low-sulfur heavy stock fuel.

There are several other significant benefits from implementation of AUP online system at BPCL-MR:

- Actionable recommendations to plant operators on how to reduce cost
- Reduced steam venting minimizes let downs from high pressure to medium pressure to low pressure
- KPI reporting in terms of energy management statement or operational KPIs
- Operational optimization

A copy of the online model is used in offline mode to run "what if" scenarios for any shutdown and configuration related decision support. This is facilitated through custom-designed Excel templates that interface with the AUP model. A few additional benefits of the offline mode include:

- Planning utility production based on forecasted process demands
- Evaluating the impact on utility cost when production rates change
- Evaluating new contracts for utilities
- Evaluating optimum equipment usage during abnormal operation

BPCL is now looking at deploying this effective solution in their other refineries. This has emerged as a success model for other refiners to emulate.

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