Blend in the Bituminous

A dream to light up homes and industries in five states was realised with the successful commissioning of the Mundra super critical power plant by Tata Power through its subsidiary Coastal Gujarat Power Limited. At a capex of USD four billion, a workforce of 12,000 personnel dedicated their lives for about six years in commissioning the plant.

Tata Consulting Engineers were part of this Greenfield project as pre-project, design engineering consultants and construction supervisors. The project was well-planned and the pride of everyone involved with it. Built on impeccable environmental standards, high grade bituminous coal was planned to be used as feedstock. Large utility boilers are designed for specific type of fuel to perform safely and optimally. The Mundra power plant’s boilers are designed for high calorific value bituminous coal. A ‘made-for-each other combination of good quality coal & boiler is necessary to minimize the impact on the environment. Coal, the feedstock for coal fired thermal plants, makes up for 70% of power generation cost. The Mundra power plant’s backend integration was planned with imported coal from Indonesia. TCE’s client, Tata Power invested in two coal mines in Indonesia for securing supply of bituminous coal suited to the boiler.

With backend integration of imported coal, the Mundra plant was among the world’s top 100 infrastructure projects. Here was a logical solution to India’s infrastructure woes; good quality coal married to designer boilers and a backend integration plan fit in perfectly. Can anything go wrong?

Just about everything, it turns out! A slight of hand and twist of reputation, the key feedstock which is imported coal become dearer. The odds were completely tilted. The Mundra plant faced 93% increase in price of imported coal at agreed power tariffs. Loss to operations of the plant was estimated at Rs 1000 crores. The very viability of a world class power plant was at stake.

A 4000 MW power plant requiring 12 million tonnes of imported coal was brought on track with a process innovation that successfully blended alternative coal with the design coal. This disruptive process innovation which Tata Consulting Engineers were part of, changes the way feedstock is managed in the generation of power and the optimization of equipment such as utility boilers.
The answer lay in the blending of coal. High grade coal and low grade coal blended efficiently will help minimize production cost. In yet another twist to the tale, studies revealed the blending of low grade coal will be limited to 30% only to ensure current boiler efficiency. The problem was narrowed down further. Optimisation of the production lay in the blending of coal. Engineers at Tata Consulting Engineers set to work. It was a toil for two years that would soon bear fruit. Through studies, trials and experimentation, a process innovation was born. 70% of low calorific coal was successfully blended with 30% of high calorific bituminous coal. A lower percentage of high grade design coal blended in with a particular category of low cost coal was now possible. This was indeed a breakthrough process innovation that would change the way coal-fired power plants operate. Tata Consulting Engineers were proud participants in this innovation working with Tata Power and the OEM supplier.

In the final analysis, an overall capex expenditure of Rs 2500 crores for coal drying and boiler retrofitting was avoided. There was a 28% reduction in fuel cost for every unit of power generated. Further research on the breakthrough solution revealed that 85% of cheaper coal blending was possible with favorable environmental standards. This blending success throws up a plethora of new opportunities –

- Production process can be managed in a flexible and non-invasive way with alternative coal types for cost optimisation.
- The technique to efficiently manage coal blends considerably reduces the risks in securing fuel sources and securing and blending various coal types is now a reality.

Tata Consulting Engineers and Team Mundra have added a new page to the history of power generation in India and abroad. We are all proud of our association with this project under the able guidance and support which made this feat possible.

Sharad Baijal
Head - Operations & Maintenance,
Coastal Gujarat Power Ltd. (Site),
4000 MW UMP Project

The team at Tata Consulting Engineers worked with their client to tackle this problem. The answer to every problem lies hidden in the problem itself. The team revisited the problem and looked for answers within the problem.

- How do we minimize losses?
- How do we optimize production with cheaper coal?

The available options:

**Option 1:** Replacing the design coal with cheaper coal. Cheaper coal had lower calorific value and higher moisture content. This implied lower performance and efficiency levels. Boiler and auxiliaries' performance will be impacted, energy consumption would be higher and there would be loss in power generation. Loss of Availability: Frequent failures in Boiler & Auxiliaries. The impact on the environment would also be higher.

**Option 2:** Retrofitting boiler to suit coal type implied huge equipment costs.

**Option 3:** Incurring cost on coal drying.

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Tata Consulting Engineers & Tata Power won several awards and recognition at national and global forums for this project. The most recent was the Tata Innovista 2013 recognition for ‘Promising Innovation’.

Engineering feats can be quite as interesting as pot boiler thrillers. The world’s largest Greenfield thermal power plant doesn’t get built in a jiffy. It is a dramatic play of events and technology with Tata Consulting Engineers as key characters.

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