

GSFC Case Study

Decision Support System (DSS) evaluates the economy of operations with respect to energy and product costs in the fertilizer complex for its various processing plants.

Introduction:

Gujarat State Fertilizers & Chemicals (GSFC) Ltd. is a petrochemical and fertilizer products manufacturing company with annual turnover of Rs. 2000 crore. The product range comprises different types of fertilizers such as urea, AS, DAP, APS, and other products such as Nylon-6 and its grades), Liquid Ammonia, Caprolactam, MEK Oxime, Sulphuric, Phosphoric acid, Melamine, and so on.

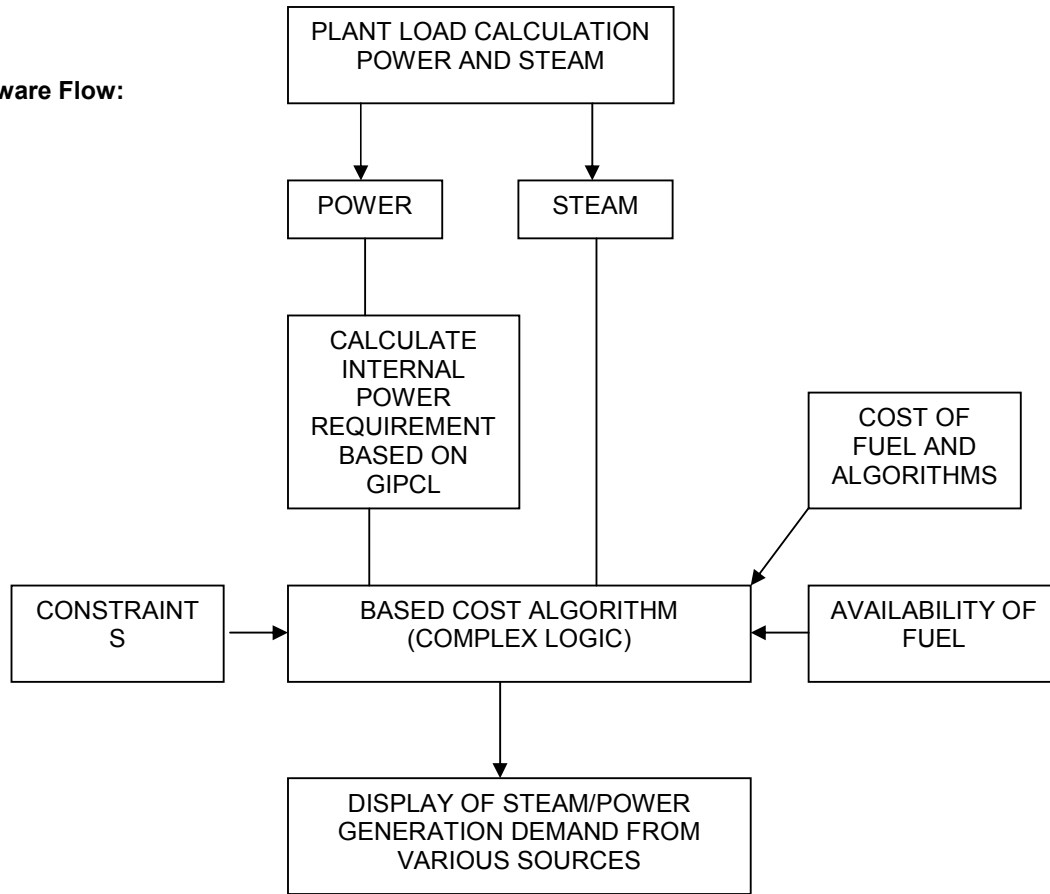
GSFC requires a large amount of energy in the form of steam and power for its process plant operations. The total steam requirement at its Vadodara unit is around 160 T/Hr. Besides generating electricity in-house, the company has also tied up with Gujarat Electricity Board (GEB) and Gujarat Industrial Power Company Ltd. (GIPCL) for sourcing electricity.

To meet the energy needs of the various plants, GSFC has an integrated network of steam supply and electric power grid parallel to the GEB grid. Presently, the quantum of steam and power to be generated by the different plants is decided based on the power available from GIPCL, which is the cheaper source of electricity. Accordingly, the internal generation is increased or decreased. The company now proposes to optimize the cost of energy and products by implementing a state-of-the-art energy/product cost model. This model would enable the operations personnel to determine:

- The best combination of generation levels of steam and power from its different available sources
- The combination of feedstock for ammonia production
- The cost of different fuels
- The level of generation of energy as a by-product from the processing plants
- The share of power from GIPCL
- The minimum practicable generation level from the sources
- The efficiency of the power and steam generation plants at different loads

This is expected to enhance the economy of operations in terms of energy and product costs.

Software Flow:



DSS Outline:

The proposed application is browser-based, semi-offline, multi-user, and password authorization-enabled. It resides on the server.

When the user activates the application, the front-end interface provides a summary of the previous day's operation of all plants. This summary includes variable cost details, GIPCL power summary, fuel/feedstock consumption, and asking rate summary with present load conditions. The user can examine the present operation in terms of cost alternatives or can intervene by entering such data as new plant loads, GIPCL power availability, estimated asking rate of generation, gas availability, and so on. The package works out three best options to satisfy the steam and power requirements with respect to cost implications and fuel/feedstock consumption. The simulation mode enables the user to examine future plant operations over a specified period. In this mode, the user enters the desired plant loads, GIPCL power, fuel and feedstock combination, and so on. The power drawn from GIPCL and consumed by GSFC is summed up for all previous days to calculate the future asking rate based on the day's availability and the remaining days' operation. There could be a condition, though remote, when GSFC is required to source power from GEB due to unforeseen outages of internal generation or outages at GIPCL. In this case, DSS recommends the minimum quantity of GEB energy to be drawn for the economy of operation. This is critical because the tariff structure imposes 20% electricity duty on the maximum demand charges (a fixed charge paid monthly to GEB irrespective of the energy drawn) whenever GSFC draws power from GEB. Otherwise, the duty is not levied on the maximum demand charges. DSS also allows the user to work out these details based on the dates specified by the user. The user can create his folder and save such exercises in the folder for the running month. The user can also print the generated reports or send them through e-mail to the desired recipients. When the application runs and finds missing data, it sends an e-mail message to the concerned head.

IASYS domain expertise to be used for this project:

1. Understanding of power plant operation
2. Understanding of steam generation
3. Understanding of the present energy cost model
4. Knowledge of plant/process modeling
5. Experience of decision-making software design and development based on the dynamic constraint and rule-based model
6. Understanding of plant distributed control systems