

COAL MINING COMPANY RUN THE PLANT FOR A FEW YEARS, THEN BUILD IT

This illustrates how a Knowledge Base can be used. The material is drawn from a number of sources.

BACKGROUND

A large petrochemical complex produces fuel from coal.

Most of the coal - the primary raw material used by the company - is sourced from five mines located close to the company's fuel plants. At one of these mines coal reserves of export quality were discovered.

An extensive feasibility study was conducted, following which the company decided to export three million tons per year.

Exporting coal was a major new business for the company. It required a number of major coal processing activities that the company had not been involved in previously.

The company set about building, from scratch, a complete coal handling system and beneficiation plant without disturbing coal supply to the fuel factories.

OBJECTIVES

A knowledge based system was created to run and test the plant as a virtual business, with the expertise and information flowing from initial design through to operations of the new plant.

KEY RESULTS

In a period of three months, the company's project team were able to test over 300 different business and process scenarios.

- The team was able to identify the most effective operating and management philosophies, the optimal equipment specifications, and the most suitable suppliers.
- Advanced training was provided for the new workforce in a simulated environment that was virtually identical to real operating conditions.
- The plant control system was tested in a non-destructive environment, shortening the commissioning time.



The risks associated with a project of this scale and complexity are enormous. Especially when undertaken by a company for the first time. In addition many aspects were an unknown quantity. The plant was required to run 24 hours a day, every day of the week. Yet the supply and demand of coal to the plant was predicted to be irregular and the characteristics of the coal were poorly known.

It was critical to trial the systems and ensure they could cope with a variety of conditions and still enable the plant to operate as a successful and profitable business.

To deal with the myriad facets of designing and constructing the new plant and systems the company established a project team, comprising its own people as well as several external consultants. All together about ten groups.

The team brought together people with different roles and areas of expertise, and different approaches to areas of design, management and problem solving. This required comprehensive project management - not the least being how and where information would be stored, managed and presented.

Part of the task was to alert management to the information resources that could be made available to them. Not just in testing different options and configurations, but also in communication, decision making, training and ongoing management. As a result, a number of key objectives were set.

These included:

- Preserving the knowledge accumulated during the design, construction and commissioning of the plant.
- Ensuring that the numerous experts on site were able to understand each other's philosophies and specifications and focus on common goals.
- Optimising and validating the plant design, ensuring it would function as planned, meet requirements, and handle variations and oversupply.
- Testing the control system prior to installation on site, and hammering out the kinks before it was made operational.
- Establishing a realistic operator training system.

- Developing a computerised system to support management decision making.

BUILDING A VIRTUAL BUSINESS

Using the knowledge based system a virtual business was created encapsulating the design and operating philosophies of the entire project team.

That business was manipulated, modified, enhanced, accelerated to show results over long periods of time, and slowed to show results in real time. It was run both independently, and connected to other computer systems.

Over a three month period around 300 design permutations of the entire plant were built and tested.

ONE EXAMPLE: NO TRAIN, NO PAIN

There are many examples of situations that can have a significant and detrimental impact on the operations of the plant. Train service is typical.

It was decided to investigate the ramifications of the train service failing to operate for a week. We chose a peak production week. The result was, literally, a mountain of problems. The stockpile build up at the rail load-out station backlashed through the entire operation, causing damage that could easily have set the plant back six months.

As a result of this experiment, an emergency stockyard was built. Several months after the plant opened trains to the plant were halted due to a derailment. The emergency stockyard took the overload

and operations continued virtually unhampered. No environmental restrictions were violated.

SMOOTH OPERATOR

Training was much faster and smoother as operators were able to use real systems and procedures. This provided them with quick, non-destructive training and enhanced their performance and capabilities especially in problematic or dangerous situations. Additionally it provided them with an intimate appreciation of the characteristics and operation of the plant, and the impact of their activities down the line.

NEGOTIATING FROM STRENGTH

The company's management had the task of negotiating with a broad spectrum of suppliers and customers. In many cases they were negotiating with people they had not dealt with before and in areas where they had little experience.

The ability to understand and quantify the impact of every design change meant management were able to negotiate from strength. They knew precisely what the sensitivities were, which issues they could compromise on and where they needed to stand their ground.

CRYSTAL BALL

The knowledge base was integrated with the plant's business information system to provide management with short and long term planning and forecasting information.

This included an automatic hands-off system for easy, quick and accurate de-

termination of plant settings, evaluation of scenarios, information transfer, and determination of the plant's initial state for forecasting. And budgeting information for sales distribution, quality management, plant management and costing.

KNOWLEDGE BASED SYSTEMS (KBS)

KBS is a major leap forward from traditional business modelling systems.

Traditionally mathematical formulae are used to describe the components of a business - with limited scope. Change the business scenario and the formulae may no longer be valid.

KBS learns and understands the business in much the same way that people do. It can replicate the entire business, including human and operational subtleties within that business. It preserves the knowledge within the business's own computer systems, providing a maturing knowledge base on which to continually build.

That knowledge can be used to simulate any imagined business scenario, and to improve the planning and control of business processes.

Within a few weeks KBS can begin to provide management with previously unheard of decision making power. It can deliver immediate answers that may otherwise take a team of engineers many years to obtain.