PMI® Case Study

SAUDI ARAMCO HARADH GAS PROJECT:

2004 PMI Project of the Year

Saudi Arabia's growing economy needs energy to supply the domestic industry and the kingdom's national electric power generating plants. While oil is abundant, greater utilization of Saudi Arabia's natural gas resources for these domestic uses would release oil for export.

Background

In 2000, Saudi Arabia's total gas sales totaled 3.9 billion standard cubic feet per day (SCFD), but were forecast to grow to 8.6 billion SCFD by 2009. New production capacity was needed fast. In 1999, Saudi Aramco gave the green light for an estimated $2 billion investment in the Haradh Gas Project.

Challenges

Haradh would cover most of the eastern province of Saudi Arabia, and send gas to customers in central Saudi Arabia and the capital of Riyadh, 300 kilometers away. The site of the processing plant was barren desert, 180 kilometers from the nearest outpost of civilization, and 10 kilometers from the nearest road. Summer temperatures often reach 52 degrees Celsius.

The plant needed raw material: 87 gas wells would tap the resource from the desert, and 680 kilometers of pipeline would bring it to the plant from three different fields. Turning raw gas into a commercial product also requires high voltage electricity, which involved constructing substations and running hundreds of kilometers of lines out to the gas fields.

Perhaps most important, the plant needed people. A permanent city—a virtual oasis in the desert—would provide housing and recreation for the 1,000 employees and contractors. Due to its remote location, people and supplies would have to be airlifted, requiring construction of an 8,000-foot airstrip qualified to land a Boeing 737.

Finally, the processed gas and liquid hydrocarbons would reach the market via 395 kilometers of cross-country pipeline.

Solutions

Company executives cite the original contracting document, which defined the mix of contracts best suited to accomplish the project objectives, as a key to the project's success. When they received the award, each contractor developed a detailed execution plan describing in detail how they would integrate work under engineering, procurement and construction phases, and manage interfacing with other contractors.

Integrating the objectives of project management at the construction agency, and at the operations staff as the “owner” of the project, was the driving philosophy in selecting the project team. To avoid these conflicts, project engineers worked with plant operations and maintenance as a single team from the beginning through start-up.

With agreement on the teams, the project was fast-tracked from the outset. The Haradh Team chose to institute a “Zero Change Policy,” freezing the design process at three months before initiation. Schedules and costs began to fall, (all for the better) and kept falling through the project.

The project employed a Lump Sum Turn Key (LSTK) contracting package philosophy. LSTK gave tremendous autonomy to the individual contractors to achieve their objectives, and put tremendous responsibility on the project team to focus on the areas where the contractors’ work dovetailed into other contractors’ work. This led to concentration on preventing problems early, and developing or implementing work-around plans, if needed.

The detailed systems outlined in the LSTK contracts were used for scheduling, progress measurement, analysis and control, but were organized to fit Saudi Aramco’s code of accounts for monthly invoicing and reporting. These in-house controls created a high level of funding and expenditure control. Monthly cost and schedule reports were sent to lower level management and a summary was sent to the highest levels of management. Everyone was kept in the loop.

By successfully defining the scope of the project early, and then managing changes meticulously, costs were rigorously controlled and change orders amounted to less than 2 percent — unheard of in a $2 billion project.

Quality control worked as a technical support group rather than a “police force,” and a new Project Quality Index (PQI) measured contractor compliance. PQI became a competitive source of price among the contractors, and compliance blossomed from 80 percent in July 2001 to 90 percent by the fall, and 98.6 percent at the project’s end.

The Saudi Aramco Haradh project team was multi-disciplined and drawn primarily from Project Management and Operations organizations. The team cross-trained personnel, and used the project

to develop the company's rising stars.

Teamwork and partnering were fostered by a series of meetings at all levels within each company. Top-level buy-in was achieved as a result of five meetings around the world with the CEOs of the major contractors, who got an update on the project and addressed potential challenges long before they materialized in the field. CEOs were always cognizant of the state of the project, and how the performance of their company compared with the others and with program objectives.

This technique of regular meetings with the team, contractors and vendors cascaded down to weekly project team meetings, and up through the highest levels of Saudi Aramco.

With seven major contractors, Saudi Aramco identified a major risk if different equipment were to be used on site. The company established a Regulated Vendor List for a wide variety of equipment.

This had multiple benefits: the heat of the Saudi desert would destroy some equipment, so if the normal operating temperatures were exceeded, either environmental protection was added, or an alternative piece of equipment was selected. Another benefit was the economy of scale; many of the bidders needed the same equipment, and could buy it at a discount from the company's approved list.

The scope and scale of procurement for a project the size of Haradh became a global project unto itself. Internet and e-mail proved invaluable in reaching around the world for contractors and vendors. It was particularly crucial in controlling vendor inspections for 400 shops around the world

The Results

Saudi Aramco engaged the best in project management knowledge and practices to complete the $2 billion, three-year project six months before schedule and 27 percent under budget. Perhaps most amazing was that the company did all this in the desert, 180 kilometers from the nearest outpost of civilization, and all 12,000 construction workers from 36 different countries went home safely from the site.

The massive project had safety, quality, schedule and cost as its priorities from the outset, and delivered on every one.

The Haradh Gas Program was selected by the Construction Industry Institute as a model project for its 2003 annual conference, and was

chosen by the Project Management Institute as its 2004 Project of the Year.

Key Acheivements
Create a $2 billion facility to gather, process and distribute natural gas and its by-products to the domestic Saudi market. Haradh produces 1.6 billion SCFD (standard cubic feet) of natural gas and 170,000 barrels of hydrocarbon condensate per day. The facility also includes:

- Permanent housing for 1,000 employees in a virtual “oasis”
- An airstrip capable of handling a Boeing 737
- 755 kilometers or pipelines and related manifolds
- 310 kilometers of fiber optic network

Budget

$334 million, or 27 percent under budget

Time from project initiation to turn key operation

31 months, six months less than projected, creating an estimated $350 million in benefits from early completion

Safety Record:

Not one lost workday accident, a record for both Saudi Aramco and the Gulf Region

More Incredible Haradh Trivia

- 12,000 workers at the peak of construction
- 100,000 cubic meters of concrete
- 22,000 tons of structural steel
- 44,000 welded joints
- 4,300 kilometers of cabling
- 540 kilometers of plant pipeline
- 4,900,000 cubic feet of earthwork
- 330,000 square meters of paving