

Perfect Harmony

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» SmartPlant® Instrumentation enables nine global EPC contractors to harmonize their efforts at the SATORP Jubail Refinery

Saudi Aramco TOTAL Refining & Petrochemical Company (SATORP) is a joint venture between Saudi Aramco and TOTAL S.A. The joint venture was formed to process 400,000 barrels per day at the Jubail Refinery in the Eastern Province of Saudi Arabia. The plant will be a full conversion refinery and will process Arabian heavy crude.

Building one of the biggest refineries in the Middle East, second only to Ras Tanura in terms of project capacity in South Arabia, is an odyssey which can only be achieved by the contributions of some of the best experts in each engineering field. Nine EPCs from Japan, Korea, Singapore, India, Saudi Arabia and Europe have been commissioned to ensure the plant will run effortlessly and at full capacity by 2013.

The challenge of building a world-class refinery is only equal to that of coordinating the instrumentation engineering generated by nine different contractors. Measuring, recording and controlling all the different variables, such as flow, temperature, level or pressure in the pipes, was crucial to the success of the project. The scope of data collection and information sharing was colossal and called for an instrumentation database which could provide all of the instrumentation specifics in one package and could integrate well with other applications.

After an evaluation of its needs for data accuracy, the scope of data collection and information sharing, SATORP adopted Intergraph's SmartPlant Instrumentation as its Central Shared Instrumentation Database (CSIDB). SmartPlant Instrumentation will enable all of the EPCs working in the project to create and manage SATORP instrumentation documents and drawings. The system includes integrated modules for instrument indexes, datasheets, process data, preliminary instrument calculation, wiring, loop drawings, hook-ups, calibration and maintenance. In addition, the piping and instrumentation diagram (P&ID) – the “roadmap” of the plant – will be developed and managed by Intergraph's SmartPlant P&ID.

This refinery information is generated, accessed, shared and

modified throughout the plant life cycle. Therefore, it is critical that the P&ID is kept up-to-date, accurately reflecting the as-built plant, with a focus on the plant asset rather than the document representation. This system will be shared by all EPCs. Contractors support the overall project's instrumentation design, performed by their instrumentation teams. In addition to using SmartPlant Instrumentation, SATORP has also requested all EPCs to deliver documents and data in SmartPlant P&ID, SmartPlant Electrical, PDS® and SmartPlant Review formats.

Single point of access

The system provides a single source of instrumentation information that can be easily accessed and updated and ensures consistency across the different instrument tasks and deliverables. This eliminates the need to search for information in multiple locations.

“SmartPlant Instrumentation reduces risks by better managing and storing the history of the plant instrumentation and control system during construction, allowing the project to stick to its timeline and avoiding the extra costs attached to delays,” said Khaja Mukarramuddin, branch manager of Atheeb Intergraph. He was responsible for the deployment and functionality of SmartPlant Instrumentation for the SATORP project. “Interfaces with upstream and downstream applications are also ensured and the focus on data rather than documents facilitates a faster project execution.”

Engineering standards related to design rules and validation are more easily met when members of the team are kept on the same page. The smallest modification is available to everyone, regardless of their geographic location or work shift.

“The benefits of an optimal instrumentation database are visible very early in the project,” said Mukarramuddin. These benefits include:

- Simpler assembly of instrument construction and commissioning packages
- Smoother maintenance, calibration and ongoing engineering
- Up-to-date test status for planning and reporting



- Rapid input of as-built data
- Platform for safe, compliant startup and operations
- Access by all users to consistent, current information from a single source

Maximizing usability

The database system was deployed in 2009 and is now in full production. More than 300,000 instruments, 60,000 specifications, 80,000 loops, 40,000 process datasheets and 80,000 cables have already been designed in the system. The numbers keep growing until the design is complete.

The database is managed by the project controller, who ensures accessibility, maintains the templates and trains the users. Each EPC assigns a SmartPlant Instrumentation super-user, who is the focal point for SmartPlant Instrumentation-related issues and has an optimal knowledge of the database. The super-user effectively supports the instrumentation engineers and database administrators with system usability. Data ownership and the synchronization of data with the “as-built” refinery is guaranteed.

Once the project reaches a more operational stage, report generation and reporting processes will also benefit from a well-maintained instrument performance database. In addition, users can create multiple production scenarios and adjust the variables to any change the project may face during construction or during the first phases of operation.

High standards

Both Saudi Aramco and TOTAL are committed to being reliable and cost-efficient in their business, while conforming to the highest safety, environmental and quality standards. The SATORP project and its engineering instrumentation are designed to maximize project schedules by reducing unplanned expenses, field changes and unplanned shutdowns. Design rules are enforced by all EPCs and relationships between performance components are effectively managed by an integrated database.

With the core goals of being an environmentally friendly and efficient plant, Jubail Refinery will produce a high proportion of



white products (from the high or light end of the distillation process) such as diesel, gasoline, LPG, petrochemicals and jet fuels from low-cost heavy crude.

Future markets

Once the plant is operational and producing at cruising speed, the company estimates that the market for gasoline will stay in the Kingdom of Saudi Arabia or the Middle East in general. The refinery jet diesel will be exported to Asia and Europe, although it could stay in South Arabia. Paraxylene will mainly go to Asia. PET could potentially be manufactured in Jubail and in just a few years' time have one customer in the region. Benzene/propylene will be sold by SATORP to its neighbors. LPG will be exported to Asia and sulphur will be sold globally. Finally, petroleum coke will be exported to Asia and used in the Middle East and possibly in Saudi Arabia in the future. ■



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