PROJECT CASE STUDY

Automatic Tank De-Watering System — Saudi Aramco Abqaiq Plant

Location	Abqaiq, Kingdom of Saudi Arabia
End Client	Saudi Aramco
In Association With	Khatib & Alami
Duration	1 year
Role	Conceptual Design, Project Proposal, Detailed Engineering Design
Scope	Fully Automated Tank De-Watering System for petroleum storage tanks

PROJECT BACKGROUND

The Abqaiq Plant is the largest crude oil processing and stabilisation facility operated by Saudi Aramco, and one of the most strategically important pieces of energy infrastructure in the world. Within facilities of this scale, the routine de-watering of crude and product storage tanks is a recurring operational requirement: free water that accumulates at tank bottoms must be removed regularly to protect product quality, prevent internal corrosion, meet environmental discharge requirements, and prevent tank boil-over during a fire.

Conventional manual de-watering practices expose operators to hydrocarbon vapours during draining, are prone to operator-dependent over- or under-draining (with the associated product loss or carry-through of water), and require continuous attendance during the draining window. The objective of the project was to remove these limitations by delivering a fully automated, repeatable, and safer de-watering solution applicable to Saudi Aramco's storage tank fleet.

SCOPE OF SERVICES

- **Conceptual Design** — defined the functional architecture of the automated de-watering system, including the oil/water interface sensing strategy, the actuated drainage circuit, and the supervisory control logic required for safe unattended operation.
- **Project Proposal** — developed the formal proposal package presented to Saudi Aramco, covering the technical solution, the safety and environmental case, equipment selection rationale, and integration with existing tank instrumentation and DCS infrastructure.
- **Detailed Engineering Design** — produced the full detailed design deliverables required for procurement and construction: P&IDs, instrumentation schematics, electrical and control interfaces, mechanical drawings, equipment specifications, and the associated operating and safety procedures.

THE DESIGN SOLUTION

The system was engineered to operate without continuous operator attendance. Tank-bottom water is detected through reliable interface sensing, the drainage circuit is opened through actuated valves under supervisory control, and drainage automatically stops at the oil/water interface to eliminate product carry-over. The control logic, the safety interlocks, the field instrumentation, and the mechanical drainage circuit were all specified to integrate cleanly with the standard instrumentation and control environment of Saudi Aramco storage facilities, allowing the design to be deployed across the wider tank fleet without bespoke modifications per tank.

OUTCOMES AND STRATEGIC IMPACT

- Elimination of operator exposure to hydrocarbon vapours during the de-watering operation through removal of manual attendance.
- Repeatable, automated drainage to the oil/water interface, eliminating operator-dependent product loss and water carry-through.
- A standardised design package ready for replication across Saudi Aramco's storage tank fleet, rather than a one-off installation.

ADOPTED AS A SAUDI ARAMCO STANDARD — the design was subsequently included as a standard requirement for all Saudi Aramco storage tanks and was incorporated into the updated Saudi Aramco Operation Manual.

The adoption of the design as a corporate standard at Saudi Aramco — one of the world's largest and most technically demanding oil and gas operators — reflects both the operational reliability of the solution and the rigour of the engineering documentation delivered. Inclusion in the company Operation Manual extended the impact of the project well beyond Abqaiq, defining the approach for the wider Saudi Aramco storage tank fleet.

DISCIPLINES COVERED

Process • Mechanical • Piping • Instrumentation and Control • Electrical • Storage Tank Engineering • Operational Safety

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