

Enhancing an LNG Export Terminal Operations in the US through Advanced Control System Integration



The LNG terminal was transformed from an import facility to a high-capacity export hub while maintaining continuous operations in a complex brownfield environment and integrating new liquefaction units with legacy systems. Sensia addressed this by implementing a sophisticated ControlLogix®-based Integrated Control and Safety System (ICSS) through a phased delivery approach, modernizing Basic Process Control, Safety, and Fire & Gas systems, and ensuring seamless connectivity with AVEVA/OSI PI historians via a global collaboration model. As a result, the terminal achieved an export capacity of 2.5 Mtpa, improved operational reliability, and enhanced data visibility, positioning it as a competitive asset in the global energy market.

Key highlights

- + Increased Export Capacity:** Successfully converted the LNG import terminal into an export facility, achieving a total capacity of 2.5 Mtpa.
- + Advanced Control System Integration:** Implemented a new Rockwell Automation PLC control system, using ControlLogix® for the Basic Process Control System (BPCS), Safety Instrumented System (SIS), and Fire & Gas System (FGS) domains.
- + Phased Delivery Approach:** Ensured minimal disruption to ongoing terminal operations by executing a phased delivery and start-up of new equipment.
- + Robust Quality Assurance:** Adhered to a stringent Quality & Project Plan (QPP) with rigorous Quality Gate Reviews (QGRs) and Factory Acceptance Tests (FAT) for thorough verification and validation.
- + Global Collaboration:** Leveraged expertise from Sensia USA, the India Center of Excellence (COE), Mexican system integration partners for HMI development, and local contractors for cabinet assembly.
- + Enhanced Operational Efficiency & Safety:** Modernized control systems significantly improved operational efficiency and safety, positioning the terminal for long-term sustainable operation.

Challenges

- + Phased Delivery and Operational Continuity:** Delivering and starting up new equipment in a phased approach while maintaining existing terminal operations, requiring meticulous planning to avoid downtime and ensure continuous liquefaction processes.
- + High-Frequency Data Integration:** Integrating high-frequency data from diverse sensors and field instruments into a cohesive monitoring system, involving data compatibility issues, managing large volumes of information, and ensuring seamless communication.
- + Remote Control and Communication Reliability:** Ensuring reliable remote control of processes like gas injection cycles, dependent on robust communication systems, is often affected by connectivity problems in remote locations.
- + System Reliability in Harsh Environments:** Maintaining system reliability and performance in harsh environments where extreme conditions can jeopardize digital oilfield solutions.
- + Multi-Party Coordination and Scope Delineation:** Navigating a highly complex multi-party stakeholder ecosystem and clearly defining responsibilities, especially regarding hardware procurement, panel fabrication, site installation, overall safety, Safety Integrity Level (SIL) achievement, and maintaining a code/configuration freeze, to prevent gaps and ensure timely provision of crucial design input documents.

Solution

Sensia's approach to this Liquefaction Optimization Project was characterized by structured project management and robust quality assurance. Sensia implemented a comprehensive Quality & Project Plan (QPP), meticulously defined project requirements, organizational structure, roles, responsibilities, and quality management measures to ensure optimal performance across schedule, quality, and cost metrics. The project adhered to Sensia's pre-defined V-Model lifecycle for system development, ensuring systematic verification and validation. Rigorous Quality Gate Reviews (QGRs) and Design Reviews (DRs) were conducted at critical milestones to assess compliance and technical adequacy.

Specialized technical implementations were crucial to the project's success. Sensia leveraged its deep expertise in Rockwell Automation ControlLogix® PLCs for the precise configuration and programming of the BPCS, SIS, and FGS, critical for seamless integration with existing systems and newly added liquefaction units. This included efficient management of the new condensate skid's 88 I/O points and their integration into the overall 5K tags, along with detailed I/O database and network loading calculations. Furthermore, Sensia successfully integrated new data points into the existing AVEVA/OSI PI Historian and Asset Management System (AMS), enhancing data visibility and asset health monitoring without necessitating major software upgrades, a valuable tool in brownfield projects.

A highly collaborative project execution model was deployed, involving Sensia's USA team with significant support from the India Center of Excellence (COE), specialized system integration partners from Mexico for HMI development, and local contractors for cabinet assembly. This global resource leverages optimized expertise and efficiency by drawing on specialized skills from regions and regional capabilities. Sensia established clear communication protocols to manage the multi-stakeholder environment effectively, including regular weekly project review meetings, formal document exchange, and a structured Design Query (DQ) process for technical clarifications, ensuring transparent and effective stakeholder engagement throughout the project lifecycle.

Result

The Liquefaction Optimization Project yielded substantial achievements and positive outcomes, demonstrating Sensia's capabilities in complex industrial automation. The new ControlLogix® PLC control system for BPCS, SIS, and FGS was successfully configured, programmed, and integrated, effectively managing the new condensate skid's 88 I/O points and seamlessly incorporating them into the terminal's overall 2.5K hard-wired I/O and 5K tags, while rigorously adhering to existing operational philosophy and libraries to ensure compatibility and continuous operational integrity.

The project was managed efficiently, leveraging a PMI-certified project management approach and a structured Quality & Project Plan (QPP). This ensured strict adherence to schedule baselines and effective scope control through a well-defined Documented Change Request (DCR) process. Comprehensive documentation, including a Supplier Document Register List (SDRL), detailed I/O databases, updated system drawings, and rigorous test procedures, was delivered, facilitating the client's future maintenance, troubleshooting, and operational clarity. Finally, successful coordination with multiple key stakeholders, and third-party HMI developers, ensured smooth system integration, clear delineation of responsibilities, and proactive communication protocols, minimizing misunderstandings and effectively managing risks.

Sensia's Integrated Control System Solutions (ICSS) played a pivotal role in the successful conversion of the terminal from an import to an export facility, directly enabling the achievement of a total export capacity of 2.5 Mtpa, which represents a significant improvement in the terminal's operational capability and its relevance in the global energy market. This elevated Sensia's role from a mere technology provider to a strategic business partner, demonstrating tangible value that directly impacted the client's commercial objectives and market positioning and has solidified its position as a trusted partner for optimizing and modernizing global energy assets, demonstrating its capability to deliver tangible value and support strategic business objectives.