GULF INTERSTATE ENGINEERING CASE HISTORY

Pipeline System Repair and Modernization - Mexico

Gulf Interstate Engineering (Gulf) provided conceptual and detail engineering for the repair and modernization of approximately 640 kilometers (400 miles) of existing 10 inch and 14-inch product pipelines and two asso- ciated pump stations for PEMEX-REFINACION. Stretching across the Sierra Madre mountains of northern Mexico, the Monterrey-to -Gomez Palacio pipeline system transports vari-ous grades of gasoline and diesel.

The engineering consisted of three phases: repair of exist-ing facilities, renovation of obsolete components, and develop-ment of a maintenance program. The condition of the existing pipe and related facilities was evaluated through a dedicated pipeline integrity manage-ment program developed by Gulf.

Based upon the results of the evaluation and testing pro- cedures, Gulf developed a program that, once implemented by PEMEX-REFI-NACION, will result in the complete rehabili-tation of the pipeline and pumping facilities to international standards. Gulf also submitted bid documents, consisting of 350 design drawings and 17 volumes of documentation, to PEMEX for the procurement and construction phases of the project.

INITIAL EVALUATION

The evaluation included a complete review of the operating and maintenance history of the system, visual inspection of all above-ground facilities and pipe metal loss (corrosion) evaluation through intelligent pig inspections followed by a verification survey. A comprehensive hydraulic analysis

was also conducted. Close interval potential surveys to evaluate the effectiveness of the cathodic protec-tion system, and D.C. voltage gradi-ent surveys to identify pipe coat-ing deterioration was performed as part of the construction program.

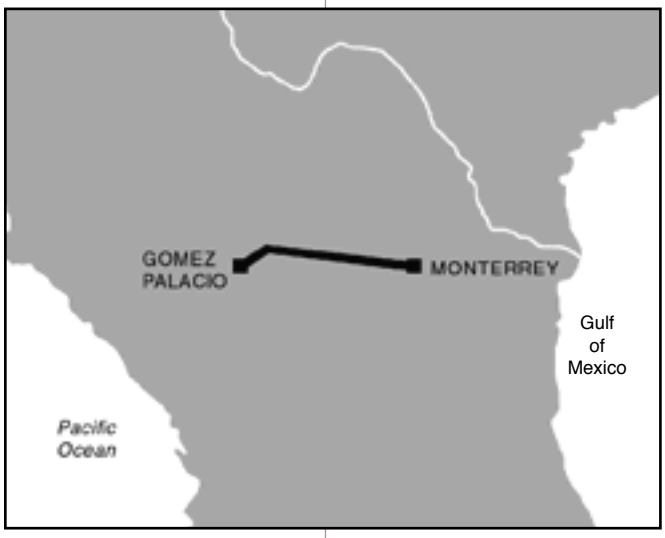
At the site, Gulf's project engi-neering staff prepared process and layout field sketches of the project facili-ties. Specifications for the var-ious equipment were recorded. The Gulf staff also met with PEMEX operations engineers and station opera-tors to discuss the current opera-tions methodology and review any problems regard-ing the safety, security and reliability of the system.

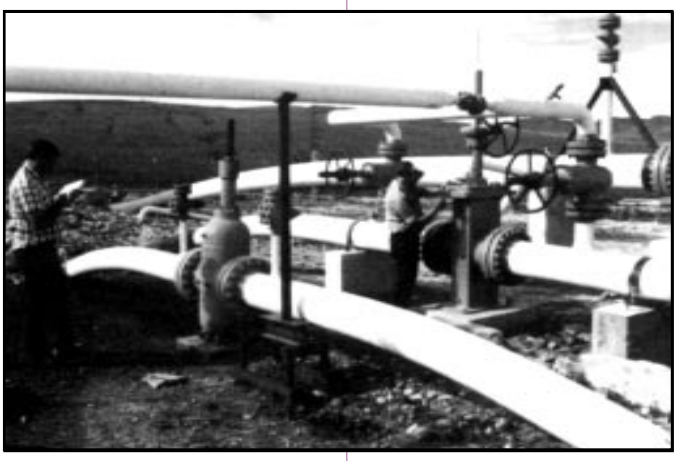
Information obtained in the field was consolidated into a summary report to PEMEX management. Field data was also used to prepare as-built P&IDs as well as for the development of the overall project strategy.

Additionally, Gulf and PEMEX officials visited a state-of-the-art products pump-ing station in the Houston area to provide a standard for comparison to the existing facili-ties.

REMEDIATION PHASE

The Gulf team prepared the neces-sary bid documents and budgetary cost estimates for the repair of existing facilities necessary to bring them into compliance with accepted standards and industry codes with regard to safety, reliability and ef-ficiency. Using site data along with PEMEX's O&M records, Gulf made assessments of pumps and rotating equipment, valves, PSVs and filters, electrical instrumentation and con-trols, utility systems, civil/structural facilities, and the cathodic protection system.





Based on this review, Gulf developed a comprehensive rehabilitation program for thesystem, then prepared the technical reports, drawings and specifications for the bid packages.

MODERNIZATION PHASE

Recommendations for system upgrades to improve operating efficiency and maintenance were developed. As the key element to this strategy, Gulf designed a state-of-the-art Supervisory Control and Data Acquisition (SCADA) system. This included the determination of necessary instrumentation and monitoring devices, site selection, specifications, drawings and installation details. Once installed, the SCADA system will provide operating data, pipeline integrity monitoring, leak detection, enhancement of safety and security, and some control capabilities. The leak detection system will be complemented with the addition of a new metering unit located at the Gomez Palacio terminal, the upgrading of the satellite plant metering unit and the addition of intermediate units as needed.

Additionally, Gulf made recommendations for improvements in metering and pumping station control systems. Modernization of valves and other equipment, utility systems, structural facilities and fire fighting equipment was also included.

MAINTENANCE PROGRAM

Gulf prepared complete oper-ating and maintenance manu-als for the entire system, and developed a program for its long-term maintenance. Specifications include safety equipment certification and the implementation of safety campaigns for leak detection and emergency response. The program also includes a pre-ventive maintenance schedule for rotating equipment, elec-trical equipment and control systems.

In addition, Gulf prepared maintenance checklists, emergency response procedures and organization charts, and safety procedures and certifi-cation forms.

INTEGRITY MANAGEMENT PROGRAM

Gulf's dedicated pipeline integrity management pro-gram provided an effective method for considering all the available technology with a carefully planned and thor-ough evaluation program in which experience-based deci- sions contributed to the overall success of the program.

GULF INTERSTATE ENGINEERING

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