

DCS Upgrade and Re-Instrumentation Projects

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HGA Acquisition

Hunt, Guillot & Associates (HGA) acquired R&D Consulting in 2014. Founded in 1976, the company was purchased in 1996 and changed the name to R&D Consulting. The engineering consulting firm serves the Gulf Coast petrochemical and fertilizer industries and is well respected for its high quality work, low turnover, and long-term client relationships in the South Louisiana market. The HGA and R&D culture and values were a great fit and R&D is now referred to as HGA's 'Baton Rouge – Brookline Office'.

RUBICON Overview

Rubicon, LLC has been a primary client of HGA Baton Rouge – Brookline for over 30 years. Founded in 1965, Rubicon is located in Geismar, Louisiana – just south of Baton Rouge.

The Rubicon plant produces polymeric and high-grade pure Methylene Diphenyl di-Isocyanate (MDI), which is commonly used in a wide variety of markets, including adhesives, automotive-related items, construction, electronics, and sporting equipment. The Geismar plant location is the largest North American producer of its kind.

MDI-1 UNIT DCS UPGRADE AND RE-INSTRUMENTATION PROJECT

Scale of the Process Control System Upgrade

Rubicon's MDI-1 unit is one of the Geismar facilities' original process units. Built in the early 1970's, it has been partially updated and integrated with a combination of different control system technologies over the past 40 years. A mix of older pneumatic control panel instrumentation was used to operate older parts of a unit, while modern Distributive Control Systems (DCS) and Programmable Logic Controller (PLC) based systems were used to control newer parts of the unit.

The older control systems were being phased out by manufacturers, and the limited availability of replacement parts made modifications and maintenance difficult and expensive. Proposed options included (1) expanding the existing DCS, (2) integrating a partial new DCS system, or (3) upgrading the entire system all together. The loss of production time was the most significant factor considered in the full scale upgrade. The first question asked by plant management was, "How can this unit be upgraded with minimum loss of production time?"

Project Scope, Schedule, and Deliverables

The MDI-1 DCS upgrade project proposed upgrading all of the MDI-1 unit control systems into one single DCS system, and replacing all existing instrumentation that was not compatible with the new DCS system.

Total Project Cost: \$10 million

Engineering: 17,500 Man-hours

DCS System: 1,050 I/O Points

Loop Diagrams: 800

Existing Field Devices: 1,700

New Instruments Specs: 415 Devices

Construction Package: 2,100⁺ Drawings

The engineering scope included providing a feasibility study and FEL to develop an installed cost estimate for the conversion project, along with a plan of execution and construction work breakdown structure. The engineering packages were broken into phases to allow for a modular design built project. The expedited schedule required the complete installation in less than one calendar year.



Engineering Challenges of a Full System Upgrade

Undocumented assumptions could have resulted in unanticipated problems during the shutdown, extending production down time, and increasing the overall cost impact of the upgrade. The older sections of the plant were particularly challenging because they were original parts of the plant and had the least amount of documentation.

The existing shutdown (S/D) system was to remain in service and not be revised as part of the upgrade. Demolition of existing signals was difficult due to the S/D and DCS I/O signals being intermixed in the same field wiring system.

The new intrinsically safe DCS system added another level of complexity because of segregation requirements of field wiring and the replacement of non-compatible field devices.

Engineering a Plan for Success

HGA's years of hands on experience in the unit provided a realistic perspective of the level of planning and detail engineering effort required to accomplish such an aggressive goal. The

Key Factors Utilized During the Engineering Phase

- Seamless team work within our in-house E&I group.
- Quality working relationship and effective communication with the Rubicon Project Team to help resolve any undocumented systems.
- Extensive research of Rubicon's current and archive document and drawing systems.
- Field verification of existing systems.
- Identify undocumented items that could not be verified while unit is running. This enabled the contractor to plan for verification early in the shutdown.

Construction Phase

Construction phase of the project was successful and T/A was completed as scheduled. The pre T/A infrastructure was installed as planned. However; a full unit shutdown was not possible as originally planned during the T/A. Some of the process sections of the unit needed to remain in service, and be partially swapped over to the new control system in stages. During construction, customized reports from the engineering database were issued to help the contractor identify process groups within the field wiring systems.

Project Awards & Highlights

"The Project Engineering Department led the effort with the help and assistance of associates from nearly every department at Rubicon. The teamwork exhibited by those associates to accomplish this within the limited time available was truly remarkable" as quoted from the article in Rubicon's plant magazine: The Rubicon Roundup.

The MDI-1 Re-Instrumentation and DCS Upgrade Project received local and regional awards, as well as recognition within Rubicon, LLC:

"Excellence in Construction Award": Local award from Associated Builders and Contractors, Inc. for the \$2-10 million category. The project received first place in "Best Project" for Specialty Contracting. Judging criteria was based upon a summation of the project pertaining to safety, scope, complexity, quality, budgets, and schedules.

"Specialty Contracting: Best Project": Regional award from Engineering News Record December 2014. Judging criteria was based on overcoming challenges and teamwork, safety, innovation and contribution to the industry/community, construction quality and craftsmanship, and functionality of design and aesthetic quality.

AN2 / NB1 DCS CONVERSION PROJECT

Continuing an Engineering Blueprint for Success

Our Baton Rouge - Brookline office has recently completed the engineering for another DCS conversion project for the Aniline 2(AN2)/Nitrobenzene 1(NB1) Unit, also located at Rubicon's Geismar, LA facility. The project was of similar size and scope to the MDI-1 Unit DCS Upgrade and Re-Instrumentation Project. HGA utilized the same three phase project execution plan to maximize pre T/A construction and minimize production down time.

Total Project Cost: \$6 million

Engineering: 9,500 Man-hours

DCS System: 800 I/O Points

Loop Diagrams: 550

Existing Field Devices: 1,200

New Instruments Specs: 210 Devices

Construction Package: 1,500 + drawings

The AN2/NB1 project is currently in the pre T/A construction and scheduled for completion in first quarter of 2015.

Summary

We would like to thank Rubicon for the opportunity to continue the long-term working relationship and look forward to providing engineering services for such projects in the future.

Special thanks to the project team in our Baton Rouge office. Their many months of hard work and dedication on both projects is greatly appreciated.