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Product Quality and Energy Use Improvements Through Better Process Control

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After a plant has been built, it has a control system that reflects the "state of the art" at the time of construction and commissioning. It then typically operates with the "as built" controls for many years. In a complex refinery or chemical plant, many process units are typically added or modified over a number of years. So, we end up with field instrumentation, controls, and control rooms that are probably very dissimilar. This leads to the usual maintenance challenges because we must deal with many different product vendors, spare parts that are becoming harder to get, and often find ourselves in a situation where modern network technologies cannot be used to extract and store process data for archiving and analysis. In addition, there may be too many control rooms that require significant upkeep, and that do not meet current "best practices" standards.

Many studies have been done over the years that show how modern process control systems and well designed control rooms have contributed to significant increases in product quality and yield, while at the same time reducing energy consumption. The comfort level of the staff running the plants has also improved.

Instrumentation and process control systems can be upgraded in order to capture those product and energy related benefits. This is best done by doing an "Instrumentation and Control System Revamp" study (I&C Revamp). A typical I&C Revamp study has these steps:

- Assemble a multi-disciplinary team comprising specialists in instrumentation, analyzers, electrical systems, process control systems, shutdown systems, control room design, and industrial ergonomics, where required
- Mobilize and travel to site
- Meet with the client's Management Team, confirm scope of work, and set up interview schedules
- Make extensive, preliminary plant visits

Work Highlights

Fired Equipment / Heat Exchangers

- Participated on a team performing an energy efficiency assessment for a US refinery. CEI provided the fired heater expertise. Total annual fuel savings identified exceeded \$3.5M of which approximately \$350k were in fired equipment.

Materials Engineering

- Onsite audit was made of the atmospheric and vacuum distillation units of an overseas refinery to assess the actions needed to permit the processing of increased amounts of High Acid Crude (HAC). Concluded that this could be done by raising feed TAN in small increments, accompanied by selected use of naphthenic acid corrosion inhibitor. Suggested guidelines on feed TAN and injection point locations were developed.

Process, Operations & Safety

- Participating within an integrated client's safety and noise NPOC team that will extend for a few years. The overall mega-project involves a major "clean fuels" revamp of a Middle East Refinery.

- Conduct detailed interviews with appropriate personnel
- Collect Simplified Process Flow (SPF) diagrams, Process & Instrument (P&I) diagrams, electrical system diagrams, control building drawings, and more
- Propose technical solutions with several options for agreed upon scope of work
- Make "Study Class" ($\pm 30\%$) cost estimates for proposed solutions, and "Return on Investment" (ROI) estimates
- Produce phased implementation plan showing manpower loading and time lines
- Recommend to client a selection of suitable engineering contractors
- Prepare comprehensive Study Report and review with client
- Make appropriate changes in report and transmit final Study Report

We plan to present the typical costs and benefits of a control system revamp project in follow-up articles. We will also describe what control systems technologies are currently being implemented, explain in some detail what the advantages are, and where the biggest "Bang for Buck" can be expected.

About the Author

John Hollemans is a Process Control Systems and Process Information Management Technology Senior Consultant with over 35 years experience in management of identification, development, and implementation of information system technology; management of Information Technology Master Plan studies; preparation of application proposals, specifications, and evaluations; process analysis and control systems design; implementation of advanced control system applications; and development of new business opportunities.

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