Environmental Operation Area (EOA) Automation Project-Control Systems Improvements

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Abstract

Since April thru July 2017, it was reported that the downtimes and cycle times at the Environmental Operation Area of a manufacturing plant had increased, since the instrument and control systems are highly degraded. In addition, it was observed the treatment operations had constant human intervention to execute the process, causing delays to the manufacturing plant. A Capital Road Map for the EOA Automation Project was developed after a detailed evaluation of the control system actual conditions. A three-phase capital investment road map was established to install a reliable control system, minimize manual interventions and mitigate downtime & regulatory compliances. Capital funds for first phase were approved. Control System option analysis was performed and DCS DeltaV control System was selected, making the EOA control system the most advance system in the Plant.

Introduction

The Environmental Operations Area (EOA) of Baxter Healthcare is presenting an issue with the current control systems. The obsolete EOA's control system have been causing regulatory issues, downtimes and unsafe work environment. A capital project is executing to mitigate the negative impact to the site and improve the actual conditions of the control system.

Baxter Healthcare of Puerto Rico in Guayama is a manufacturing facility of inhalation anesthesia. The main products are Forane® (Isoflurane), Suprane (Desflurane), and Sevoflurane.

The EOA treatment plant needs to be operating to manufacture the Bulk anesthesia. However, the actual conditions of the treatment plant have been impacting negatively the manufacturing operations. The actual condition of the control system present the following principal negative aspects that are the root cause of the downtimes in the area:

- Obsoleted Control System
- Physical Condition Highly degraded
- Instrumentation wiring without tags
- Lack accurate drawings/hard to troubleshooting
- Control System Operation in separate places
- Limited trained (system knowledge) resources
- Level Indicator degraded (recurrent failures)
- Manual Operations

Objectives

Control System Analysis

Currently the EOA control system is a Programable Logic Control (PLC), however the manufacturing plant have a distributed control system (DCS). Therefore, an evaluation it was performed between DCS DeltaV System and Control Logix & Compact Logix PLC systems. Refer to Tables 1 and 2 for Control Systems

Table 1 : Control System Benefits and Disadvantage Comparison

DeltaV	Control Logix
Benefits: ▪ Robust Control System ▪ Easy Integration/ ▪ Historian ▪ Expansion Capability ▪ Configuration in one platform ▪ Existing Templates ▪ Resources with high technical Knowledge ▪ Spare part available on site ▪ Standardize control system around the plant **Disadvantage:** ▪ Expensive	**Benefits:** ▪ Robust Control System ▪ Less Expensive ▪ Historian ▪ Expansion `Capability (modular system) **Disadvantages**: ▪ Hard Integration/Configuration ▪ Configuration in separates platforms ▪ Limited resources on site with technical knowledge ▪ Spare part unavailable on site

Table 2 :Control System Cost Comparison

	Hardware	Current DST Configuration	New DST Configuration	Estimate Cost
DeltaV	$ 184,040.00	$ 73,400.00	$160,000.00	$ 417,440.00
Control Logix	$ 143,557.39	$ 91,312.00	$189,800.00	$ 424,669.39
Compact Logix	$ 127,500.00	$ 91,940.00	$189,800.00	$ 409,204.00

Based on the control system technical analysis performed it's recommended the Delta V System solution for the Environmental Operations process.

Note: Delta V System: is an expensive control system, but it is easy to configure providing reduction cost around the time.

Capital Project Road Map

The roadmap (Figure 1) is the governing document that dictate the project phases deliverables and investment that support the strategy and helps drive business priorities over the next 3 years

Figure 1: Capital Project Road Map

Phase #1 Execution & Deliverables

On August 2017, it was presented the project proposal to the senior staff and corporate and it was approved $528,000 to start the phase #1.

Once the capital was approved it was executed a bidding process for the two major investment areas, Control System Hardware and Software and Electrical & Instrumentation work. For the Control System Hardware and Software were participated a total of three companies and for Electrical & Instrumentation seven companies. Refer to Tables 3 and 4 for bidding results details.

Table 3: Control System Hardware/Configuration/ Documentation Bidding Results

Control System Hardware/Configuration/ Documentation	
Company	Proposal Amount
1	$227,743.80
2	$314,357.23
3	$377,203.00

Table 4: Electrical & Instrumentation Bidding Results

Electrical & Instrumentation	
Company	Proposal Amount
1	$176,529.00
2	$205,729.00
3	$226,800.00
4	$257,023.00
5	$265,292.82
6	$269,365.00
7	$346,295.00

Control System Deliverables

- Control System Design. Figure 2 shows a proposed concept design.
- Supply DeltaV Cabinet and Hardware.
- Supply Control Room Rack and Rack Mount DeltaV Server and DeltaV Control System
- Hardware/Software. (One rack-mount DeltaV Proplus Server, One rack-mount Operator Station, and two remote terminals via KVM's.)
- Program DeltaV Control Modules and HMI Graphics using Baxter all-ready validated Control Module templates and HMI graphic objects.
- Test Cases for qualifications (One for each Control Module)

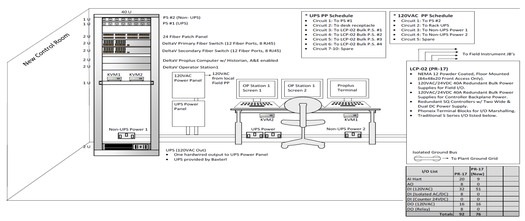

Figure 2: EOA Control Room System Design

Electrical and Instrumentation Deliverables

- LCP-02 Conduit and wiring Demolition.
- PVC-Coated Conduit Furnish from PR-17 LCP02 to PR17 instrumentation.
- Engineer Support and Drawings.
- New Loop Drawings & Update P&ID

Control Room Improvements Deliverables

- Convert Safety Office in the EOA Control Room. Figure 3 show a proposed concept design for the new control room.
- Install acoustic celling and lamps.
- Install 18kbtu split unit for the operator area.
- Install 10KVA UPS

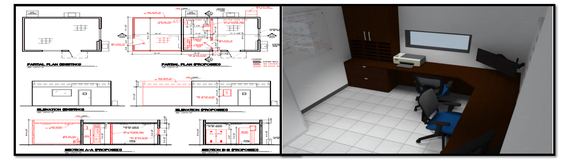

Figure 3: Control Room Improvements Design & Furniture

Factory Acceptance Test and Documents

As part of a regulated manufacturing environment the documentation plays a fundamental role. For the phase one it was developed the following documents: Control System Requirements, Functional and Design Specification, Equipment modules Configuration Design, Factory Acceptance Test Protocol for EOA Control System.

On December 4 to December 8 2017 it was executed the Factory Acceptance Test (FAT) in Atlanta GA were Hardware and software were accepted after the issues found were successfully fixed.

The project fully implantation will be executed during the summer shutdown, since the impact of the Hurricane Maria was delayed its implementation. During the implementation process a detailed commissioning protocol will be executed. All the EOA operators will be trained and procedures must be issued and effective.

Conclusion

In this case, the main objective of the project selected were install new reliable control system and establish a new EOA control room to mitigate the downtime, regulatory observations and unsafe environment conditions. After the phase #1 completion, it will be accomplished those objectives. Making the Environmental Operations Area control system must update control system installed at the site. In addition, the project reduces the operators' manual interventions and provide an historian that could be used for future investigations and process improvement projects. With the three phases implemented the manual intervention will be reduced in 70%, with accurate metering and automated sequences.

Bibliography

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