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Chemical | Millennium Chemicals

Kemwater- Millennium Chemicals do Brasil Proves the Efficiency and Economic Benefits of PlantWeb Architecture

Case study written by: Divaldo Franco (Millennium Inorganics Chemicals Inc., Bahia, Brazil) and Roberto Arbex (Arbex - Automação e Controle em Engenharia S/C Ltda., Sao Paulo, Brazil)

FOUNDATION fieldbus technology has been implemented successfully hundreds of times throughout the world, thus demonstrating a clear and irreversible trend in the Process Automation and Control community. In this article we will describe a real application of PlantWeb Architecture at the hepta-hydrated ferrous sulfate recovery unit Ferrix-XL3, at Kemwater-Millennium's chemical plant located in Bahia, showing the architecture's potential, with significant savings in the following areas: project, commissioning, start-up and in industrial production.

PlantWeb Architecture at Kemwater-Millennium's Plant

The process automation and control plan developed by Millenium Inorganics Chemicals do Brasil is based on the use of FOUNDATION fieldbus technology and process control network, aiming at total integration of all the tasks that involve the automation/instrumentation equipment. Among the main goals are:

- provision of process data on-line for the entire plant;
- measurements and totals of energy and production;
- implementation of statistical process control;
- quality management;
- integration with SAP;
- maintenance management using asset management software;

Once these goals have been reached, the next step involves attaining substantial benefits such as:

- instrumentation and automation cost reduction via asset management software;
- reduce operating costs through process automation;
- reduce production losses and improve quality by improving process measurement and control;
- increase the reliability and safety of process control; reduce costs of energy and raw materials, optimizing control strategies and loop tuning.

Millenium is constantly concerned with reducing process variability [1], with the main objective of reducing variable costs and improving quality. Over 300 variability audits [2] on the performance of control loops in process industries indicate that only 20% of the loops reduce process variability, while the remaining 80% promote an increase. The causes of this inefficiency can be varied: 30% of the loops oscillate and increase variability due to tuning, 30% oscillate and increase variability due to the use of transmitters and control valves with questionable performance, 15% require new control strategies and 5% require new design.



It was within this context that the hepta-hydrated ferrous sulfate recovery unit called Ferrix-XL3, was implemented at Kemwater-Millennium's chemical plant. The choice of PlantWeb Architecture occurred naturally, since it is currently the only architecture that serves the process automation and control plan described above, supplying all the tools necessary to reduce variability along with instrumentation with a proven track record.

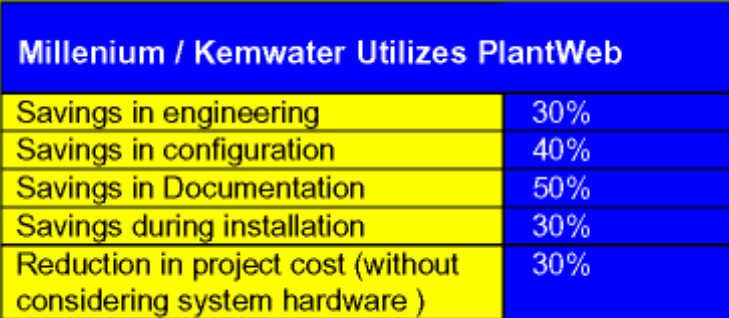
The Ferrix-XL3 unit processes hepta-hydrated ferrous sulfate, a by-product of the manufacturing process of titanium dioxide (TiO₂), obtaining a product for water treatment with a lower cost than traditional aluminum sulfate (Al₂(SO₄)₃) and a similar performance. The unit is presently undergoing tropicalization, while its product is being introduced in the market successfully. Besides this plant in the state of Bahia, Brazil, the company has another two plants: one in Finland and the other in Japan.

System Architecture

The automation of the Ferrix-XL3 unit requires a mid-sized system with 82 DIs, 65 DOs, 32 AIs, 6 AOs and 8 PID meshes performed on the field. The system includes two standard PC operations stations running in Windows NT and connected to the standard Ethernet network with a TCP/IP protocol. Only one controller is needed for the quantity of I/O at Ferrix-XL3, as seen in figure 2.

The digital 24 Vcc inputs and outputs include all the on-off valves, motors and level switches. The analog 4-20 mA inputs obtain level data (radar), mass flow and weight, while the analog 4-20 mA outputs are references for the frequency inverters.

The Project

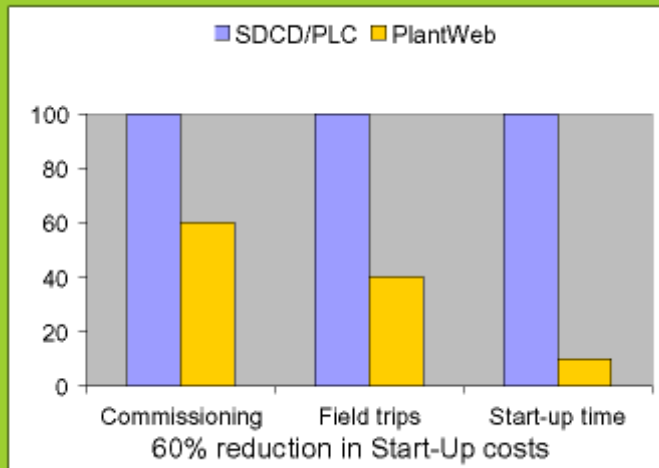


Millennium / Kemwater Utilizes PlantWeb	
Savings in engineering	30%
Savings in configuration	40%
Savings in Documentation	50%
Savings during installation	30%
Reduction in project cost (without considering system hardware)	30%

When comparing the project for PlantWeb Architecture with traditional architectures comprised of PLCs or SDCDs, we noticed significant reductions in the number of HHs necessary for engineering (30%) and configuration Millennium / Kemwater Utilizes PlantWeb Savings in engineering 30% Savings in configuration 40% Savings in Documentation 50% Savings during installation 30% Reduction in project cost(without considering system hardware) 30% (40%), in the quantity of document (50%) and in cleaning savings during system installation (30%). Taking the dimension of the Automation System at the Ferrix-XL3 unit into account, the project brought a total cost reduction of around 30%, without considering the system hardware.

Commissioning and Start-Up

During commissioning considerable earnings were discovered even for the same number of intelligent field devices. 40% less HHs were needed for commissioning, field trips were reduced by 60%, 4-20 mA and 24 Vcc signal commissioning errors/mistakes were reduced by 10% and no errors occurred in the FOUNDATION fieldbus devices. We estimated a 90% reduction in start-up time for the Ferrix-XL3 unit and an approximate reduction of 60% in the total start-up cost.



The speed promoted by PlantWeb Architecture in configuration alteration during start-up is very impressive, even when the control logic was modified, since the system did not have to be shut down at any time.

Since the process is currently being tropicalized, as described above, it has not yet been possible to discover any reductions in the time required for industrial production in accordance with quality standards, although a reduction in the learning curve has been observed due to the ease with which maintenance problems are solved. For this operation, the improvements are due to the historic trend of the DeltaV software, its graphic resolution, the Windows NT platform and the ease of use with faceplates (built-in or configurable).

Software Configuration and Maintenance

The facilities found in the DeltaV configuration are surprising, especially in the self-identification of I/O cards and FOUNDATION fieldbus devices. The traditional configuration of I/Os has become easier, even for 4-20 mA and digital signals, while more sophisticated control strategy configurations can also be implemented easily in the same platform.

The auto-documentation of the system fully meets maintenance requirements with web and logic diagrams along with significantly reducing designs since with PlantWeb Architecture, 16 intelligent devices and, for example, 4 control loops can be represented. The reduction in the amount of designs depends on the number of devices and the quantity of control loops per segment. We must not refrain from mentioning the earnings obtained via cost reductions in documentation updating by plant engineering, since the designs are automatically updated in the DeltaV system.

Hardware Maintenance

Due to the lack of time available and the current reduced industrial production at the Ferrix-XL3 unit, we have not yet observed gains related to HW maintenance. Unnecessary field trips will undoubtedly be reduced, with rapid diagnoses of the FOUNDATION fieldbus devices, significant improvements in the maintenance of control valves ("The undesirable behavior of control valves is the biggest single contributor to poor control loop performance and the destabilization of product uniformity.", W. L. Bialkowski, President of EnTech Control Engineering) and therefore an increase in the availability of the process.

Although AMS software has not been used to a large extent in maintenance, it has proven to be a powerful tool throughout the entire phase of calibration and commissioning, with all the resources necessary for asset management. It also proves an excellent tool for ISO 9000 compliance, storing the data from all the configuration alterations and calibration, thus allowing for the "trackability" of the device.

Automation Project Costs

The tables below present the list of costs for comparison of the automation project between PlantWeb Architecture and a traditional system comprised of a PLC, Supervision Software and conventional field instrumentation.

Item	Traditional System (%)	PlantWeb (%)
Total Equipment	100%	85.2%
Assembly/Commissioning	40.8%	25.2%
Assembly Material	32.0%	17.5%
Cables	15.5%	8.8%
Development	11.7%	11.6%
Total Services	100%	63.1%
Overall Total	100%	80%

Comparison in (%) between the automation project of PlantWeb Architecture and that of a Traditional System.

By analyzing the above table, a 20% reduction in the total cost of investments was noted, making PlantWeb Architecture the best option.

Conclusions

Choosing PlantWeb Architecture at Kemwater-Millennium's chemical hepta-hydrated ferrous sulfate recovery plant Ferrix-XL3, located in Bahia, proved to be the right decision. As operations continue even higher earnings are expected. In this case we are referring to the reduction of process variability, % of loops in automatic mode, quality of the final product, optimization of yield, and performance of the plant, besides substantial earnings in maintenance.



We are satisfied with the complete adaptation of PlantWeb Architecture to our process automation and control plan, and are certain about two aspects: complete service of our automation plan by the most updated Automation Architecture existing and Millennium's option to continue using it.

The objective of this article regarding the use of PlantWeb Architecture is to inform the Process Automation and Control market of some of the details related to the economic benefits of Kemwater-Millennium's Ferrix-XL3 unit automation project. As is the case of any innovative solution, a great deal of time and energy was spent in the supplier definition phase to demonstrate the gains we would obtain from this option. These gains were subsequently proven and described herein, showing the need to adopt this modern architecture, especially considering the increasingly competitive and globalized market in which we live.

Bibliographic References

[1] Arbex, R.T., Bialkowski W.L., Process Variability Propagation in Pulp and Paper Manufacturing, 31st. Annual Congress of Paper and Cellulose held by ABTCP, Sao Paulo, SP, 1998.

[2] Arbex, R.T., Pardal, A. & Costa, G. A Diminuição do Custo Variável Através da Redução das Variabilidades de Processos (The Reduction of Variable Costs via the Reduction of Process Variability), Intech, December, 1998

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