WHITE PAPER

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AREA WIDE CONTROL SYSTEMS

Controlling Networks require a specific Design Approach

Local and Remote Controls

In this era smart controllers are common items that can be purchased configured and or programmed from a multitude of vendors. Each product has its own unique speciality or place in the market as a result of the products reliability, performance, functionality and price.

Many processes only require local controls 24/7. Area Wide controls are often implemented as a secondary measure to improve system performance. Large distances sometimes separate process plants from the raw materials and handling which ultimately warrants a primary real time interface to disparate and often very remote equipment.

The purpose and objective of the control system should ultimately determine the choice of technology and then the detailed selection of appropriate products. The following discussion raises issues that should be reviewed when considering Distributed Intelligence Area Wide Controls Systems.

Different Approaches to Remote Input/ Output Devices

Various models exist for the management of remote information or plant. In large plants such as power stations and mineral plants, DCS systems are used to manage the main plant functionality. To recover information and perhaps remote requirements "field IO" is logically connected to the system by using transparent connections back to the DCS, or intelligent field devices are used.

Transparent connections make use of various telecommunications media and operate at different levels in the ISO model. For example data radio modems may communicate flow meter information sourced as a 4-20mA input and delivered to the DCS as an analogue output as 4-20mA. The DCS seamlessly measures a standard 4-20mA input and has no intimate knowledge of the communication methods or devices, which could be hundreds of kilometres away.

Intelligent controllers are used more frequently when large distances come into the equation of analysis. Often there is more than a single IO point to be monitored or controlled. On larger scaled implementations RTU's and PLC's are employed to perform some of the following tasks:

- Interfacing with discrete and analogue signals via industry interface standards.
- Processing of Inputs and Outputs
- Manage communications links and real time data to maximise throughput and minimise transmission time. (RTU's not usually PLC's)
- Provide control of plant by executing SCADA operator commands and translating this to process outputs.
- Provide automated processing & conditioning of statistics and control systems based on I/O information in real time.

Where Should Controls be Implemented

When you have a choice to put controls in the Computer Server equipment, a master control device or remote intelligent controllers, where should you position it?

The answer to this question is determined after considering some of the following issues:

- Is the control process secondary or a primary function?
- What happens to the process if the control device should fail?
- Do I require redundancy in the process itself, in the telecommunications infrastructure or in the control devices?
- If the process to be managed spans multiple intelligent controllers can they all communicate simultaneously? If not, what are the latency considerations and how does this affect the process being controlled?
- What is the reliability (MTBF) of the Computer Server equipment, a master control device or remote intelligent controllers?
- If a communications error occurs does the local intelligent controller need to fall back to a backup mode for safety or to manage the process in a particular manner?
- Answering these questions highlights how to weight the decision as to where the "smarts" should be located.

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Complex Designs and the Main Concepts to Include

It cannot be emphasised enough that safety of personnel and plant comes first, and in that order. A combination system could be complex such that intelligence for a particular process may be distributed across Computer Server equipment, master control devices and multiple remote intelligent controllers. How this type of system behaves under failure condition or operator error could save lives.

Perhaps the most often overlooked dimension that is usually purchased, as a single line option on the requisition form is redundancy. Redundancy of any piece of equipment particularly with distributed intelligence must be thought our very clearly and tested against the design criteria. Difficulties often arise during fail over condition and especially when attempting to restore a system back to normal. The control system operator interfaces need to consider these elements and make it safe and easy for making necessary adjustments in real time during recovery procedures.

A very common method to ensure system integrity is watchdog loops. This safety method check could be applied to communications, a control process or equipment to ensure periodically that the system is operating as intended. The process system must determine when failure occurs inside the window of controllability. For example, there is no point in notifying a condition of failure after a process has shutdown if there are alternatives available.

Keeping it Simple

Keeping it simple is an obvious catchcry, which especially applies to process and information systems. Distributing intelligence without well-defined structures and predictability is a recipe for disaster. Concepts and ideas always seem so simple to understand when well written and clearly documented. What is not so obvious is the process taken to achieve the written evidence of the design process performed. What becomes especially clear is the end result, usually immediately and definitely in the long run!

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