July '96

Control Arts ControlSoftware Review

1 WHAT'S NEW

What's New!!

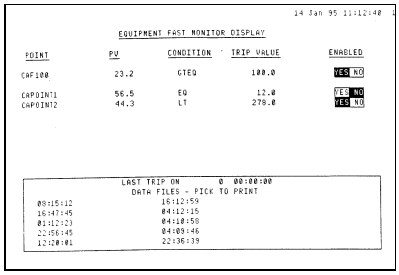
Two new Control Arts software tools are now available - Fast Monitor and Alarm History Analysis.

Fast Monitor

When there is a major upset condition in the Plant, every manager in a three mile radius descends on the Control center. If the cause of the upset involved rotating equipment or any other fast acting process, the Operators and Engineers trouble-shoot the upset by looking at the strip charts! Why isn't the information from the DCS being used? Well, the data isn't being logged frequently enough and therefore, it isn't useful. Wouldn't it be nice to have a tool that gave you more frequent data in an alarm situation? In addition, you could overlay plots to help determine relationships. This is something that you can't easily do with the analog strip charts! The next time the managers come running during an upset, you'll have a much better idea of the trigger condition. Then you can get the equipment back up faster and take action to prevent a recurrence - and that means better reliability for your plant!

Alarm History Analysis

Your DCS has alarms - lots of them. In fact, a common operator complaint is that an upset will overwhelm their ability to process the avalanche of alarms coming in. You could install an artificial intelligence/expert system, but they're too costly and time consuming, and besides, could you ever trust them enough to turn off your alarms? A much better answer is to statistically analyze your alarm occurrences for redundancies, chattering, and frequency using the Alarm History Analysis tool. Then you can easily pick out the troublesome alarms and adjust them (or get rid of them) - ensuring that your operators only get the right alarms at the right time.



The fast monitor TDC display shows the current trip points and lets you print any data file by picking the time the trip occurred.

2 TRAINING

Practical Control and Analysis for Plant Engineers

Mark your calendar for the week of December 2, 1996. This 5 day course is essential for plant engineers who need to be familiar with TDC3000 applications - the theory, the dangers, and the tricks of the trade.

Topics for this course include basic and advanced control practices, and applications of the Control Arts Toolkit to real problems. Of special consideration will be techniques to increase the robustness of control applications.

3 QUESTIONS AND ANSWERS

Frequently Asked Questions

We tested a Multivariable Controller (MVC) on one unit and it improved the performance on the unit. Should we implement MVC on every unit in the plant?

Definitely not. Each unit should go through the checklist detailed in this newsletter - MVC - Decision Criterion. If the unit doesn't need MVC - and you implement it - then you are spending too much money on control that isn't effective.

We're being told that better reliability is key this year - but the information we get on control strategies doesn't mention how reliability is impacted. What do you recommend?

There are many opportunities for improving plant reliability. For example, I recommend Fast Monitor, Alarm Enforcer, Alarm History Analysis, and Operator Messages. These are basic capabilities that every plant should implement - before even considering advanced control!

(continued on next page)

Frequently Asked Questions cont'd

INSIDE

The plant I work in uses both a DCS and old analog instrumentation. I've noticed the operators often prefer the old backpanel to monitor the process. Are there any tools to improve the interface on the DCS?

The automotive industry also discovered that analog instrumentation allows for a better feel of the equipment being operated. That's why our speedometers and gas gauges are analog. Of course, the DCS is infinitely more flexible than a backpanel, and the challenge is to design a display that presents information without drowning the operator in a sea of numbers. There are several texts on this problem, but most of these refer to PC Windows type of systems. The best general reference is "The Visual Display of Quantitative Information " by E.R. Tufte. Pick this up if it's not already on your bookshelf.

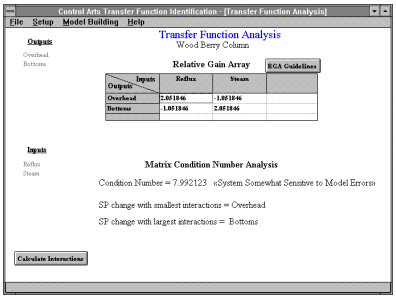
Several Control Arts tools are designed to lessen the "informational overload" on the operators. Check out the Trend, Message, and Alarm displays, as well as the controller subpicture library, for ways to improve information presentation.

I'm a new plant engineer and when I came on board various control strategies were already implemented on the units. Is there an easy way to determine which ones are the most effective?

Having an easy way to determine the effectiveness of control would be useful even to the engineers who have been in the plant for years. There are two aspects to controller effectiveness - on-line time, and control quality. The first aspect is easy to measure - just divide the total time the controller is on control by the total time the unit is running normally. Measuring the quality of control can also easily be done using the Performance Assessment tool in the Control Arts toolkit. This assessment tool, based on some recent research from Queen's University, gives a single number indicating the quality of the control which is *independent* of the disturbance level. Best of all, no plant tests are required to obtain this measurement - you can determine controller performance in less than 5 minutes.

While the performance analysis gives a hard number to compare against, it is more difficult to say what a good on-line time is. Most plants run pretty smooth 90-95% of the time, so having an on-line time of 90% may indicate that the operators don't trust your controller and turn it off whenever a disturbance hits the plant!!!

If you've already got the plant models, it's an easy step to see if your plant requires a multivariable controller and if the controller will be sensitive to model errors.



MVC - Decision Criterion

Are you considering implementing

4 TECHNOLOGY WATCH

you've already implemented MVC on some units, use the following questions to determine if it makes sense to change it.

1. Would the unit benefit from "more" control (tighter variance or performing closer to constraints)? The Control Arts Performance Assessment will tell you if controller performance can be improved. Or if you prefer, Dr. Tom Marlin of McMaster University (MarlinT@McMaster.CA) offers an excellent two day course on determining benefits from advanced control.

Go to Step 2.

2. Does the unit need a multivariable controller or are single loop controllers/ constraint controllers sufficient? Most units were designed for single loop control, and many will show only marginal improvement with multivariable control. Techniques for determining the degree of coupling in a plant have been researched for many years and are well developed. These tools are available as part of the system analysis tools in the Control Arts Model Identification Toolkit.

Go to Step 3.

3. Will any controller meet your desired specifications for control? It's often tempting to include all of the process variables in one big contoller. However, you may end up with a system that is very sensitive to model errors; and you don't want to have your shiny new MVC go unstable next Tuesday at 3:00 AM when the plant moves to a slightly different operating condition. There are techniques for determining whether the system you've set up will be robust to changes in the plant; these tools are included in Control Arts Model Identification toolkit. These techniques don't require any additional information or plant tests other than what you've done already to determine the plant model, and should be considered an essential part of any controller implementation. Note that some MVC's are explicitly designed for robustness issues (Honeywell's RMPC), but it's always a good idea to check these things out before you turn on a controller.

You've answered yes to all of the above questions! Great, implementing MVC on this unit makes good business sense.

Alternatively, you've gone through the above checklist and answered no to one or more of the questions. Do not implement MVC on the unit. Send your engineers to Club Med as a reward for saving plant resources (and outside consulting dollars) - - money that would have been spent on set-up, installation and maintenance of multivariable controllers.

Control Arts

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