WHAT IS YOUR CONTROL SYSTEM TELLING YOU?

Are you listening?

Legacy Systems

- Plant personnel with clip boards
- Chart recorders
- Paper storage
- Data Entry
  - Paper makes it way to the office area where office personnel manually enter data into digital format.
- Alarming
  - Light indicators on panels
  - Or none at all

Traditional Control System

- PLC and HMI (Hardware and Software)
  - Information presented to the operator on the screen
    - Information may still be entered from screen to clipboard.
  - Graphical representation in the form of a fixed table or trend chart data.
  - Printed to a printer or PDF file and stored
  - Alarming
    - Alarm tables showing current and historical data.
    - Often unimportant alarms and critical alarms mixed together without distinction.

Methods of Entry

- What paper is still on your plant floor?
  - Inventory Tracking
  - Procedures for cleaning
    - CIP, COP, Inspection reports
  - Maintenance Logs
  - Recording Uptime/Downtime
    - Overall Equipment Effectiveness (OEE)
  - Product Loss
  - How do you get this into your plants Manufacturing Execution System (MES)?

DATA

- I have noticed over the last 20+ years of data collecting, is that plants seldom take advantage of all the data they have their systems collect.
- I feel the main reasons can be:
  - The way the data is presented (cluttered alarm lists)
  - Lack of access to the information where it is required
  - Lack of training on how to acquire and use the data the system has stored.

So where's your data?

- Do you still have paper in drawers?
  - Many companies are still maintaining paper records.
    - As most of you know that certain paper records are required if the process is still on paper.
  - Chart recorder paper data is one example of information that is kept for multiple years. This piece of paper maintains the time, date, and signature of the person responsible for the CIP or HTST operations.
  - Regulations have changed allowing certain paper to become digital information, which carries the same information as above.
  - However some of the regulations haven't caught up yet and chart recorders and other specific instrumentation is still needed in certain processes

Most common

- In the plants that I work in, I most commonly see a combination of data storage being used.
  - Multiple storage locations depending on the system and its connectivity to the rest of the plant.
  - Paper data – stored as paper or being scanned
  - Plant floor data is usually staying on the plant floor.   In the hands of the supervisor in the area.
  - Shared corporate hard drive
    - Multiple folders located on a server or single computer where everyone saves their information to.

What plants are implementing

- A corporate database of information
  - Has all the data being recorded stored to corporate database.
    - This could be located onsite or at a corporate site.
  - All authorized personnel will have access to query tools to give them the data they need to do their jobs.
    - Reporting templates are sometimes refined other times quite crude and a lot of data manipulation is often needed to get the information you want.

Questions to ask about your system

- How do you or other employees access your system data?

- Do all the necessary people know what data is available?

- Do they know how to retrieve it?

- Is the system information being backed up in some way in case of hardware failure

A couple of case examples of data use

- Problem solving using data that was available
  - Both of these examples are based on pasteurization equipment.
  - These are the legal step and critical to every process.
  - A HTST that is off product is a significant problem for any plant.

Problem 1:

- Late 1990's: Only 1 of 6 Identical UHTs will drop out on a transition step.
  - Technology was 1990's technology with a PLC 5 system and Wonderware interface.
  - The PLC code was pointed to as the problem
  - The code was analyzed and found to be fine.
  - By using the alarm table to pinpoint time, and the trend screens highlighting all of the instrumentation data around that time we could see what was happening in the system.
  - There was a sharp drop in pressure when the transition step occurred, this did not happen on the other 5 UHTs
  - By looking at this we found there was one VFD parameter that wasn't correct on that UHT.
  - Changing that parameter solved the problem.

Problem 2:

- This problem was within the last month
- A plant had been having periodic problems with an HTST a booster pump would fail.
- The failure alarm in the drive was an overcurrent.
- I had conversations with all of the operators and received conflicting information from each.
- I went to the area manager to discuss the events

Problem 2: continued

- We used his e-mail as a data source for the problem.
- Since he received all of the shift reports via email we filtered on timing pump failure
- We found that the problem could happen at any time during any condition within the system.
- We found that maintenance had changed a motor a year earlier.
- We also found that the VFD drive had been changed 2 weeks prior to try and solve the problem.

Problem 2: Solution

- In the information we had found from the e-mail source we noticed that problems started occurring after the motor was changed.

- We also found no indication that maintenance had ever re-checked the leads on the motor itself.

- During the mid day shutdown we had maintenance look at the motor leads and they found there connections to be quite poor.

The data led to the problem

- In both of the cases above the different sources of data led to the problems that these plants were experiencing.

- Correct tracking, and analyzing of the data will help with operational uptime in a manufacturing facility.

What's Changing

- The modern systems are so much more sophisticated than the systems we had 20 years ago.

- In addition our ability to share information has changed dramatically as well.

Advances in Technology

- Computers on the plant floor
  - Operator Interfaces are computers and in todays system we have a lot of data collection power and information right at our finger tips. Systems are now taking advantage of these powerful devices to control and inform the operators of todays plants. Devices such as:
    - HMIs
    - Tablets
    - Cell phones
    - Sophisticated instrumentation and analyzers

Reporting Methods

- Software advancements have been made to make the user interface more user friendly.
  - These packages are setup specifically to record, store, and compress data for future use.
  - The tables the data are stored in are open so off the shelf software packages can be used to query the data and present it in a easily readable format.

Interconnection of Automation Systems

- Common protocols are being used to place several different devices on the same networks.

- Advanced IO networks using Ethernet and ASI bus bring back diagnostics as well as the IO information associated with the devices.

- Special modules are available to bring legacy or special equipment into the control system.

Servers and Data Storage

- Server technology
  - Virtualized images for computers
    - Reducing Hardware
    - Reducing network and maintenance on system hardware.
- Data Storage
  - Size is increasing
  - Price is decreasing

Other changes – Work Force

- One distinct change that you find in the workforce is everyone is now familiar with technology in some form.

- Most people have access to computers and smart phones, and todays educational system is based around technology from an early age.

- Adaptation to plant technology isn't as large a problem as it had been in the 80s – 2000's

The Plant Environment

- Most of us are now on a 24 hr 7 day a week plant production schedule in the US

- Very little tolerance for downtime of equipment

- High need for personnel and equipment that can keep the production running.

Design Considerations

- On your next project think about utilizing technology to get the most out of your systems.

- Even if the technology isn't implemented right away be aware of what you want in a system.

- Involve your local inspectors on critical items like data storage, what is acceptable to them.

Electronic Records and Operator Signage

- Tracking a person at a terminal is becoming easier with modern technology
  - There is always the log in for an operator
  - But badge readers can be utilized to identify the operator at the computer
  - Providing an electronic signature for the process they are working on.
  - FDA 21CFR – Part 11 applies to records in electronic format as well as electronic signatures.

Program functionality into your system

- Accumulation Counters as a tool
  - Machine Uptime/Downtime & Idle time
  - Personnel response time to a function
  - Levels of severity and escalation
- Manual Control Montoring
  - Systems made to run in auto should run in auto
  - Manual is a necessary piece of a system to keep running sometime.
  - Know how you want to handle manual control in your system and monitor when it is in manual.   That way you have another piece of information.

Alarming and Data Collection

- I have read many very good controls specifications over the years.   But I find one of the details that is often missing is on data collection and reporting.
  - What should be collected?
  - How long of retention is desired?
  - How will it be accessed.
  - Report formats
- Among the best specifications are the ones from pharmaceutical companies. The regulations have driven this detail. Many of us feel that food manufacturing is not far behind.

Imagery Capture

- One of the items I believe that will really be taking off in the near future is the capture of imagery.

- Most of us are carrying a smart phone with a high definition camera built into it.   That camera is capable of pictures and video.

- You are starting to see maintenance wearing body cameras to record the process of rebuilding something to assist in the training of younger personnel.

Offsite Troubleshooting

- We have seen great changes to outside access to our control systems. Very seldom do we install a system without the capability of remote support. This leads to less downtime, but there is only so much that can be done without seeing some of the equipment physically.

- Troubleshooting has started where shared video, and pictures are being texted to our company to assist in the offsite trouble shooting of a system.

- This decreases the downtime significantly and also saves money from having to fly a specialist to your facility.

Last Thought

- Consider the data that will help you or your company.

- Find out how to get that into your data storage.

- Determine the best format to retrieve it from the system.

Any Questions

Thank you!