There is Nothing New Under the Sun

PRESENTATION
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Presented by
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INTRODUCTION:

Good morning. We were asked to discuss the latest technology for hydro plant remote control. Instead I want to discuss "There is nothing new under the sun."

Inventions and innovation become commercial at the intersection of technology and the market demand. Sometimes technology leads market. For example, lead-acid batteries were invented 175 years before the automobile created a market for portable automobile starting batteries and now it has been 100 years for battery technology to advance beyond the basic lead-acid battery.

Sometimes the market is there waiting for technology. I once visited a hydro plant in Ann Arbor, Michigan allegedly designed by Henry Ford himself in the 1930's. Everything on the generator floor was shiny black and chrome like a Model A Ford. The plant was fully automated using electro-mechanical control relays. Electrical engineers have known how to design automated industrial processors for at least 75 years but it was the development of the programmable logic controller, PLC to supply the market demand for industrial and hydro automation.
Many of you remember when radio communication links required FCC license and they never worked that well. Now spread spectrum radios are ubiquitous for garage door openers, cell phones, wi-fi hot spots, remote control on and on limited only by your imagination.

Did you know the movie star of the 40’s Hedy Lamarr was the inventor of the spread-spectrum technology with composer George Antheil; they called it frequency hopping.

Now there are several SCADA-graphical interface software packages on the market that are updated every couple of years. Any of them will do the job if you do the basics but if you don’t do the basics nothing works.

**Basics**

The basics need not be in a particular sequence but you must do all of them:

- A Logic Diagram of what you want your system to do is the best place to start. The Logic Diagram can be in many forms depending on your comfort level. Most people even non-technical can follow a simple flow chart diagram. Every logical function, *on-off-and* must have a physical device or a virtual device in software with its unique device name. There are many Logic Diagram software packages available. Don’t ask me for a recommendation because I’ve never used one. We have so many projects in the drawer that I typically find one most like the new one and mark it up.

- A Block Diagram is a schematic representation of your system that shows all of the devices in your Logic Diagram such as wicket gate, actuators, wicket
gate position sensors, etc. If the device is on the Logic Diagram, it must be on the Block Diagram and vice-versa.

- Device List is a list of all the unique names from the Logic Diagram and Block Diagram. You can’t make a Device List in the abstract, you need the Logic Diagram and the Block Diagram.

**SUMMARY**

When we talk about “latest technology” we implicitly assume latest technology is the best technology. For me the best is the vendor with a local application engineer with at least 5 years-experience who is willing to work with me and help. Thank you.
APPENDIX

1. Spread Spectrum
2. Logic Diagram – Example
3. Block Diagram- Example
4. Device List – Example
1. Spread Spectrum

In 1942, actress Hedy Lamarr and composer George Antheil received U.S. Patent 2,292,387 for their "Secret Communications System". This intended early version of frequency hopping was supposed to use a piano-roll to change among 88 frequencies, and was intended to make radio-guided torpedoes harder for enemies to detect or to jam, but there is no record of a working device ever being produced. The patent was rediscovered in the 1950s during patent searches when private companies independently developed Code Division Multiple Access, a non-frequency-hopping form of spread-spectrum, and has been cited numerous times since.

A practical application of frequency hopping was developed by Ray Zinn, co-founder of Micrel Corporation. Zinn developed a method allowing radio devices to operate without the need to synchronize a receiver with a transmitter. Using frequency hopping and sweep modes, Zinn's method is primarily applied in low data rate wireless applications such as utility metering, machine and equipment monitoring and metering, and remote control. In 2006 Zinn received U.S. Patent 6,996,399 for his "Wireless device and method using frequency hopping and sweep modes."

https://en.wikipedia.org/wiki/Frequency-hopping_spread_spectrum
AUTOMATIC FLOW CONTROL -- ENABLE, SET

ENABLE AUTOMATIC FLOW CONTROL

FLOW CTRL MODE

AUTO

TC MODE = 1

MIN OUTFLOW LIMIT

INFLOW > AB 0 FERC MAX SP

MIN OUTFLOW LIMIT

AB 0 SP < AB 0 FERC MAX SP

AND

< MIN

FLOW

NO

YES

AB 0 SP = AB 0 FERC MAX SP

MAX OUTFLOW LIMIT

AB 0 SP > AB 0 MAX SP

AFTERBAY FLOW SETPOINT C

MAX OUTFLOW ALARM

AB 0 > AB 0 MAX SP

YES

AB FLOW ALARM

AB 0 MAX LIMITED = 1

NO

AFTERBAY FLOW MAXIMUM ALARM

AS FLOW LOST IN ALARM

AB 0 MAX LIMITED = 0

REVISION  DATE  DESCRIPTION  DRAWN  APPR'D  PROD.  WORK

0 07/21/06  PLC AND EXCITER UPGRADE  MRE  SCS  SCS
POINT CALCULATIONS, LIMITERS, ALARMS

AFTERBAY FLOW SETPOINT CALCULATION

FLOW LIMITED FLAG
AB Q CALC LIMITED = 1

AFTERBAY FLOW SETPOINT
AB Q SP = AB Q MAX SP

FLOW LIMITED FLAG
AB Q CALC LIMITED = 1

MAX FLOW

YES

FLOW NOT LIMITED
AB Q CALC LIMITED = 0

AFTERBAY FLOW MINIMUM ALARM

MIN OUTL LOW ALARM
AB Q < AB Q FLOW MN SP

C Mn FLOW

YES

AS FLOW ALARM
AB Q Mn LIMITED = 1

AS FLOW NOT IN ALARM
AB Q Mn LIMITED = 0

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