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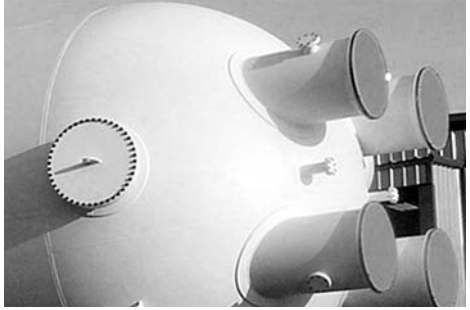
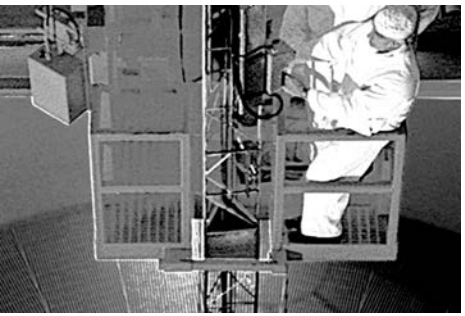
Nuclear Division

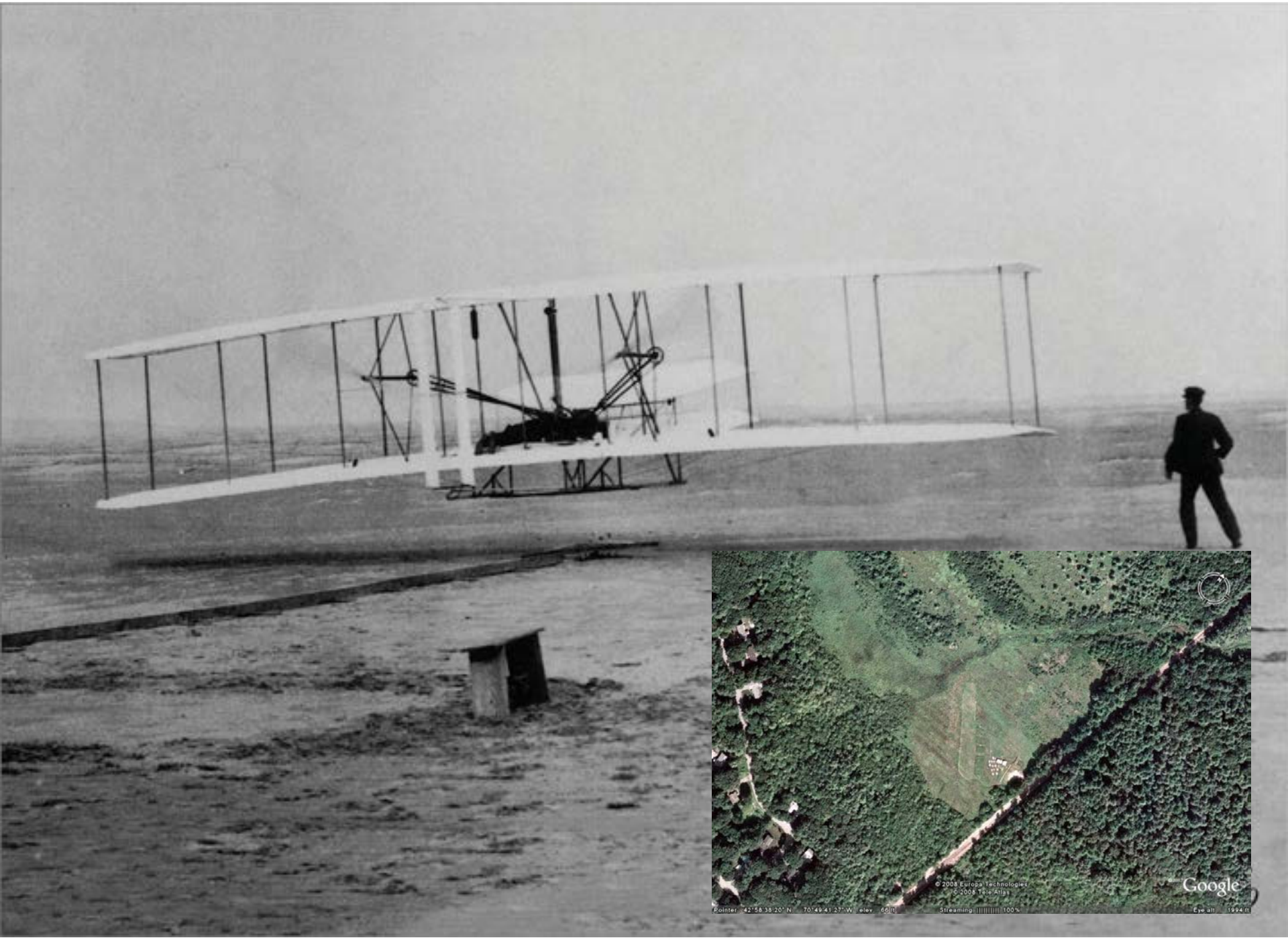


Plant Process Computers
Past, Present and Future.



Don Chase
Plant Process Systems
August 2015

CURTISS-WRIGHT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The Problem

Operations “The PPC isn’t working…..again!”

Management “So????”

Unless the malfunction results in LCO or prevents power ascension what is management’s motivation for updating the PPC?

The largest single contributor to the fragility of nuclear industry PPCs today is the remarkable ability of plant staff to repeatedly find temporary solutions to the endemic issues they encounter in these aging systems. The ability of plant staff to remedy issues and the plants’ ability to temporarily sustain operation without the PPC are the main reasons that many PPCs across the industry are so unreliable.

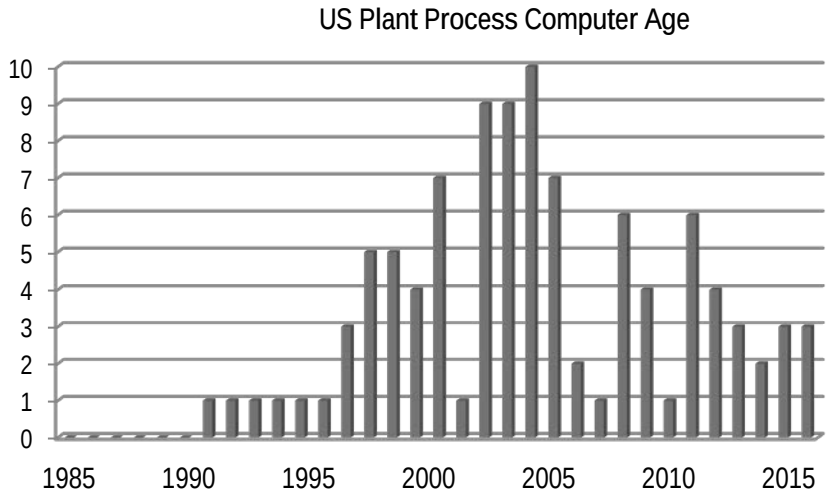
The History

Nuclear PPCs were first introduced in the early 1960s to calculate thermal performance and log a few other key parameters.

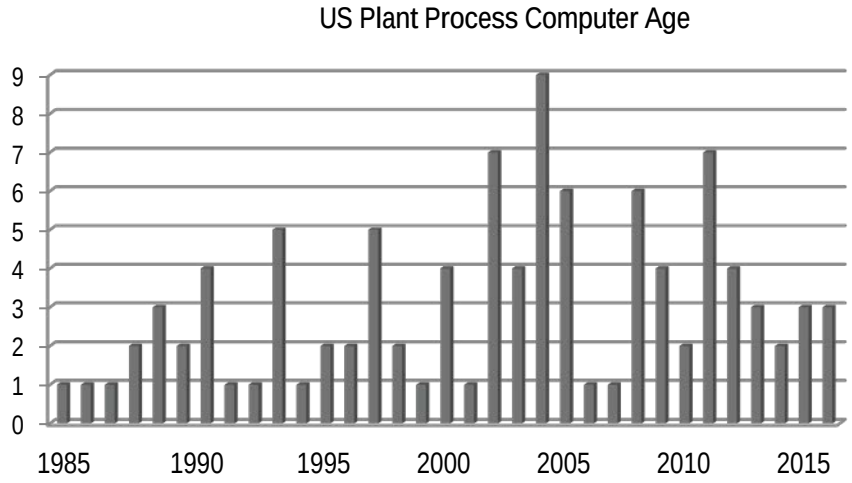
PPC development essentially halted in the mid 1980s at the end of the first nuclear build cycle and following NUREG-0696 implementation.

Current PPC functionality is the outcome of ad hoc requirements to monitor operating conditions in the plant that must be synthesized from available process variables and I&C design goals to minimize the control room size, complexity and cost while maximizing the information available to the operator.

The Current Age of the US Nuclear Plant PPCs



By the numbers

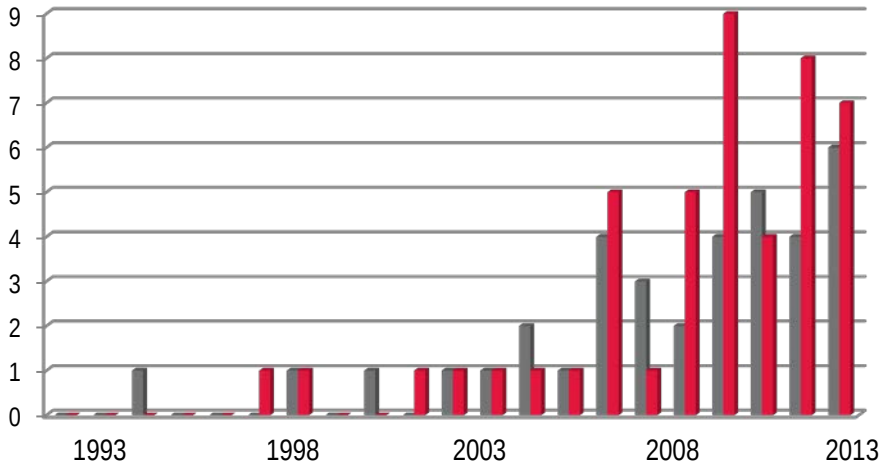


Plant perception

Many plants actually consider their PPC installations older than might be concluded due to network, infrastructure and component age.

Increasing Failure Frequency

Partial inoperability rising dramatically

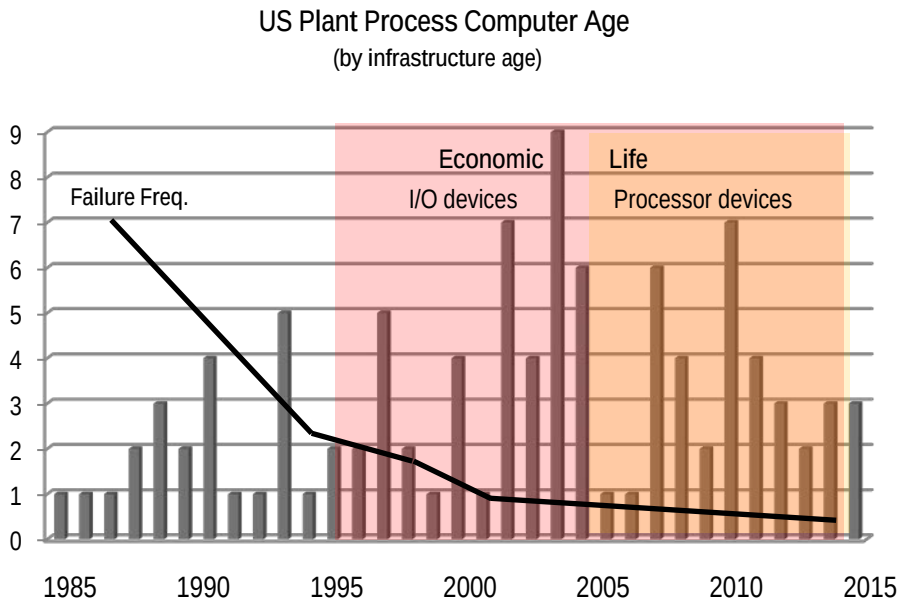


20 Year Aggregate Condition Reports Failure Frequency

Resulting in

- Reduced operator plant visibility
- Loss of the ability to track plant performance
- Delayed or missed surveillances
- Loss of the ability to trend equipment performance.
- Delays in equipment troubleshooting
- Unrealized degradation in equipment performance.
- MW loss during power ascension or LCO.

PPC Life Cycle



Processor based components	8 – 12 years
I/O devices	15 – 20 years
Displays	10 – 15 years
Work Stations	8 – 12 years
Network Components	10 – 15 years

1-byte

Bigger Byte

Path Forward

Today – Reactive response

- Recognize failures increase operating costs
- Age increases likelihood of unrecoverable failure
- Failure risk is greatest during power ascension
- Exiting tribal knowledge increases recovery risk

Tomorrow – Proactive design

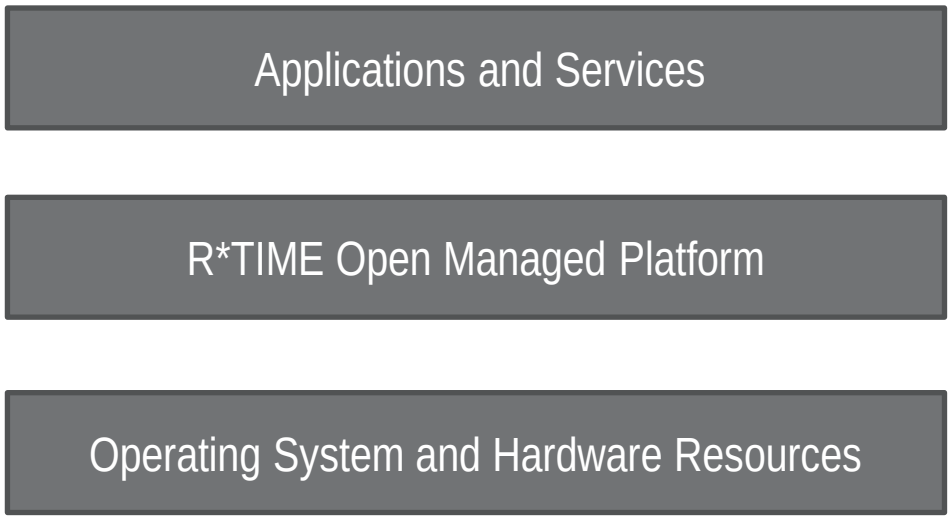
- Change the paradigm
- Eliminate proprietary content
- Drive toward open environment
- Eliminate component interdependence
- Adopt modern programming tools
- Manage obsolescence

Path to Successful PPC Project Approval

- Use lessons learned to support planned action.
- Record and quantify all PPC impacts on operations.
- Create a PPC life-cycle strategy that demands operation through decommissioning.
- Map out a plan to eliminate component and software independencies.
- Understand technology obsolescence progression and formulate actions to manage it.
- Determine project and management success metrics before meeting with the Plant Health Committee.

Changing the Paradigm

Build an open, managed platform with interchangeable parts that eliminates obsolescence issues and component / software interdependencies.



Hardware Independent
Modern Language Compliant

Common standardized interface
Managed Resource Compatibility

Operating System Conformity
Architecture Compliance

- Eliminates Obsolescence issues
- Simplifies Maintenance and Support
- Encourages Plant and Fleet Standardization
- Enables simple addition new functionality throughout the plant
- Controls system “Refresh” costs

Questions?

R*TIME System Architecture