



# How to Engage Employees through Technology - The impact of Computer-Based Procedures

January 2017

*Changing the World's Energy Future*

Johanna Oxstrand



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**January 2017**

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# How to Engage Employees through Technology

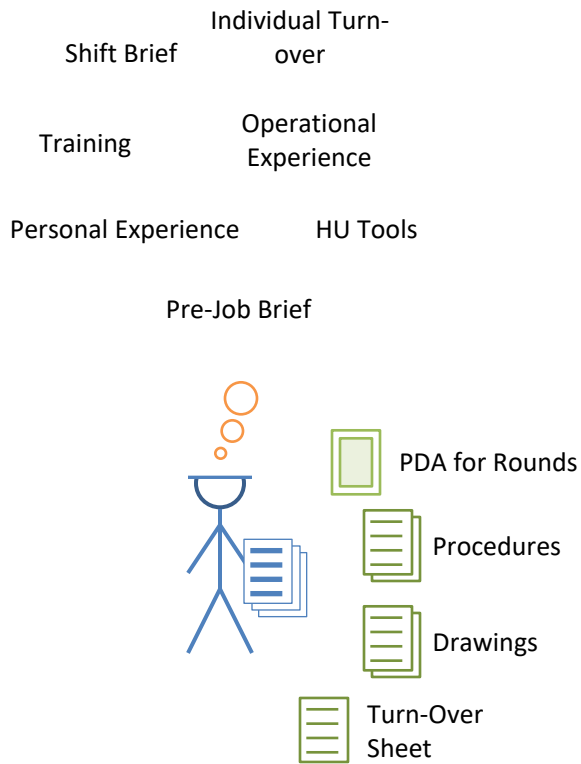
## The Impact of Computer-Based Procedures

**Johanna Oxstrand**  
**Idaho National Laboratory**

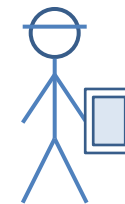
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## Current Plant Status



**Current**



Everything  
Everywhere  
Seamless  
On demand  
Real Time Status

**Future**

# Computer-Based Procedure Research

## Research Objectives

- Define design requirements
- Streamline and distill information
- Use dynamic presentation to:
  - Increase efficiency
  - Improve the ease of use
  - Reduce opportunities for errors
  - Incorporate human performance tools
- We do **NOT** investigate how to display a document on an electronic device

# Human Factors Research

- Human Factors Drivers
  - Focus on task
  - Integration of human performance tools
  - Procedure use & adherence
  - Dynamic procedures
- Four Field Tests
  - Catawba
  - Palo Verde
  - Diablo Canyon
  - Vogtle 1 & 2



## ***Error-Prone Situations***

Omitting steps  
Doing steps out-of-sequence  
Making poor field decisions (failure to adhere to procedure)  
Manipulating wrong equipment  
Relying on operator memory and experience

## ***Solutions***

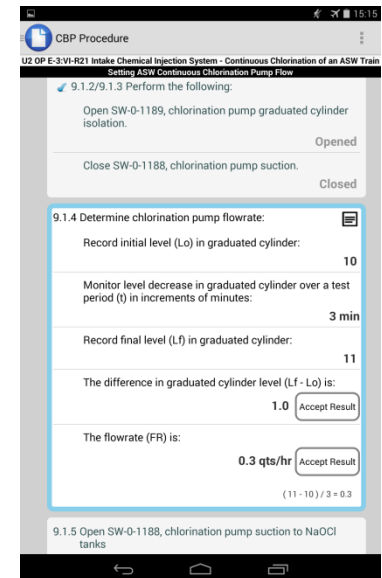
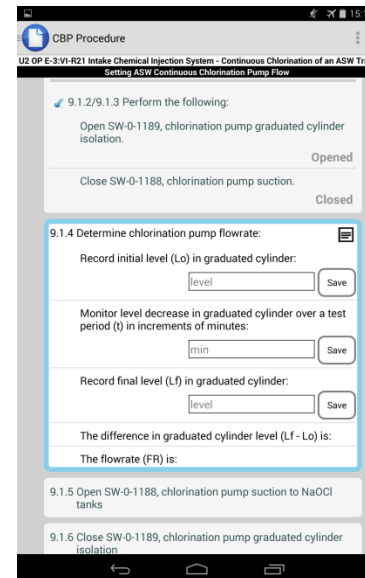
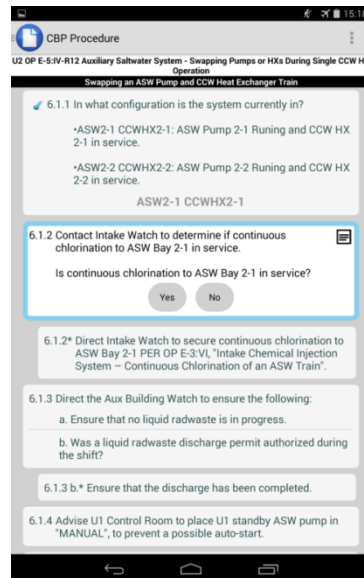
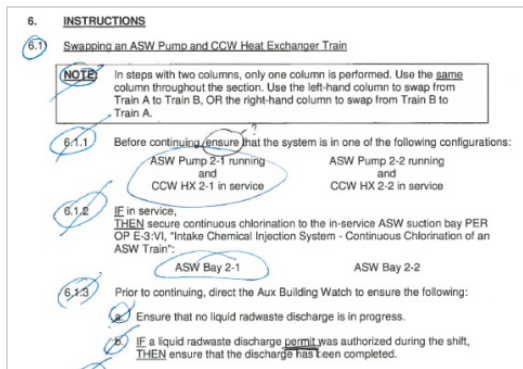
Automated Place-Keeping  
Dynamic Context Sensitivity  
Simplified Step Logic  
Automatic Verifications  
Dynamic cues to highlight important information  
Access to supplemental materials  
Automated aids





# Results - Greatest Impact on Performance

- Automatic placekeeping
- Digital correct component verification
- Calculations
- Photos and drawings
- Checking ranges and tech specs
- Notifications
- Timers



# Examples

10:56

CBP Summary

**DEMO-1 (Short) Functional Test Compressor 1**  
**Enclosure 1 Procedure**

Has the B/U VI Compressor 1 been returned from preventive or corrective maintenance?  
{CAP-YY-2139}

Yes

Is this the initial run?

Yes No

Ensure the following valves are closed:

1VI-4517 (VI Comp B/U1 Disch Drain)

1VI-4518 (VI Comp B/U1 Disch)

8:43

CBP

**Operation of the Flow Work Station**  
**Lab Lineup**

Ensure the following valves are closed:

V1, Pump Outlet Isolation Valve

✓ V1  
Closed

V2, Upper Flow Station Reservoir Inlet Valve

✓ V2  
Mark as Closed

V3, Upper Flow Station Reservoir Outlet Valve

✗ V3  
Scan V3 Manually Confirm V3

V7, Flow Control Valve Inlet Isolation Valve

15:15

CBP Procedure

**U2 OP E-3:VI-R21 Intake Chemical Injection System - Continuous Chlorination of an ASW Train**  
**Setting ASW Continuous Chlorination Pump Flow**

Record final level (Lf) in graduated cylinder:

11

The difference in graduated cylinder level (Lf - Lo) is:

1.0

The flowrate (FR) is:

0.3 qts/hr

9.1.5 Open SW-0-1188, chlorination pump suction to NaOCl tanks

Opened

9.1.6 Close SW-0-1189, chlorination pump graduated cylinder isolation

Closed

9.2 Record scheduled chlorination flowrate:

qts/hr Save

9.2\* Adjust Pp 0-2 pump speed and/or stroke to obtain desired flowrate.

Current Flowrate: 0.3 qts/hr

Scheduled Flowrate: \_????\_ qts/hr

End of Changing Over Bay Chlorination when Changing Over From ASW Train 2-1 to Train 2-2.

# Examples

CBP Summary

U2 OP E-3-VI-R21 Intake Chemical Injection System - Continuous Chlorination of an ASW Train Summary

5.7 NaOCl Pp 0-1 and 0-2 are normally in operation with swing (0-3) pump flushed and isolated per section 6.3.

Acknowledged

5.8 If changing NaOCl Pp configuration, consider having NALCO representative present (if available) when performing manipulations.

Acknowledge

**\* ADDITIONAL JOB INFORMATION**

\*.1 Operating Experience. OP E-3VI OE.

\*.2 Attached OVIDs used in this procedure:

\*.2.1 See NaOCl Pp 0-2 ASW Bay 2-1 Valve Alignment.

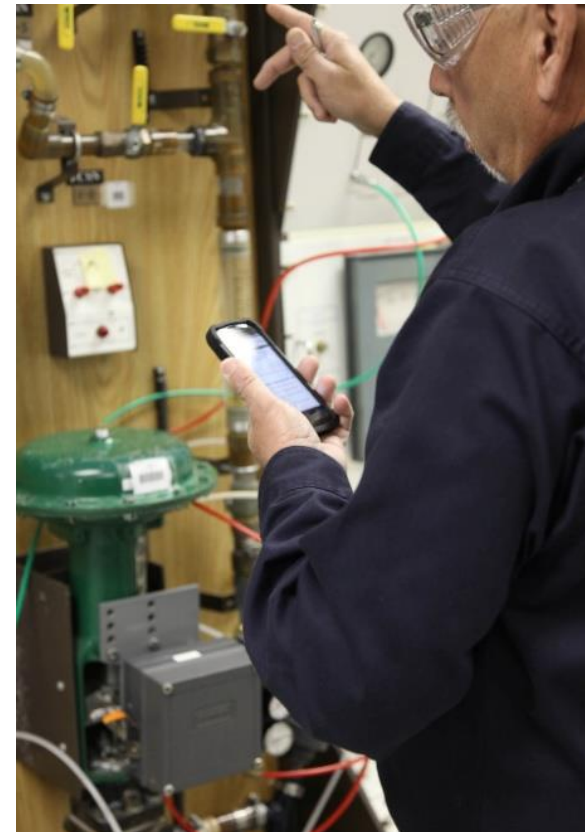
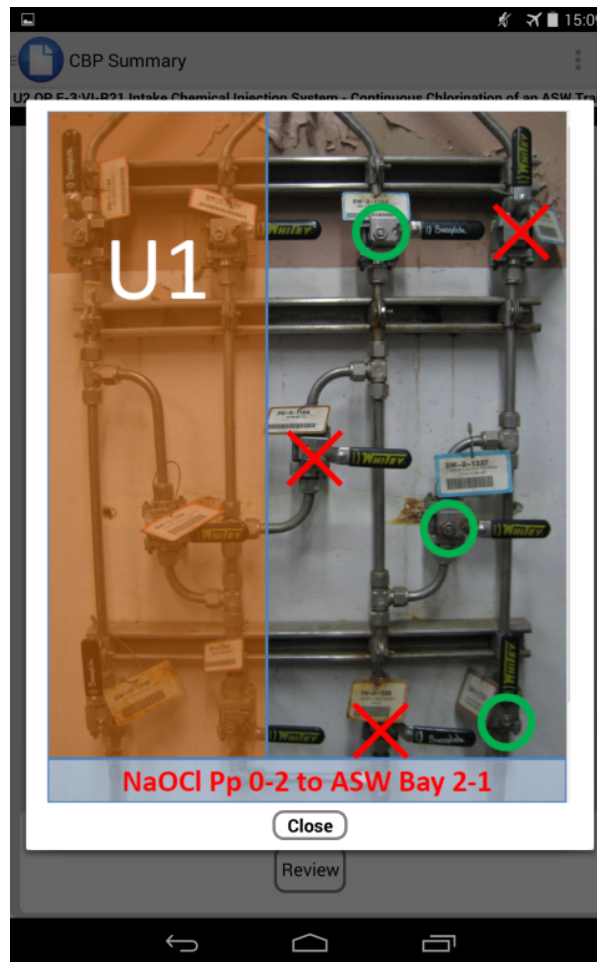
\*.2.2 See NaOCl Pp 0-2 ASW Bay 2-2 Valve Alignment.

\*.2.3 See NaOCl Pp 0-3 ASW Bay 2-1 Valve Alignment.

\*.2.4 See NaOCl Pp 0-3 ASW Bay 2-2 Valve Alignment.

You may review the process by clicking on "Review".

Review



# Examples

CBP Procedure

U2 OP E-3-VI-R21 Intake Chemical Injection System - Continuous Chlorination of an ASW Train  
Changing Over Bay Chlorination when Changing Over From ASW Train 2-2 to Train 2-1

6.9.1 Place local power toggle switch in "OFF" for Pp 0-2

Off

6.9.2 Close SW-2-1164, NaOCl to ASW Bay 2-2 (3rd Off).

REFER TO Attached OVID

Mark as Closed

6.9.3 Align ASW Bay 2-1 for continuous chlorination for Pp 0-2 for return to service in the following section.

**Chlorination of ASW Bay 2-1 Using Continuous Chlorination Pump**

1 Verify ASW continuous chlorination Pp 0-3 is NOT aligned to ASW Bay 2-2

2 Align the ASW continuous chlorination pumps discharge and cross-tie valves:

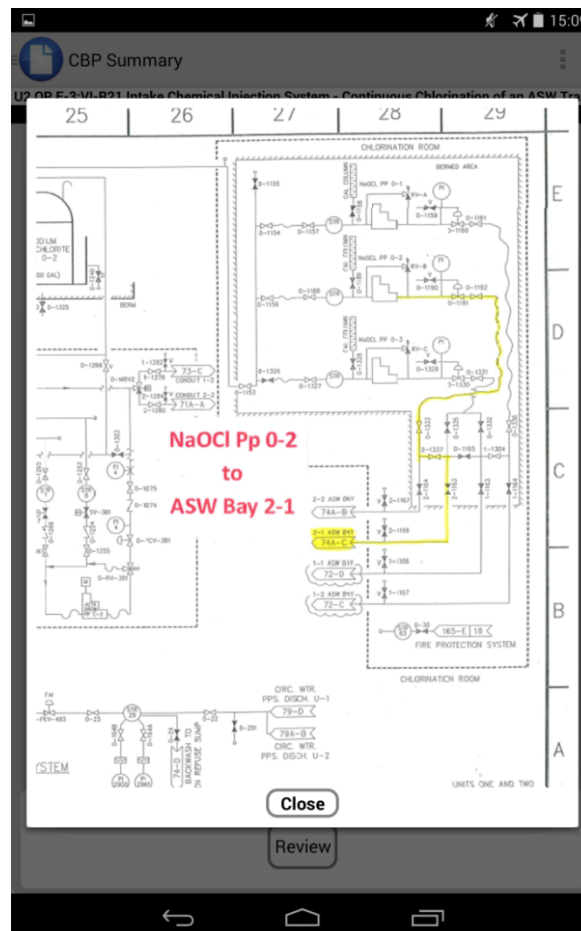
REFER TO Attached OVID

a) Open SW-0-1333, NaOCl Pp 0-2 Disch to ASW Bays (2nd Off).

b) Verify CLOSED SW-0-1165, ASW Bays NaOCl Xtie.

c) Verify CLOSED SW-0-1335, NaOCl Pp 0-3 Disch to ASW Bays (2nd Off).

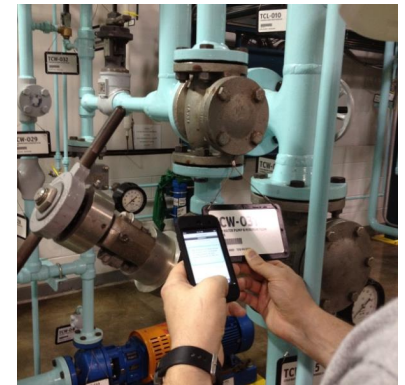
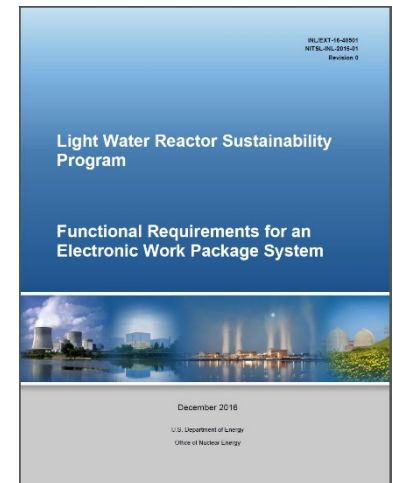
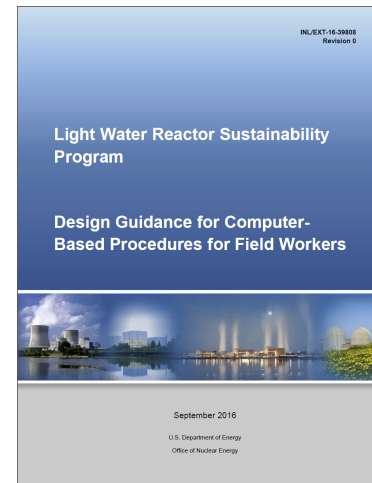
d) Open SW-2-1337, NaOCl Pp's 0-2 & 0-3 Xtie Between 2-1 & 2-2 ASW Bays





# Requirements and Design Guidance

- Comprehensive Design Guidance
  - Document
  - Web-based tool  
<http://cbpdemo.inl.gov/>
- NEWPER Requirements documents
  - Electronic Work Packages
  - Dynamic Smart Documents



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We look forward to future collaboration endeavors!  
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