



Cicada

(from Google images)

SACADA

A Data Collection Tool for Simulator Training

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This document can be found in NRC's Web-based ADAMS at
<https://adams.nrc.gov/wba/> with the access number of ML17053B558

Presentation Outline

- Brief history
- Introduction of the SACADA*
 - Functions & graphical user interface
- Benefits for operator simulator training
- Framework for collaborating with the U.S. Nuclear Regulatory Commission (NRC) on SACADA

*SACADA: Scenario Authoring, Characterization, and Debriefing Application

Brief History

- NRC wants to collect operator simulator training data to improve its human reliability analysis (HRA) techniques.
- NRC collaborated with the South Texas Project Nuclear Operating Company (STP) to develop the SACADA system
 - With support of the Idaho National Laboratory and domain experts
- STP has used SACADA for operator simulator training since 2012 with very positive experience

Some of the Developers



Current Collaborations

- STP (since 2011)
- Halden Reactor Project (since 2014)
- Advanced test reactor (since 2016)
- Taiwan Power Company (since 2016, piloting)
- KAERI(Korea) (since 2013*)
- ÚJV Řež, a. s. (Czech Republic)(since 2015*)

*Reviewing taxonomy but not sharing data

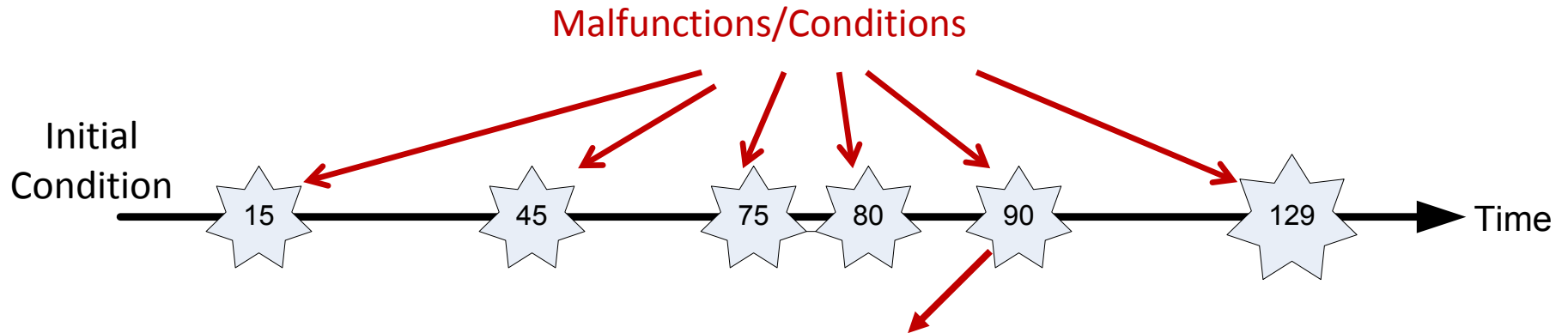
SACADA's Goals

- Capture real simulator performance data to inform HRA
 - The goal here is to determine actual risk, and get possible credit for performance
- Provide a debriefing tool that facilitates improved operator performance

SACADA Software Main Functions

- Design simulation scenarios
- Characterize performance challenges
- Debrief performance results
- Output data (Reports)

Simulation Scenario Structure



Training
Objective
Elements

Loss of ECW 1A	
POSITION	EXPECTED RESPONSE
CREW	Recognize loss of EW flow to A train.
Crew	Secure ECW pump 1A
SM	Manually trip Diesel Generator prior to any of Diesel Generator trips
Crew	Ensure CCP 1A is in service
Crew	Verifies Natural Circulation
SM	Determines need to cooldown
SM	Declare an Alert HA1/EAL2 due to damage to EW structure or notify ED that escalation is appropriate.

Authoring – Design Simulation Scenarios

SACADA Scenario Authoring, Characterization, and Debriefing Application

Scenario Selection | Debrief | Reports | Export | Forum-FAQ | Authoring | Admin

Language: English - US | Account | Logout | About

Plant: Example Plant | Year: 2017 | Cycle: Cycle 1 | Crew: Test A | Scenario: RST 216.17 - CPE Scenario | Instructor: Instructor Generic | Comments/Info:

Select Scenario | Add Scenario | Copy Current Scenario | Plant: Example Plant | Year: 2017 | Cycle: Cycle 1 | Scenario: RST 216.17 - CPE Scenario

☒ + Add Malfunction | Import Malfunction | Malfunctions: 12 Items

☐ + Add Element | Import Element | ECO activity

☐ + Add Element | Import Element | No. 12 Condensate Pump Trip

☒ + Add Element | Import Element | Fire in No. 12 Condensate Pump Motor

Position	Expected Response	Context
US	Enter POP04-ZO-0008, Fire/Explosion	✓
CREW	Activate the fire alarm, make the announcement, and call out the Fire Brigade	✓
SM	Review 0ERP01-ZV-IN01 for Emergency Plan Classification (None required)	✓

☒ + Add Element | Import Element | Injured Fire Brigade Member

Position	Expected Response	Context
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Authoring – Edit Malfunction/Situation

SACADA Scenario Authoring, Characterization, and Debriefing Application

Scenario Selection Debrief Reports Export Forum-FAQ Authoring Admin

Language English - US Account Logout About

Plant: Example Plant Year: 2017 Scenario: BPT 246 47 CBF Scenario: Instructor Instructor Canada Comments: Info

Select Scenario Add

☒ + Add Malfunction |
☐ + Add Element |
☐ + Add Element |
☒ + Add Element |

Position

Position

Position

Position

☒ + Add Element |

Position

Edit Malfunction

Title: Fire in No. 12 Condensate Pump Motor

Description:

Order: 3

Enable Timing Data: ☒

Trigger on Start of Malfunction: - No Trigger -

Trigger on Start of Element: - No Trigger -

Trigger on Stop of Element: - No Trigger -

Save Cancel

Authoring – Edit Elements

SACADA Scenario Authoring, Characterization, and Debriefing Application

Scenario Selection | Debrief | Reports | Export | Forum-FAQ | Authoring | Admin

Language: English - US | Account | Logout | About

Plant: Example Plant | Year: 2017 | Cycle: Cycle 1 | Crew: Test A | Scenario: RST 216.17 - CPE Scenario | Instructor: Instructor Generic | Comments/Info:

Select Scenario | Add Scenario

Position

- US
- CREW
- SM

Edit Element

Expected Response: Enter POP04-ZO-0008, Fire/Explosion

Order: 1

Position: US

Position Color:

Enable Timing Data: ☒

Trigger on Start of Malfunction: Fire in No. 12 Condensate Pump Motor

Trigger on Start of Element: - No Trigger -

Trigger on Stop of Element: - No Trigger -

Save Cancel

Authoring -

Four Levels of Element Importance

1. Red: Critical tasks directly affect core safety and radioactivity release
 - E.g., manually trip reactor and emergency depressurization
2. Orange: affect the availability and reliability of the equipment related to reactor safety or other items important to safety
 - E.g., enter correct AOPs/EOPs, EAL classification, and training emphases
3. Yellow: Professional tasks, not affecting reactor safety
 - TS LCO and three-way communication
4. White: general tasks

EAL: Emergency Action Level;

TS LCO: Technical Specification Limiting Condition for Operation

Authoring – Summary

- Four levels of element importance
- Semi-automatic time data collection
- Develop new scenarios based on old scenarios to save effort
- Import/export functions to share information between plants
- Lock scenario to prevent from editing
- Store scenario package
- Group discussion corners: instructors & crews

Characterization – Task Cognitive Type

Element: Enter POP04-ZO-0008, Fire/Explosion

Characterize Expected Response

Select the Type for this Expected Response

- ☐ **Placeholder:** Trivial or needed placeholder/milestone currently not worth characterizing [i](#)

----- 1st DRAWER (Standard) ELEMENTS -----

- ☐ **Monitoring/Detection:** Detecting a cue or prompt. [i](#)
- ☒ **Diagnosis and Response Planning:** Cognitive processes that result in an observable outcome. [i](#)
- ☐ **Manipulation:** Manual manipulation of a component remotely from the Main Control Room. [i](#)
- ☐ **External Communication:** Communication with anyone outside of the control room. [i](#)

----- 2nd DRAWER (Special Purpose) ELEMENTS -----

- ☐ **Localized Operator Detection and Response:** Action taken following the "Review" step of STAR. [i](#)
- ☐ **Tech Specs:** Entry into, exit from, or upgrade/downgrade of a Technical Specification.
- ☐ **Timing:** Use this to start and stop clocks based on the state of simulator addresses. [i](#)

----- MISFIT DRAWER (Left-over) ELEMENTS -----

- ☐ **Other:** Non trivial item that does not fit a category above. [i](#)

Specialized Factors

- ☐ **Immediate Action**
- ☐ **Reactivity**
- ☐ **Calculation/Assessment**

Safety Systems/Components

Next »

Characterization – Cognition Specific Factors

Element: Enter POP04-ZO-0008, Fire/Explosion

Diagnosis and Response Planning: Contextual Factors

Diagnosis or Response Planning

- ☐ Primarily Diagnosis
- ☒ Primarily Response Planning/Decision Making

Response Planning/Decision Making

Decision Basis

- ☐ **Procedure:** The decision is driven by procedures or other guidance.
- ☐ **Skill:** Skill-driven decision; without procedure, operator can make the decision from memory. ⓘ
- ☒ **Knowledge:** Knowledge-based decision (no procedure is applicable; crew relies on engineering or technical knowledge and operating experience). ⓘ

Familiarity

- ☒ **Standard:** There is a preferred, well-practiced decision for this challenge. ⓘ
- ☐ **Adaptation Required:** Procedures must be adapted to fit the situation (e.g., plant conditions do not match procedure assumptions).
- ☐ **Anomaly:** Standard training must be adapted to fit an anomalous situation (e.g., the procedures do not cover the circumstances).

Outcome

- ☒ **Procedure-Based Activity:** The decision results in the crew performing a procedure step, transitioning to another step in the same procedure, or transferring to another procedure.

Specify Outcome Procedure ID:

Specify Outcome Step ID:

- ☐ **Skill-Based Behavior:** The decision results in the performance of a skill-based activity. ⓘ
- ☐ **Knowledge-Based Behavior:** Decision results in the performance of a knowledge-based activity. ⓘ

Uncertainty

- ☒ **Clear:** There are no competing goals or uncertainty; there are clear decision criteria.
- ☐ **Uncertain:** There is a lack of information or ambiguous decision criteria.
- ☐ **Competing Priorities:** There are multiple competing goals and/or foreseeable severe consequences.
- ☐ **Conflicting Guidance:** Policies, practices, and/or procedures provide conflicting guidance.

Other

Specify:

Characterization – Overarching Factors

Element: Enter POP04-ZO-0008, Fire/Explosion

Overarching Issues

Specify Event Type:

Specify Evolution ID:

Workload

- ☐ **Normal:** All crew members have peer check and backup.
- ☒ **Concurrent Demands:** One crew member has an individual task with no backup; all other crew members have normal peer check and backup.
- ☐ **Multiple Concurrent Demands:** The crew is overloaded, with no peer check. Everyone has their own task with no backup.

Time Criticality

- ☐ **Expansive Time Available**
- ☒ **Nominal Time Available**
- ☐ **Barely Adequate Time Available:** e.g., high-tempo, time-pressured tasks.

Extent of Communications Required

- ☒ **Nominal Communication:** Standard level of three-way communication within the control room, with occasional onsite communication.
- ☐ **Extensive Onsite Communication:** High level of close communication with on-site operators (e.g. to coordinate fire response).
- ☐ **Extensive Communication Within the Control Room:** High level of close communication within control room (e.g., to coordinate actions between board operators)

Other Demands/Factors

- ☐ **Non-Standard:** Anomalous conditions force the operator to account for previous discoveries/incidents/failures.
- ☐ **Noisy Background:** Loud background noise makes communication challenging.
- ☐ **Coordination:** Requires close coordination with on-site personnel. ⓘ
- ☐ **Communicator Unavailable:** Designated communicator is needed but is not available. ⓘ
- ☐ **Multiple Demands:** Multiple competing demands on attention/distractions. ⓘ
- ☐ **Memory Demands:** Demands on memory.

« Diagnosis and Response Planning: Contextual Factors

Save\Close

Cancel

Characterization – Summary

- From a human-centered system-neutral perspective to characterize the task and challenges
- Information is important for data analysis to inform HRA
 - Extract performance information from multiple plants

Timing data

- Initially, SACADA was not designed to input data DURING the scenario
- A need arose to capture the TIMING of specific tasks
- Combined with a mobile platform, SACADA was leveraged to capture the timing of predetermined tasks

Debriefing – Collect Time Data

SACADA Scenario Authoring, Characterization, and Debriefing Application

Scenario Selection Debrief Reports Export Forum-FAQ Authoring Admin

Language English - US Account Logout About

Plant: Example Plant Year: 2017 Cycle: Cycle 1 Crew: Test A Scenario: RST 216.17 - CPE Scenario Instructor: Instructor Generic Comments/Info: Save Debrief

<input checked="" type="checkbox"/>	Malfunctions: 12 Items			Duration	Malfunction Comments	Edit
<input type="checkbox"/>	ECO activity					
<input type="checkbox"/>	No. 12 Condensate Pump Trip					
<input checked="" type="checkbox"/>	Fire in No. 12 Condensate Pump Motor			00:00:48		
	Position	Expected Response	Sat?	Duration	Comments/Notes	Edit
	US	Enter POP04-ZO-0008, Fire/Explosion	SAT	00:00:48		
	CREW	Activate the fire alarm, make the announcement, and call out the Fire Brigade	SAT			
	SM	Review OERP01-ZV-IN01 for Emergency Plan Classification (None required)	SAT			
<input checked="" type="checkbox"/>	Injured Fire Brigade Member					
	Position	Expected Response	Sat?	Duration	Comments/Notes	Edit

- The only information that needs to be collected while the simulation is running
- Tablet app available to collect time data

Tablet App for Mobility

- Collect
 - Time
 - Disposition
 - Comments
- Download/Upload data from/to server
- Windows platform

The screenshot displays the SACADA tablet application interface. At the top, there is a navigation bar with tabs for 'Scenario Selection', 'Debrief', 'Pending Uploads', and 'Settings'. Below this, a header section provides context: 'Plant: Example Plant', 'Year: 2017', 'Cycle: Cycle 1', 'Crew: Test A', 'Scenario: RST 216.17', and 'Instructor: Instructor Generic'. The main interface is divided into two sections. The top section contains a list of events, each with a plus or minus icon for expansion/collapse. The events listed are 'ECO activity', 'No. 12 Condensate Pump Trip', 'Fire in No. 12 Condensate Pump Motor' (which is expanded), 'Injured Fire Brigade Member', 'Main Feedwater Pump Trip', 'PT-0505 Failure', 'RC filter blockage', and 'Letdown Relief Lifts'. The bottom section provides a detailed view of the selected event, 'Fire in No. 12 Condensate Pump Motor'. It includes a text input field for the event description ('Enter POP04-ZO-0008, Fire/Explosion'), a 'SAT' dropdown menu, and a clock icon showing '00:01:13'. Below this, there are three rows of data entry, each with a colored header (US, CREW, SM) and a 'Comments:' text field. The 'US' row has a 'SAT' dropdown and a clock icon showing '00:01:07'. The 'CREW' and 'SM' rows also have 'Comments:' fields. The interface is designed for data collection and management on a tablet.

Debriefing – How did we do?



Debriefing – Performance Rating

Position	Expected Response	Sat?
US	Enter POP04-ZO-0008, Fire/Explosion	SAT
CREW	Activate the fire alarm, make the announcement, and call out the Fire Brigade	<div> <i>i</i> Edit selected values. <i>i</i> SAT+ <i>i</i> SAT <i>i</i> SAT Δ <i>i</i> UNSAT <i>i</i> Earlier Action <i>i</i> Interruption <i>i</i> Not Applicable </div>
SM	Review 0ERP01-ZV-IN01 for Emergency Plan Classification (None required)	
Injured Fire Brigade Member		
Position	Expected Response	Sat?
US	Enter POP04-ZO-0004, Personnel Emergencies	
Main Feedwater Pump Trip		
Position	Expected Response	Sat?
RO	Report SGFPT 12 TRIP annunciator and verify Main Feed Pump #12 has tripped.	SAT

- Four classes: SAT+, SAT, SATΔ, and UNSAT
- Default rating: SAT

Debriefing – Deficiency Analysis

- Importance driven debriefing facilitates wise use of debriefing time
 - Is mandatory when a red or orange element is SATΔ or UNSAT
 - Is optional when a yellow or white element is SATΔ or UNSAT
- Systematic analysis
 - Class of the performance deficiency
 - INPO five operator fundamentals
 - Macroognitive functions
 - Specifics of the performance deficiency
 - Causes of the performance deficiency
 - Recovery of the deficiency
 - Effects on the scenario
 - Remediation
- Stimulate thinking and discussing in debriefing

Debriefing

– Link to INPO Operator Fundamentals

Operator Fundamental Weakness x

Operator Fundamental Weakness:

Please choose a value

- Teamwork
- Control
- Monitoring
- Conservatism
- Knowledge

☒ Yes ☐ No

Roles are clearly defined

- The shift manager (SM) maintains oversight.
- The control room supervisor (CRS) has command and control.
- The shift technical advisor (STA) provides technical advice and contributes to crew oversight.
- The reactor operator/equipment operator (RO/EO) monitors and controls the plant.

- Information is in the control room operators and
- Shift turnovers
- Crewmembers other.

Operator Fundamental Weakness x

Operator Fundamental Weakness:

Teamwork

Continue to Debrief? ☒ Yes ☐ No

Save \ Close Cancel

Debriefing –

1. Macro cognition Based Deficiency Classification

- Seven classes
 - Monitoring/Detection
 - Diagnosis/Understanding
 - Procedure Following/Decision Making
 - Manipulation
 - Supervision
 - Teamwork
 - Communication
- Stimulate crew to think
- Can choose more than one class

UNSAT - Element: Enter POP04-CD-0001, Loss of Condensate Flow

Type Menu: Performance Problem Type.

Operator Fundamental Weakness: Teamwork

Instructions: Check all that apply. ⓘ

Core Tasks

Monitoring/Detection ⓘ	
✓ Diagnosis/Understanding ⓘ	Clear
Procedure/Decision Making ⓘ	
Manipulation ⓘ	

Assist Tasks

✓ Supervision ⓘ	Clear
Teamwork ⓘ	
Communication ⓘ	

« Performance Result Next »

Debriefing –

2. Deficiency Specifics - Diagnosis

UNSAT - Element: Enter POP04-CD-0001, Loss of Condensate Flow

Diagnosis/Understanding: Performance Problem Sub-Type.

Sub-Type

- ☐ **Misinterpreted:** Critical data misinterpreted. ⓘ
- ☐ **Discredited:** Critical data dismissed, discredited or discounted.
- ☐ **Incorrect/Incomplete:** Failure to form a correct understanding or to revise initial false concept. ⓘ
- ☐ **Awareness:** Lack of awareness of plant conditions.
- ☒ **Slow:** Slow interpretation of plant parameters.
- ☐ **Other:** Explain.

« Type Menu: Performance Problem Type. Next »

Progress

Type	SubType	Cause
Diagnosis/Understanding	Slow	

Recovery	End Result	Remediation

Comments

ABC ✓ Check spelling ▼

Delay in entering the POP04-CD0001 procedures

- Classify the type of diagnosis deficiency
- Stimulate crew to think what went wrong
- Other: for other specific behaviors
- Comments

Debriefing –

3. Deficiency Causes - Diagnosis

UNSAT - Element: Enter POP04-CD-0001, Loss of Condensate Flow

Diagnosis/Understanding: Performance Problem Cause.

Alarm Issues

- ☐ **Unspecific Alarms:** Individual Alarms are not specific enough pointing to the system problem.
- ☐ **Unfamiliar/Unrecognizable alarm pattern:** Alarms did not show recognizable pattern in pointing to the system problem.
- ☐ **Spurious:** For example, sensor failure triggered the alarm.
- ☐ **Failed:** key alarm failed dark.

Indicator Issues

- ☐ **Misleading Indications:** Subset of indicators gave misleading or conflicting information. ⓘ
- ☐ **Missing Indications:** The primary cue was missing. ⓘ

Other Situational Issues

- ☒ **Ambiguous/Unreliable:** Ambiguous/subtle cues.
- ☐ **Masked:** Masked cue. ⓘ
- ☐ **Pre-disposed (Fake-out):** Initial symptoms capture thinking leading to misdiagnosis. ⓘ
- ☐ **Distributed:** Relevant information distributed over time/space. ⓘ
- ☐ **Mismatch:** Plant response mismatched prior training/experience. ⓘ
- ☐ **Other:** Explain.

Overarching Issues/Person Specific

- ☒ **Overarching Issues:** Situational issues that apply across problem types. These concern factors present due to the way events unfold during the scenario.
 - ☐ **Multiple Demands/Distractions:** Multiple attention demands.
 - ☒ **Tempo:** High tempo tasks. ⓘ
 - ☐ **Memory:** Demands on memory.
 - ☐ **Stressors:** Psychological/physical stressors. ⓘ
 - ☐ **Habit Intrusion:** Highly practiced response interfered with desired response.
 - ☐ **Personnel Shortage:** Shortage of personnel. ⓘ
- ☐ **Person Specific**

- Identify the reasons contributing to the diagnosis deficiency
- Stimulate the crew to think why it happened

Debriefing –

2. Deficiency Specifics - Supervision

- Classify the supervision deficiency
- Stimulate crew to think what went wrong

UNSAT - Element: Enter POP04-CD-0001, Loss of Condensate Flow

Supervision: Performance Problem Sub-Type.

Sub-Type

☒ **▼Oversight Error**

☐ **Big Picture:** Failure to maintain a big picture of the plant status and situation.

☒ **Inadequate Oversight:** Failure to oversee the task adequately.

☐ **Standards:** Failure to uphold standards.

☐ **Brief:** Failure to brief in accordance with standards (communication issue).

☐ **Reactivity Focus:** Failure to maintain a reactivity focus (understand how events effect the reactor core).

☐ **Tech Specs:** Failure to maintain a technical specification focus (could also fall under procedure).

☒ **▼Leadership Failure:** Failure to ensure clear lines of command.

☐ **Communicate Directions:** Failure to set and communicated a direction for the crew.

☐ **Team Functioning:** Failure to promote/maintain effective team interaction.

☐ **Failure to Prioritize:** Failure to prioritize (most important things addressed first).

☐ **Poor Delegation:** Failure to delegate tasks.

☐ **Too Reactive:** Maintains a reactive posture rather than a proactive posture.

☐ **Poor Staff Loading:** Failure to utilize resources effectively.

☐ **Other:** Explain.

« Type Menu: Performance Problem Type. Next »

Debriefing –

3. Deficiency Causes - Supervision

UNSAT - Element: Enter POP04-CD-0001, Loss of Condensate Flow

Supervision: Performance Problem Cause.

Issues

- ☒ **Overarching Issues:** Situational issues that apply across problem types. These concern factors present due to the way events unfold during the scenario.
 - ☒ **Multiple Demands/Distractions:** Multiple attention demands.
 - ☐ **Tempo:** High tempo tasks. ⓘ
 - ☐ **Memory:** Demands on memory.
 - ☐ **Stressors:** Psychological/physical stressors. ⓘ
 - ☐ **Habit Intrusion:** Highly practiced response interfered with desired response.
 - ☒ **Personnel Shortage:** Shortage of personnel. ⓘ
- ☒ **Person Specific**
 - ☒ **Oversight Failure**
 - ☐ **Misplaced Trust:** Halo effect (inappropriate assuming that unsupervised work is sufficient).
 - ☐ **Non-confrontational:** Disinclined to confront nonconformance.
 - ☒ **Over Focused:** Too involved in individual tasks.
 - ☐ **Leadership Failure**
 - ☐ **General**
- ☐ **Other:** Explain.

- Identify the reasons contributing to the supervision deficiency
- Stimulate the crew to think why it happened

« Supervision: Performance Problem Sub-Type.

Next »

Debriefing –

4. Deficiency Recovery

UNSAT - Element: Enter POP04-CD-0001, Loss of Condensate Flow

Recovery

Recovery Status

☐ **Immediate Recovery:** Error was recovered with minimal impact on crew performance. ⓘ

☒ **Delayed Recovery:** Scenario objectives met but mistakes resulted in delay or confusion with noteworthy impact on crew performance. ⓘ

How Recovered

☐ **Self Recovery:** Error was caught and recovered by individual who made the error.

☐ **Peer Check:** Intervention by peer checker prevented error.

☒ **Team Recovery:** Questioning attitude by team member realigned crew.

☐ **Supervision:** Intervention by supervisor identified or prevented error.

☐ **STAR:** Review of system response uncovered error.

☐ **Unrecovered:** Error was never recovered. ⓘ

« Type Menu: Performance Problem Type. Next »

- Explicitly identify the deficiency recovery mechanism and timing

Debriefing –

5. Scenario Impacts

UNSAT - Element: Enter POP04-CD-0001, Loss of Condensate Flow

End Result

End Result From Perspective of What Plant Needs

- ☐ **None:** Error may have affected crew performance but did not impact control of the plant.
- ☐ **Required Action Not Taken:** Failed to take required action (did not attempt action).
- ☐ **Incorrect Timing**
- ☒ **Process Control Complication**
 - ☐ **Limits Exceeded:** Process parameters exceeded control band limits.
 - ☒ **Oscillation:** Excessive process parameter oscillation.
 - ☐ **Other:** Explain.
- ☐ **Executed undesired action:** Incorrect action from perspective of what plant needs or requires.

« Recovery

Next »

- Explicitly identify the impacts on the scenario

Debriefing –

6. Remediation

UNSAT - Element: Enter POP04-CD-0001, Loss of Condensate Flow

Remediation and/or Follow Through Items

Export to Crew Notebook

☐ **Export:** Add this element to the list of items to export to the crew notebook.

Remediation (Data not shared with NRC)

☐ No Follow through/Remediation Required.

☒ Follow through/Remediation Required.

☒ **Performance gap:** Individual/Team performance gap that should be addressed.

☐ **Lacks Finesse:** Individual/Team has know-how but needs practice. Note specifics in Comments field below.

☒ **Technical Knowledge:** Knowledge gaps in system fundamentals or technical concepts.

☐ **On the Spot Correction:** Knowledge gap was corrected on the spot. Note specifics in Comment field below.

☒ **Formal Remediation:** Knowledge gap will be formally remediated per the following remediation plan. ⓘ

Responsible Individual: ⓘ

James Smith by mm/dd/yyyy

☐ **Training Request:** Knowledge gap may exist across group and will be addressed per the following training request. ⓘ

☐ **Simulator Deficiency:** Fix needed to simulator equipment or code.

☒ **Condition Report**

☐ **Procedure Revision:** Problem(s) found with procedure(s).

☒ **Teamwork/Supervisory Practices**

Responsible Individual: ⓘ

James Smith

Specify Improvement:

XYZ by mm/dd/yyyy

☐ **Policy Tune Up:** Recommendation that plant policy be reviewed. ⓘ

☐ **Organizational Lesson Learned** ⓘ

☐ **Other:** Explain.

☐ **Other:** Explain.

- Specify the remediation approaches and the responsible individuals
- Export to crew notebook to save data entry effort

Debriefing – Importance Driven Debriefing

Show all elements
- Chorology driven debriefing

SACADA Scenario Authoring, Characterization, and Debriefing Application

Scenario Selection Debrief Reports Export Forum-FAQ Auth

Plant: Example Plant Year: 2017 Cycle: Cycle 1 Crew: Test A Scenario: RST 216.17 - CPE Scenario Instructor: Instructor Generic Comments/Info:

Malfunctions: 12 Items

ECO activity

No. 12 Condensate Pump Trip

Position	Expected Response	Sat?
RO	Report No. 12 Condensate Pump Trip annunciator.	SAT
US	Enter POP04-CD-0001, Loss of Condensate Flow	SAT
SEO	Monitors Deaerator Level Control Valve to ensure DA level is restored	SAT
CREW	Places the No. 13 Condensate Pump in service and Opens the discharge valve	SAT

Fire in No. 12 Condensate Pump Motor

Position	Expected Response	Sat?
US	Enter POP04-ZO-0008, Fire/Explosion	SAT
CREW	Activate the fire alarm, make the announcement, and call out the Fire Brigade	SAT
SM	Review 0ERP01-ZV-IN01 for Emergency Plan Classification (None required)	SAT

Injured Fire Brigade Member

Position	Expected Response	Sat?
US	Enter POP04-ZO-0004, Personnel Emergencies	SAT

Main Feedwater Pump Trip

Position	Expected Response	Sat?
RO	Report SGFPT 12 TRIP annunciator and verify Main Feed Pump #12 has tripped.	SAT
RO	Perform Immediate Actions; • Verify Start Up Feed Pump is running • Start the standby Feed Water Booster Pump	SAT

Show only red and orange
- Importance driven debriefing

SACADA Scenario Authoring, Characterization, and Debriefing Application

Scenario Selection Debrief Reports Export Forum-FAQ Auth

Plant: Example Plant Year: 2017 Cycle: Cycle 1 Crew: Test A Scenario: RST 216.17 - CPE Scenario Instructor: Instructor Generic Comments/Info:

Malfunctions: 12 Items

ECO activity

No. 12 Condensate Pump Trip

Position	Expected Response	Sat?
US	Enter POP04-CD-0001, Loss of Condensate Flow	SAT
CREW	Places the No. 13 Condensate Pump in service and Opens the discharge valve	SAT

Fire in No. 12 Condensate Pump Motor

Position	Expected Response	Sat?
US	Enter POP04-ZO-0008, Fire/Explosion	SAT

Injured Fire Brigade Member

Position	Expected Response	Sat?
US	Enter POP04-ZO-0004, Personnel Emergencies	SAT

Main Feedwater Pump Trip

Position	Expected Response	Sat?
US	Enter POP04-FW-0002, Steam Generator Feed Pump Trip	SAT
US	Direct/complete a load reduction to restore feed flow and SGFPT speeds to within limits (5,500-5,600 rpm for 1 hour, < 5,500 rpm with flow > 8250 gpm)	SAT

PT-0505 Failure

Position	Expected Response	Sat?
US	Enters OPOP04-TM-0004, Failure of Turbine Impulse Pressure Transmitter (PT-505/506)	SAT

Summary Table

☑ No. 12 Condensate Pump Trip

Position	Expected Response	Sat?	Duration	Comments/Notes																	
RO	Report No. 12 Condensate Pump Trip annunciator.	SAT																			
US	Enter POP04-CD-0001, Loss of Condensate Flow	UNSAT		<table border="1"> <thead> <tr> <th>Type</th> <th>SubType</th> <th>Cause</th> </tr> </thead> <tbody> <tr> <td>Diagnosis/Understanding</td> <td>Slow</td> <td>Ambiguous/Unreliable Overarching Issues: Tempo</td> </tr> <tr> <td>Supervision</td> <td>Oversight Error: Inadequate Oversight Leadership Failure</td> <td>Overarching Issues: Demands Overarching Issues: Shortage Person Specific: Oversight Failure: Over Focused</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Fundamentals</th> <th>Recovery</th> <th>End Result</th> <th>Remediation</th> </tr> </thead> <tbody> <tr> <td>Teamwork</td> <td>Delayed Recovery: Questioning Attitude</td> <td>Process Control Complication: Oscillation</td> <td> Required: Condition Report: Teamwork/Supervisory Practices: Person Responsible: James Smith Required: Remediation Performance Problem: Technical Knowledge: Formal Remediation: Responsible Individual: James Smith by mm/dd/yyyy Required: Condition Report: Teamwork/Supervisory Practices: Specify Improvement: XYZ by mm/dd/yyyy </td> </tr> </tbody> </table> <p>Hide Preview</p> <p>Delay in entering the POP04-CD0001 procedures</p>	Type	SubType	Cause	Diagnosis/Understanding	Slow	Ambiguous/Unreliable Overarching Issues: Tempo	Supervision	Oversight Error: Inadequate Oversight Leadership Failure	Overarching Issues: Demands Overarching Issues: Shortage Person Specific: Oversight Failure: Over Focused	Fundamentals	Recovery	End Result	Remediation	Teamwork	Delayed Recovery: Questioning Attitude	Process Control Complication: Oscillation	Required: Condition Report: Teamwork/Supervisory Practices: Person Responsible: James Smith Required: Remediation Performance Problem: Technical Knowledge: Formal Remediation: Responsible Individual: James Smith by mm/dd/yyyy Required: Condition Report: Teamwork/Supervisory Practices: Specify Improvement: XYZ by mm/dd/yyyy
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SEO	Monitors Deaerator Level Control Valve to ensure DA level is restored	SAT																			

- Summarize the entered information

Debriefing Summary

- Facilitate the debriefing based on task importance rather than the chronology
- Minimize eyes away from monitoring crew behavior to collect time data
- A systematic comprehensive taxonomy to stimulate discussion on performance deficiency to improve training effectiveness
- Quick data collection to meet limited debriefing time

Reports

- Various types of reports available
 - Debriefing, authoring, end of cycle, remediation, and all data (for statistical analysis)
- Can be exported to other formats including PDF, MS Word, and Excel
- Flexible to add more report types

Debriefing Reports

Exportable formats: PDF, MS Word, and Excel

SACADA Scenario Authoring, Characterization, and Debriefing Application

Scenario SelectionDebriefReportsExportForum-FAQAuthoringAdmin

Plant: Example Plant Year: 2017 Cycle: Cycle 1 Crew: Test A Scenario: RST 216.17 - CPE Scenario Instructor: Instructor Generic Comments/Info:

Report options

☒ Include Test Crews ☒ Include instructor and instructor comments

Get Debrief Report

Retrieve the report for currently selected scenario.

Get Debrief Report

Get Cycle Debrief Report

Retrieve the cycle reports for the current plant.

Year: Select a Year -
Cycle:

Get Authoring Report

Retrieve the authoring report for current scenario.

Get Authoring Report

Get Cycle Authoring Report

Retrieve the cycle authoring reports for the current plant.

Year: Select a Year -
Cycle:

End Of Cycle Report Preview

Retrieve the preview of the End Of Cycle report for the current plant.

Year: Select a Year -
Cycle:

Remediation Report Preview

Retrieve the Remediation Report Preview for current scenario.

Get Remediation Report Preview

Debrief Assessment Pivot Table

Retrieve the data for debrief.

Debrief Assessment Pivot Table

4 of 13 Rich Text Format Export

Malfunction Title	Duration	Malfunction Comments		
Fire in No. 12 Condensate Pump Motor				
Position	Expected Response	Disposition	Duration	Comments
US	Enter POP04-ZO-0008, Fire/Explosion	SAT	00:02:13	
CREW	Activate the fire alarm, make the announcement, and call out the Fire Brigade.	SAT	00:00:00	
SM	Review 0ERP01-ZV-IN01 for Emergency Plan Classification (None required)	SAT	00:00:00	

Neat Features

- Automatically Email Remediation Report

To training managers and operations managers immediately after saving the debriefing file when there is SATΔ or UNSAT in Red or Orange elements.

Remediation Report

Plant: Example Plant

Crew: Test A

Instructor: Instructor Generic

Scenario	Position	Expected Response	Disposition	Comments			
RST 216.18 - CPE Scenario COPY	US	Enter POP04-CD-0001, Loss of Condensate Flow	UNSAT	Type	Sub Type	Cause	
				Diagnosis/Understanding	* Slow	* Ambiguous/Unreliable * Overarching Issues: Tempo	
				Supervision	* Leadership Failure * Oversight Error: Inadequate Oversight	* Overarching Issues: Demands * Overarching Issues: Shortage * Person Specific: Oversight Failure: Over Focused	
				Fundamentals	Recovery	End Result	Remediation
				Teamwork	Delayed Recovery: Questioning Attitude	Process Control Complication: Oscillation	Condition Report: Teamwork/Supervisory Practices: Person Responsible

Delay in entering the POP04-CD0001 procedures

Neat Features

- Crew Composition and Experience

Scenario Experience For Test A ✕

 Add Experience

	Position	Experience
 	RO	High
 	RO-2	Med
 	SS	<div>High - > 5 years Low - < 2 years Med - 2 - 5 years High - > 5 years</div>

- Three levels of experience
 - Less than 2 years
 - Between 2 and 5 years
 - Greater than 5 years
- Balances information need and privacy

Neat Features

- User Control & Exam Security

- Can be installed on a personal computer or a server computer
 - Install in a dedicated computer for exam security
 - Install in a server for convenience
- User control in the server computer
 - Data accessibility control based on the login identification
 - Software lock to control edits

Benefits for Simulator Training

- STP Experience (1)

- Improved debriefing quality
 - Provides consistency between crews in the debriefs
 - Ensure crew addresses an issue
 - The issues cannot be minimized – drill down to the root cause
 - Can be used to track individual crew performance as well as overall department performance
- End of cycle report
 - Used for planning the next training cycle
 - Enables rapidly addressing the identified performance issues
 - Real time comparison against actual performance

Benefits for Simulator Training

- STP Experience (2)

ACAD Objective 3.2 – Managers are engaged in training activities through monitoring and oversight to provide feedback and direction

- Automatic reports
- Included in the end-of-cycle roll-up reports along with other cycle observations to get better picture of overall training performance
- Used to identify department issues to make as a focus area for future training cycles
- Allows management to promptly address performance issues

Benefits for Simulator Training

- STP Experience (3)

ACAD Objective 3.3 – Personnel performance and feedback during training are used to evaluate and modify training programs

- Tracks and trends simulator performance issues
- Captures good performance and identifies weaknesses
- Feedback issues identified export to crew notebooks
- Helps evaluate and group performance deficiencies by operator fundamentals

STP Overall Experience

- Overall very positive experience
- Has helped in identifying issues and ensuring they are closed out properly
- Have helped improve training by identifying gaps that need to be focused on in later training cycles
- A learning curve in the beginning with crews and instructors on the system and data

Collaboration with NRC

- NRC welcomes collaboration on SACADA
- Collaboration Principals
 - NRC provides free software licenses, training and technical support
 - The collaborators share the data with NRC for HRA researches
 - For NRC licensees, NRC will not perform regulatory actions against the licensees base on the provided SACADA data

Collaboration Process

- Upon request, NRC provides an onsite or web meeting to present the SACADA system and demonstrates the software for initial evaluation
- The potential partners can request to pilot the system for evaluation
 - NRC provides free training (2 days per session), software, and tech support to support the piloting
 - A memorandum of understanding (MOU) to be developed to formalize the partnership
 - A foreign language version of SACADA may need to be developed (Currently English and Chinese versions are available)
- Implement a formal collaboration based on the MOU

Share Data with NRC

- Each partner has its data stored locally
- At the end of each training cycle, the partner exports the cycle data to the SACADA master database (currently operated and maintained by the Idaho National Laboratory)
 - The remediation data will not be exported
 - The exported data contains no individual identifications
 - NRC hosts but does not own the data. The data are proprietary to the data providers.

Sharing Data Insights

- NRC plans to analyze the master database's data focusing on generic instead of plant-specific human performance insights
- Plan to analyze the data on a regular basis. The frequency is tentatively to be annually
- NRC will share the insights with the SACADA partners

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