PALO VERDE
NUCLEAR GENERATING STATION

Instructor Training

Classroom Lesson

Program: I & C Program	**Technical Review:** Wiseman, Richard T(Z01813) Digitally signed by Wiseman, Richard T (Z01813) DN: cn=Wiseman, Richard T(Z01813), email=Richard.Wiseman@aps.com Reason: I have reviewed this document Date: 2008.06.12 08:23:01 -07'00'
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Rev Author: Harry W. Gahagen	

INITIATING DOCUMENTS:

Site Maintenance Training Program Description

REQUIRED TOPICS

NONE

CONTENT REFERENCES

Orbisphere Diagnostic and Service Center Manual

36ST-9GR02 : Gaseous Radwaste Explosive Gas Monitoring System Calibration

74OP-9SS03 : Gaseous Waste System Sampling

VTM-O115-00001 Vendor Tech Manual for Orbisphere Oxygen Analyzer

Lesson Plan Revision Data

Apr 13, 2008	Harry Gahagen	Record created

Tasks and Topics Covered

The following tasks are covered in Diagnostic and Service Center:

Task or Topic Number*	Task Statement
Lesson:	Diagnostic and Service Center
GR03	Troubleshoot GR system

Total tasks or topics: 1

TERMINAL OBJECTIVE:

1.1 Given the appropriate references,, DESCRIBE the operation and components of the Diagnostic and Service Center

1.1.1 STATE the two sections associated with the Diagnostic and Service Center

1.1.2 DESCRIBE the cleaning operation using the Diagnostic and Service Center

Lesson Introduction: Diagnostic and Service Center

The following items are things to consider in your Lesson Introduction. They are not mandatory. You should develop your own introduction and place that material in the Program Hierarchy in the Lesson Introduction Tab or appropriate Training Unit.

CLASSROOM GUIDELINES

- If applicable, remind students of class guidelines as posted in the classroom.
- Pass the attendance sheet around and have it signed in Dark ink.
- Ensure that student materials needed for the class are available for each student.
- Emphasize student participation and remind them of your philosophy on asking and answering questions, if applicable.

ATTENTION STEP

- Give a brief statement or story to get student concentration focused on the lesson subject matter.

LESSON INTRODUCTION

- Give a brief statement that introduces the specific lesson topic. Should be limited to a single statement.

MOTIVATION

- Focus student's attention on the benefits they derive from the training. At Instructor's discretion. The need for motivation in each succeeding lesson must be analyzed by the Instructor and presented as necessary.
- Instructor should include how the STAR process can be used to improve or enhance Operator Performance, if applicable.
- Read and discuss lesson terminal objective and review lesson enabling objectives, if desired.
- If applicable, briefly preview the lesson topic outline and introduce the major points to be covered. The objective review may have been sufficient.
- REINFORCE the following PVNGS management expectations as opportunities become available:

  Nuclear Safety
  Industrial Safety Practices
  STAR and Self-Checking
  Procedure Compliance
  Communication Standards
  ALARA
  Prevent Events

NOTE Method of instruction will be lecture and discussion of referenced transparencies or slides and handout pages, unless otherwise specified.	**NOTE** Before class, ensure your equipment is operable and place the following on the board: Instructor's Name Instructor's work phone number Course name Course length
*******INTRODUCTION*******	*******INTRODUCTION*******
I. Attention Step.	I. Get the attention of the students on you rather than outside interests. Any appropriate means is acceptable.
II. Self Introduction	II. Introduce yourself and present your background and experience, if applicable. This is the best opportunity to have students introduce themselves, if you use this technique to "open up" the class.
III. Classroom Guidelines	III. Refer to the CLASS GUIDELINES at the front of the handout and in front of this lesson plan. Read them or discuss them as applicable to the particular group in your class.
A. Attendance Sheet	A. Pass the attendance sheet around and have it signed in black ink. If applicable, have students add their mail station numbers to the attendance sheet for use when mailing out course certificates. If needed, now is a good time to fill out a seating chart or individual name cards.
B. Materials	B. Ensure that student materials needed for the class are available for each student. For materials required, refer to the list of materials on the cover page. Describe the handout format, if applicable,

	and stress the importance of taking good notes for future reference, both in the field and for the remainder of the course.
C. Questions and Participation	C. Discuss the importance of participation and your philosophy on asking or answering questions (i.e.,do they need to raise their hand, etc.), if applicable.
IV. Lesson Introduction	
A. Topic Introduction	A. Give a brief statement which introduces the specific lesson topic(s).
1. Description of the Diagnostic and Service Center	
2. Cleaning operation of the Diagnostic and Service Center	
B. Motivation	B. Relate the specific lesson topic to the students' future and present needs.
1. Explain that the Service Center can be used to clean a sensor or used to both simulate a sensor or troubleshoot a sensor	
C. Lesson Pre-summary	
1. Objectives review	1. Read and discuss the lesson terminal objective. Refer to T002.
2. Topic summary	2. Briefly preview the lesson topic outline and introduce the major points to be covered. The objective review may be sufficient.

T.Obj 1.1	**Given the appropriate references,, DESCRIBE the operation and components of the Diagnostic and Service Center**

EO 1.1.1	STATE the two sections associated with the Diagnostic and Service Center

1.1.1.1 Main Idea

I. Diagnostic and Service Center

A. Description

1. Consists of two parts

a. Instrument

1.) Top panel

2.) Knobs

3.) Sockets

4.) Indicators

2. Two electric cables enter through the rear panel

a. Power plug - power is needed for cleaning

b. 10 pin Lemo plug - use for testing, power is not needed

b. Regeneration Cell

c. Two additional banana plugs are supplied for testing (red and black)

3. The top panel is divided in the center by a line separating the TEST section on the left from the sensor CLEANING section on the right

4. In the center is a SENSOR socket used to plug the sensor into for cleaning or testing

B. Cleaning Section

1. Contents of the cleaning section:

a. Timer switch

b. Selector Know

c. Cleaning electrode socket

Lecture ausing Powerpoint and refer to the student handout.

Diagnostic and Service Center

2. Timer switch

    a. Activates the cleaning function by sending a current through the sensor cell

    b. Automatically switch off after 70 seconds

    c. Red light in the corner illuminates when cleaning

3. Selector knob

    a. Chooses which sensor electrode is to be cleaned

    b. Anode, cathode or guard ring

4. Cleaning electrode socket - takes the red banana plug on the end of the regeneration cell

5. Regeneration cell

    a. Separate from the instrument, but is required for cleaning of a sensor

    b. The white tube fits over the sensor head and has an 0-ring inside as a seal

    c. The whicte tube is lined with a concentric tube of black carbon which acts as a counter electrode during cleaning

C. Test Section

1. Contents of the test section

    a. O2 selector selector switch

    b. Degree centigrade selector switch

    c. Series of eleven sockets for banana plugs

2. O2 selector switch

    a. Simulates the working of a sensor and delivers a series of predetermined currents (0, 0.1, 1, 10, 100. CAL)

    b. The signal is sent to the back of the micro via the Lemo plug

3. Degree centigrade switch - simulates known input signals that can be connected to the back of the micro

4. Banana sockets

    a. Allow the sensors to be electrically tested

    b. Each socket is connected to the corresponding pin of the sensor

    c. Connecting across two sockets a resistance can be measured and verified.

D. Cleaning Operation

1. Remove and disassemble the sensor

    a. Rinse with demin water

    b. Place the sensor into the stand

    c. Insert the sensor plug into the SENSOR socket of the Service Center

2. Place the regeneration cell over the sensor head and plug the red plug into the CLEANING ELECTRODE socket

3. Cleaning solutions

    a. Pour cleaning solution at least half way up the black cleaning electrode

    b. If a preliminary cleaning was done, electrolyte will be used as the cleaning solution

4. Perform the cleaning function

    a. Selector knob on the CLEANING panel to O2 CATHODE.

    b. Press the TIMER switch and verify the red light - should be on for 70 seconds

5. Observe the solution in the regeneration cell

    a. The solution should go from clear to filling with small hydrogen bubbles

    b. The solution should darken at once

    c. If after 70 seconds a large amount of bubbles are not seen, press the TIMER switch again

    d. A large amount of bubbles is a sign of a clean electrode

6. Perform the same cleaning operation and observe the same results for the Guard after placing the selector switch to the GUARD position

7. Cleaning of the anode is done the same as that for the cathode and guard, but the bubbles will probably be more suppressed

   a. The timer will need to be pressed several times before a large amount of bubbles will be seen

   b. If after 5 cleaning periods bubbles are not observed, pour out the cleaning liquid.

   c. Then carry out a chemical cleaning of the sensor with ammonia, nitric acid and ammonia then perform another Service Center cleaning

8. Once clean, unplug the cleaning electrode and sensor and empty the cleaning solution and rinse with demin water

*******SUMMARY*******	******SUMMARY******
I. Summary of Main Principles	
A. Objectives review	A. Review the lesson enabling objectives
1. STATE the two sections associated with the Diagnostic and Service Center	
2. DESCRIBE the cleaning operation using the Diagnostic and Service Center	
B. Topic review	B. Restate or review the main principles or ideas covered in the lesson
II. Questions and Answers	
A. Oral questions	A. Ask questions which implement the objectives. Discuss students' answers as needed to ensure the objectives are being met.
III. Problem Areas	III. Review any problem areas discovered during the oral questioning. Use this opportunity to solicit final questions from the students (last chance).
IV. Lessons Learned	IV. Read or have the students read applicable SER's, EER's, etc.; especially those which deal with PVNGS. Have students discuss the reports and decide what actions were incorrect, and what actions should have occurred.

V. Concluding Statement	V. Review the motivational points which apply this lesson to the students' future and present needs. Use this opportunity to address an impending exam.

EO 1.1.2	**DESCRIBE the cleaning operation using the Diagnostic and Service Center**

SUMMARY OF MAIN PRINCIPLES

The following items are things to consider in your lesson summary. They are not mandatory. You should develop your own summary.,

Objectives Review

Review the Lesson Objectives

Topic Review

Restate the main principles or ideas covered in the lesson. Relate key points to the objectives. Use a question and answer session with the objectives.

Questions and Answers

Oral questioning

Ask questions that implement the objectives. Discuss students answers as needed to ensure the objectives are being met.

Problem Areas

Review any problem areas discovered during the oral questioning, quiz, or previous tests, if applicable. Use this opportunity to solicit final questions from the students (last chance).

Concluding Statement

If not done in the previous step, review the motivational points that apply this lesson to students needs. If applicable, end with a statement leading to the next lesson.

You may also use this opportunity to address an impending exam or practical exercise.

Should be used as a transitional function to tie the relationship of this lesson to the next lesson. Should provide a note of finality.