PALO VERDE
NUCLEAR GENERATING STATION

Instrumentation & Controls Training

Classroom Lesson

I&C Program		**Date: 07/12/2000**
LP Number: NIA9902XC014	**Rev. : 01**	**Rev Author: Norman R. Cooley**
Title: Chemical and Oily Waste Water Systems		**Technical Review:Robin T. Meredith**
Duration : 1 Hour		
		Teaching Approval:

INITIATING DOCUMENTS:

Site Maintenance Training Program Description

PROCEDURES

NONE

REQUIRED TOPICS

NONE

CONTENT REFERENCES

Systems Training Manual Volume 37 "Oily Waste and Non-Radioactive Waste System"

Systems Training Manual Volume 76 "Chemical Waste System"

Tasks Covered

The following tasks are covered in Chemical and Oily Waste Water Systems:

Task Number*	Task Statement

Total tasks:	0

TERMINAL OBJECTIVE:

1.0	**Given the appropriate references,, the participant will be able to recognize the components, functions and operation of the Chemical and Oily Waste Water Systems.**

1.1	**Identify the functions of the Chemical and Oily Waste Water Systems.**

1.2	**Identify the components associated with the Chemical and Oily Waste Water Systems.**

1.3	**Recognize the operation of the Chemical and Oily Waste Water Systems.**

Lesson Introduction:Chemical and Oily Waste Water Systems

CLASSROOM GUIDELINES

If applicable, remind students of class guidelines as posted in the classroom.

Attendance Sheet

Pass the attendance sheet around and have it signed in black ink.

Materials

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.)

Questions and Participation

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 which introduces the specific lesson topic. Should be limited to a single statement.

MOTIVATION

Focus students attention on the benefits they derive from the training. At Instructors discretion. The need for remotivation 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.

Lesson Terminal Objective

Read and discuss lesson terminal objective and review lesson enabling objectives, if desired.

Topic

If applicable, briefly preview the lesson topic outline and introduce the major points to be covered. The objectives 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

<PG 11663(1220)><<Course Terminal Objective

Given the appropriate references, the participant will be able to recognize the components, purposes and capabilities of the Plant Systems and Components as demonstrate by 80% overall proficiency on a series of three written examinations.>>

T.Obj 1.0	**Given the appropriate references,, the participant will be able to recognize the components, functions and operation of the Chemical and Oily Waste Water Systems.**

EO 1.1	**Identify the functions of the Chemical and Oily Waste Water Systems.**

1.1.1 Main Idea

<PG 11663:OB 79503(1114)><<A. Overview

1. Drainage and Leakage are facts of life for a power station. At a Nuclear Power Station, we have to consider types of drains.

   a. Chemical Waste Drains

      1) high amounts of dissolved solids

      2) corrosive

      3) environmental pollutants

   b. Oily Waste Drains

      1) leakage from heavy equipment, hydraulics

      2) damages water purification media - resins

      3) environmental pollutant

      4) flammable

   c. Radioactive Drains

      1) represent a large portion of systems at plant; many are or have potential to be radioactive

      2) complicate segregation of other drains (chemical, oily, etc.)

         a) while others can be treated and released to environment easily, radioactive contamination complicates treatment and release.

d. Pure or low dissolved solid drains

1) ideal - can be released to environment easily

2) easy to reclaim by some means – demin. water is expensive

2. We need means of segregating these.

a. Separate out known

1) Radioactive drains - sent to Liquid Radwaste low TDS holdup tanks. Includes drains from:

a) Aux. Building Sump

b) Containment Drainage Sumps

2) Radioactive - Chemical Drains sent to Chem Drain Tank then to either Solid or Liquid Radwaste. Includes:

a) Decon Station Drains

b) Laboratory Drains

3) Potentially Contaminated Chemical Drains - sent to Cooling Water Holdup Tank. Include:

a) Essential Cooling Water Room Drains

b) Various Radwaste Room Drains

4) High dissolved solid wastes -sent to Chemical Waste Neutralizing Tank. Includes:

a) Condensate Demineralizer Regeneration Waste

b) Blowdown Demineralizer Regeneration Waste

5) Oily Waste - sent to Oily Waste Separator. Include various sump drains that usually contain oil.

3. Three systems to discuss are:

a. Cooling Water Waste Drain System

b. Condensate Polisher Waste and Drain System

c. Oily and Non-Radioactive Waste Drain System

d. (Radioactive Drains are discussed in the Radwaste Systems lecture.)

II. Cooling Water Waste Drain

T001

A. Function

1. Collect, by gravity, chemically treated cooling water from Auxiliary, Fuel, and Radwaste Building drains. (Expected to not contain radioactive contamination)

B. Description

1. Cooling Water Holdup Tank

a. collects drainage from primarily closed cooling loop overflows, drains, relief valves

1) Nuclear Cooling heat loads

2) Essential Cooling heat loads

b. pumped by two redundant pumps to either:

1) Chemical Waste Neutralizer tank

2) Nuclear Cooling surge tank

3) Essential Cooling surge tank

c. holds 5000 gallons - sufficient capacity to hold contents of any heat exchanger in EW or NC systems

2. Cooling Water Holdup Pumps

a. Take suction on Cooling Water holdup tank and deliver to either:

1) Chemical Waste Neutralizer Tank

2) Nuclear Cooling Surge Tank

3) Essential Cooling Surge Tank

b. 7.5 hp, 75 gpm

C. Operation

1. Cooling water waste collected until 85% level alarm received.

2. Tank is sampled for radioactivity then sent to Chemical Waste Neutralizer tank.

3. Holdup pumps stop automatically on low-low level, but are stopped manually before when low level alarm received.

III. Condensate Polisher Waste Drain Subsystem

T002

A. Function

1. Collect and neutralize potentially radioactive waste for disposal (if non-radioactive) or discharge it to the Liquid Radwaste System (if radioactive).

B. Description

1. Consists of:

a. Condensate Polishing Demineralizer (Cond Demin.) sumps

b. Cond Demin sump pump

c. Chemical Waste Neutralizer Tanks (CWNT)

d. Neutralizer transfer pumps

2. Cond Demin Sumps - 2 sumps

a. high TDS (total dissolved solids)

1) receives drains from

a) Cond Demin Acid and Caustic Regeneration drains

b) Turbine Bldg. floor drains near chemical storage tanks

2) pumped to CWNT

b. low TDS sump

1) receives water from resin rinses and overflow

2) pumped to CW intake canal or LR low TDS tank if radioactive

3. Chemical Waste Neutralizer Tanks (CWNT)

a. Receives drains from:

1) high and low TDS sumps

2) Blowdown demin high and low TDS

3) Cooling water holdup tank

4) Condenser area oily waste pumps if there is contamination in the secondary

5) Acid transfer pump

6) Caustic transfer pumps

b. Sized to receive high and low TDS waste from a regeneration of cond demin without having to dispose.

c. Contents neutralized with acid and caustic.

d. Contents sent to either

1) Retention Basin if non-radioactive

2) LR Holdup tank if radioactive

e. Two 40,000 gallon tanks

f. Equipped with acid and caustic addition lines and motor driven propeller type agitator to mix the contents.

4. Neutralizer Transfer Pumps

a. Pump contents of CWNT to Retention Basin or LR Holdup tank.

b. 10 hp, 300 gpm

C. Operation

1. Wastes are sent to high or low TDS depending on conductivity.

a. conductivity less than 100 umhos is sent to low TDS sump

b. acid and caustic rinses and rinses with conductivity greater than 100 umhos go to the high TDS sump

2. Low TDS wastes are pumped to:

a. CW canal if non-radioactive

b. to LR Holdup tank if radioactive - e.g. during Steam Generator tube leak

1) performed by manually lining up valves

2) radioactivity is detected air condenser air removal exhaust - then sump is sampled

3) if radioactivity is detected in the sump - then diverted to LR system

3. High TDS waste pumped to one of two CWNTs.

a. each tank sized to hold 2 regen cycles

b. tanks is sampled for

1) radioactivity

2) pH

c. tank pH is neutralized to range of pH 6.0 to 9.5 by addition of acid or caustic

d. after pH is neutralized, tanks released to retention basin if radioactivity within limits of the license

e. if radioactivity present (e.g. - S/G tube leak) CWNT contents pumped to LR system

IV. Oily and Non-Radioactive Waste Drains

T003

A. Functions

1. Collect and transport liquid waste from equipment and floor drains of the:

a. Turbine Bldg.

b. Control Bldg.

c. Diesel Generator Bldg.

d. Plant yard areas

2. Remove entrailed oil from the waste for disposal and transfer the oil free water to the retention basin and then to the evaporation pond.

B. Description

1. System consists of:

a. various sumps and respective pumps

b. oily waste separator

c. Retention Basins

d. Evaporation Pond

2. Sumps automatically pump their contents to oil waste separator by level controllers.

3. Oil/Waste Separator

T004

a. Acts to reduce the oil content of the influent wastes by gravity and coalescence.

1) removes emulsified and free dispersed oil

2) oil/water mixture enters through baffles that direct oil to the coalescing package that contains:

a) oil attracting (olcophile) media

b) water repelling (hygrophobic) media

3) coalescing package

a) retains suspended particles

b) coalesces oil droplets (makes big ones out of little ones)

c) distributes flow in laminar flow for more effective separation

4) oil goes into coalescing chamber

a) water is drawn through prefilter cartridges and is discharged to the separator sump

b) oil particles separate from the liquid, become larger, rise to surface

c) oil skimmers remove oil to oil storage compartment which pumped to a disposal truck

d) water is pumped to retention basin

5) oil/waste separator accommodates 200 gpm flow demand

4. Retention Basins (2)

a. 500,000 gallons each

b. contain recirc pumps to recirculate contents

c. receive discharge from all three units

5. Evap Ponds

a. receive discharge from retention basins

C. Operation

1. Sumps are pumped automatically at 80% level down to 20%.

2. Samples are periodically taken if radioactive contamination is suspected.

3. Retention Basin is sampled prior to release to Evap Pond.

a. pH - 6.0-9.5

b. Hydrazine - 10 ppm

c. presence of oil - should be none

d. if conditions are not met, corrected prior to release

>>

EO 1.2	**Identify the components associated with the Chemical and Oily Waste Water Systems.**

EO 1.3	**Recognize the operation of the Chemical and Oily Waste Water Systems.**

SUMMARY OF MAIN PRINCIPLES

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 which 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 which 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.