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GEORGIA POWER
POWER GENERATION DEPARTMENT
VOGTE ELECTRIC GENERATING PLANT

INSTRUCTIONAL UNIT

TITLE: PERFORM EMERGENCY DIESEL GENERATOR OPERABILITY TEST NUMBER: NL-IU-11205-005-01-C

PROGRAM: OUTSIDE AREA OPERATOR REVISION: 1

AUTHOR: G. D. STONE DATE: 7/31/89

APPROVED: *Royal A. Stone* DATE: 8/29/89

REFERENCES:

VOGTE PROCEDURE 14980-1, DIESEL GENERATOR OPERABILITY TEST (REV 15)

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PERFORMANCE OBJECTIVE

Given a directive from the control room, perform an emergency diesel generator operability test.

The plant must be in MODES 1, 2, 3, or 4 with both diesel generators operable for the DG operability test to be performed. Sufficient manpower must be available to perform the test. The diesel generator must be prepared for startup. With the DG running, operating parameters must be monitored. The fuel oil day tank must be sampled for water. The diesel generator air start compressor test must be performed. The system must be returned to standby mode status upon completion of the test. All communication and activities must be performed in accordance with current, approved procedures.

INFORMATION

The plant must be operating in either Mode 1, 2, 3, or 4 when the test is performed. The diesel generator operability test is normally scheduled every 31 days. The operability test run every 6 months differs depending on how the engine is loaded.

The operability test performed in this Instructional Unit is by manual start. During this test, the control room operator will be verifying that the diesel generator reaches a certain voltage (3750 to 4330) and frequency (58.8 to 61.2 Hz) within a given time (11.4 seconds). The CRO will then load the DG to 6800 to 7000 Kw paralleled with the RAT, and maintain that load for at least one hour.

The turbocharger bearing pre-lubrication is performed by opening the turbocharger prelubrication bypass valve 1 to 2 minutes before the generator is started.

Prior to the DG test, a cylinder moisture check must be performed. The moisture check must also be performed between 4 and 8 hours after the test. The moisture check should also be performed approximately 24 hours after the test. The moisture check is used to detect water in the cylinders due to a cylinder head leak.

The DG cannot be operated when the cylinder moisture check is in progress. It is important to note that one generator must be available for startup at all times.

The control room personnel should be aware of any maintenance that may have been performed on the voltage regulator or the governor. The diesel generator is equipped with circuitry that "presets" the governor and

voltage regulator. If maintenance has been performed in these areas since the previous DG shutdown, it is necessary to monitor the voltage and speed (frequency) for any erratic behavior.

INPO has compiled a report containing reported DG failures and percentages of incidence. Forty percent of the failures are associated with failed or degraded mechanical components, 42 percent are related to electrical and I&C components, and 18 percent of all failures are related to personnel error. It is very important that knowledgeable personnel be present during test runs to observe and instruct inexperienced personnel to identify operating problems. The control room will direct the procedure. During the test, the control room will require OAO assistance to obtain data from local instrumentation.

PERFORMING THE DIESEL GENERATOR OPERABILITY TEST

Startup Diesel Generator

Obtain all necessary materials in accordance with Plant Vogtle Procedures 13145-1 and 14980-1. Before the test is started a moisture check must be performed.

Record the diesel generator pre-startup readings on diesel generator Pre-start Readings Completion Sheet 1. The control room operator will supply a copy of all necessary data sheets. Upon the completion of the task, the data sheets must be taken to the control room.

1. Obtain the following equipment:
 - a. A clear container 1 liter size or larger.
 - b. Hearing protection (Sound-proofed phones, or muffs)
 - c. Copy of Procedure 14980-1, "Diesel Generator Operability Test."
 - d. Copies of Procedure 11885-C, "Diesel Generator Operating Log," one initial and one per each hour of the run.
 - e. Keys for air start receiver isolation valves.
 - f. Ensure a copy of Procedure 13145-1 is in the diesel generator room.
 - g. The CRO should dispatch an assistant to help with the barring and air roll.
2. Perform a cylinder moisture check of the diesel generator to be tested.

The opposite train diesel generator and all of its related ESF equipment must be fully operable before the control room operator will give permission to perform the check, since the DG is inoperable during the cylinder moisture check. Report start and completion times to the control room operator.

3. Record the pre-startup readings on 11885-C.

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4. Test annunciator lights.

Verify all annunciator lights are operable. The CAO will be stationed in the diesel building for the duration of the test run.

5. Align the Starting Air System per Procedure 14980-1.

Ensure the appropriate air receiver is isolated and that this information is recorded on data sheet 1 of 14980-1.

6. Pre-lubricate turbocharger bearings.

Prelubricate the turbocharger bearings by opening the turbocharger prelubrication bypass valve 1-2403-U4-130 (131 for B train) about 1-2 minutes before start time. The control room operator will direct this.

Perform the Diesel Generator Operability Test

1. Monitor the start.

While the engine is starting, listen for the escape of air from the starting air manifold vent to verify the manifold vent is open and unobstructed. Put on the sound-proofed headphones and direct anyone else in the room to put on hearing protection. Alert personnel in the room of the pending start. When the engine starts, note the red starting light, shutdown system active light, and running light. The Generator Field Ground relay may spuriously actuate, resulting in a Generator Trouble Alarm. This is an expected alarm.

2. Close the turbocharger prelubrication bypass valve 1-2403-U4-130(131). This should be soon after starting, since the lube oil keepwarm pump (the source of pre-lubrication oil) shuts off after the engine starts. Reset the Generator Field Ground relay, relay target and alarm if they were actuated during the start.

3. Open the air start receiver discharge isolation.

Open the air start receiver discharge isolation which had previously been closed.

4. Monitor temperatures as they stabilize.

For the normal 31 day run, the diesel generator will be idled for 5 to 10 minutes. Check lube oil temperature (in/out) and jacket water temperature (in/out) at the engine control panel. Ensure they are within the range shown on 11885-C, and not changing rapidly towards the end of the idle period. For the 184 day (6 month) operability test, there is no idle period.

5. Initiate the diesel generator operating log.

This is done 30 minutes after the diesel generator has been loaded. Since there are no local KW meters, the control room operators will indicate the time that the diesel generator was loaded. Observe the three annunciators

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on the engine control panel. Notify the control room of any reading outside the range on the form.

NOTE: The air compressor test may be performed now or, if desired, after DG shutdown. Agree with the control room operator as to when it will be done.

6. Examine the diesel generator during the run.

Check for the following:

- a. Generator slip-rings and brushes for excessive wearing.
- b. Generator bearing oil ring turning freely and picking up oil.
- c. Jacket water system keepwarm pump and heater off, temperatures within range, standpipe level, pump pressure, no leaks.
- d. Lube oil system keepwarm pump and heater off, temperatures and pressures within range, no leaks, differential pressures occurs strainer and filter steady and within ranges shown on 11885-C. Also, note turbocharger oil pressures, which are somewhat sensitive to increases in lube oil temperatures as loads increase.
- e. Check fuel oil system pressure and differential pressures across the filter and strainer. Observe each injection pump, checking for fuel leaks at the base of the pumps. Notify the control room if any appear. Also, check the governor/actuator which is directly associated with the fuel oil system. Its output shaft, and the linkage to the racks of the injection pumps should be steady, not jerking or hunting excessively.
- f. Check engine intake and exhaust piping for loose supports and breaks.
- g. Check the combustion air header drains. The 1/4 inch tube from the bottom of each end of both intake manifolds provide a way to blow down moisture which may be inside the intake piping. Check the drains for water when the diesel is in standby. Water in the drains indicates water in the intake manifolds.
- h. Although it is not listed in 14980-1, also check that the starting air pressure has restored and check the receiver(s) used for the start. Also, a very hot starting air supply manifold (one on each bank) indicates that one of the head-mounted starting air valves is open.

Monitor the Shutdown

1. Verify post-shutdown equipment starts.
Verify that the following equipment starts:
 - a. Jacket water keepwarm pump
 - b. Lube oil keepwarm pump
 - c. Generator heater energized

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The indicating lights are on MCC INBI (INBO).

If the lube oil keepwarm pump does not start, immediately notify the control room operator as operability can be affected by the loss of the keepwarm pump.

2. Verify that the red stopping light is off.
After the stopping light goes off, the diesel generator can accept another normal start signal. It could have started on an emergency start (breakglass or safety injection signal) while the stopping light was lit.
3. Record engine hours on Data Sheet 1.
The hour meter is on the engine control panel.
4. Check the diesel generator building HVAC.
The control room operator will stop the ESF-fans, and select the non-ESF fan for auto start. The non-ESF fan should start and the lower level dampers open at 85 degrees F., increasing. The exhaust fan in the day tank room should be running continually.

Perform Other Tests and Record Results

1. Sample the day tank for water.
 - a. Use the clear container (1 liter or larger).
 - b. Unlock the day tank drain valve 1-2403-U4-035 (036) and remove its cap. Drain a small amount of fuel oil into the container. Close the valve.
 - c. Examine the sample for water on the bottom of the container. During the one hour run, water or moisture may have been pumped from the DFST to the day tank.
 - d. Repeat the sampling process until no water is found in the sample. Dispose of the sample in the approved container.
 - e. Ensure the valve is closed. Lock and cap the day tank valve 1-2403-U4-035 (036).
2. Perform the diesel generator air start compressor test.
In this IU, train A air compressors are tested. At least one air start receiver must be greater than 210 psig at all times, and only one compressor should be tested at a time. This test may be performed while the diesel generator is loaded, if desired.
 - a. Crack open the air start receiver drain 1-2403-X4-762 and slowly reduce air pressure to 145 to 155 psig.
 - b. Verify that the air start compressor 1-2403-G4-001-C01 starts automatically when air receiver pressure is between 215 and 235 psig. If the compressor fails to start when it should, do not allow air pressure to fall below 210 psig.

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- c. If the compressor failed to start automatically, close the drain valve and immediately notify the control room operator so that maintenance can be initiated.
- d. Assuming that the compressor started correctly, place the control switch for that air compressor in OFF. (1-2403-C4-001-C01). Air will continue to bleed from the receiver.
- e. When the air start receiver pressure has decreased to 145 to 155 psig, close 1-2403-X4-762.
- f. Start the air compressor by placing the control switch to AUTO. Note the pressure.
- g. Record the air compressor start time on Data Sheet 1.
- h. Verify the compressor automatically stops at between 240 and 255 psig.
- i. Record the time the air compressor stops on Data Sheet 1.
- j. Repeat the above for air compressor and receiver 2.

3. Restore the system.

Perform the standby mode status check which is Checklist 1 of Procedure 14980-1.

4. Record the following Data Sheet 1 information:

- a. Air start receiver 1 pressure
- b. Air start receiver 2 pressure

NOTE: The five valves which were operated during this test must be independently verified. These valves are:

- Air start receiver discharge isolation which was closed (verified open).
- Turbocharger pre-lube bypass valve 1-2403-U4-130 (verified open).
- DFO day tank drain valve 1-2403-U4-035 (verified locked closed).
- Air start receiver 1 drain 1-2403-X4-762 (verified closed).
- Air start receiver 2 drain 1-2403-X4-772 (verified closed).

5. Perform a cylinder moisture check (four to eight hours after shutdown).

This again is from Procedure 13145-1. Get approval prior to performing the check.

6. Perform a cylinder moisture check (24 hours after shutdown). Get approval prior to performing the check.

LOG THE ACTIVITY.

Locate the appropriate log book and log the procedure.

PERFORMANCE GUIDE

Follow these steps to perform the diesel generator operability test.

1. Perform diesel generator startup.
2. Perform operability test.
3. Monitor DG shutdown.
4. Perform other tests and record results.
5. Log the activity.

SELF-TEST

Before proceeding to the Task Practice, answer the following questions.

1. What hearing protection is advised during the test?
2. When are readings made on the diesel generator operation log (11885-C)?
3. You should always perform a cylinder moisture check, especially when the other DC is inoperable.
 - a. True
 - b. False
4. After the control room operator has stopped the diesel generator, when can it be restarted on:
 - a. a normal start?
 - b. an emergency start?
5. If a small amount of water is found when you sample the day tank, how is it removed from the tank?
 - a. Pumped out
 - b. Recirculated back to the DFCS
 - c. Left in the tank
 - d. Re-sampled until no more water is found in the samples
 - e. Drained into a sump below the tank

ANSWERS

1. Sound-proofed phones, or earplugs.
2. Pre-startup readings after the diesel generator has been loaded for 30 minutes, and every hour thereafter.
3. False. This will render both diesel generators inoperable at the same time.
4. a. After the stopping light goes out.
b. Anytime
5. d. Resampled until no more water is found in the samples.

TASK PRACTICE

1. Review Procedure 14980-1. Be sure that you understand all precautions, limitations, and steps associated with performing a diesel operability test.
2. Take this instructional unit and Procedure 14980-1 to the diesel generator building. Be sure that you can locate all local components and instrumentation associated with performing a diesel operability test.
3. In the diesel generator building, walk through the task of performing a diesel operability test. If possible, have a fellow trainee evaluate your performance using Procedure 14980-1 and this instructional unit.

FEEDBACK ON TASK PRACTICE

1. If you have any questions about the precautions, limitations, or steps in Procedure 1480-1, ask your instructor.
2. You should have been able to locate all local components and instrumentation associated with performing a diesel operability test. If you had any difficulty, ask your instructor for help.
3. You should have walked through the steps necessary to perform a diesel operability test. If you had any difficulty, re-read the pertinent sections of this instructional unit and the procedure. Resolve any questions with your instructor.