

EN346

Advanced - 3rd Class Power Engineering Lab

6 Credits

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EN346 Version: 2



Advanced - 3rd Class Power Engineering Lab

Calendar Description

Students are guided running labs -- 27 (135 hours) in a safe efficient manner. Labs include multiple types of boilers and turbine operation coupled with power generation. Students also perform flue gas analysis, firing on oil, backup power and perform a plant shutdown. P/F.

Rationale

Students must have 200 hours of 3rd class lab (plus pass the 4 ABSA exams and a 3 month practicum) in order to be eligible for their 3rd class steam certificate. In this course EN346, students get 135 hours of those 200 hours in a controlled lab setting. In order to do this course students need to have completed EN345 and have a 4th class steam certificate. ABSA has defined requirements that these two courses demonstrate in order for students to be able to operate pressure vessels in a safe manner.

Prerequisites

EN345 and students must have a 4th class ABSA steam certificate.

Co-Requisites

None

Course Learning Outcomes

Upon successful completion of this course, students will be able

For Steam turbine driven-electric generator

1. perform a pre-start check, prior to starting a steam turbine/generator set.
2. demonstrate the correct procedure for warming up a steam line leading to the steam turbine and have the line charged at the required operating pressure.
3. safely start-up a steam turbine following the required steps or explain e.g., preparing condenser, cooling water to oil coolers, drains that are required to be opened or closed, steam glands, oil level, auxiliary oil pump, jacking oil pump, barring gear, condenser vacuum, throttle valve operation, warming up the turbine, testing the overspeed trip, etc.

Note: Some steam turbines will not have all these auxiliaries and if not, the student needs to explain what he or she would do if the turbine was equipped with these devices.

4. execute the correct procedure to synchronize and operate an electrical generator.
5. complete the safe shut down procedures for a steam turbine/generator set and if applicable setting the turbine on barring speed.
6. demonstrate the correct procedure to stop a turbine engine under routine and emergency situations.
7. demonstrate and explain if applicable how to carry out routine steam turbine/generator maintenance, for example., changing over oil coolers, cleaning oil coolers, remove water from lubrication oil tank, filling lubrication oil tank, check for overheated bearings, check for lubrication oil contaminates, etc.
8. operate a steam turbine/generator by performing routine inspections during steam turbine/generator operation.
9. demonstrate the ability to properly isolate the mechanical and electrical equipment.
10. identify and explain all of the steam turbine/generator components and their auxiliary equipment.

For Internal combustion engines and auxiliaries

1. demonstrate a pre-start and a full start-up of an internal combustion engine.
2. execute a safe shutdown following a required procedure.
3. complete the routine checks required for an internal combustion engine that is running and normal load.
4. conduct preventative maintenance for an internal combustion engine while the engine is locked out and while the engine is operating.
5. inspect and test the internal combustion engine.
6. complete the starting up of a refrigeration system.
7. perform the operating checks of an operating refrigeration system.
8. conduct the safe shutdown of a refrigeration system.
9. activate the emergency response procedure that is required during a refrigerant release.
10. perform inspection for leaks e.g., soap test, halide torch test, litmus paper detector, etc.
11. explain how to charge the refrigeration system.
12. explain how to purge the system of non-condensable gases.
13. demonstrate or explain how to add oil to the crankcase.
14. safety test devices on the refrigeration system e.g., low oil pressure, high oil pressure, high gas temperature, etc.; deaerator, feed-water pumps and heat exchangers; trace water lines from the water supply to the boilers.
15. perform pre-start checks and start-up operation of boiler feed pumps including recirculation valve operation.
16. conduct the start-up and shut-down of the operation of a deaerator.
17. demonstrate how to put a heat exchanger in and out of service.
18. explain how to prepare a heat exchanger for an internal inspection.
19. test a heat exchanger for leaks.
20. explain how to change a tube in a heat exchanger.
21. demonstrate or explain how to back flush a heat exchanger.
22. explain WHMIS as it relates to water treatment.

23. explain/demonstrate methods of internal treatment.
24. demonstrate the storage and disposal of wastes in accordance with appropriate legislation.
25. perform water treatment testing e.g., hardness, ph, chlorine, chlorides, P & M alkalinity, phosphates, conductivity, etc.
26. verify proper steam trap operation (mechanical, thermodynamic, thermostatic.
27. identify the various pipe fittings (coupling, cap, reducer, reducer tee, tee, 90 degree elbow, plug, close nipple, union, etc.).
28. explain various valves (gate, globe, needle, boiler non-return, pressure reducing, etc.).
29. inspect and test of all pressure relief devices within the power lab.
30. prepare a boiler for a pressure test to operating pressure.
31. demonstrate the use of hand and power tools as needed, micrometer and Vernier calipers.
32. identify the parts of a control valve and explain the purpose of each.
33. inspect and adjust pressure reducing valves.
34. explain the plant electrical supply and distribution system.
35. inspect all pressure equipment in the power lab.

Resource Materials

Students are required to purchase the 3rd Class EN345 and EN346 Lab Manual from the Lakeland College Bookstore. All Labs and Assignments are pulled from this document.

Conduct of Course

Students perform in the Cenovus Lab and Husky Lab:

- group/team work
- hands on controls
- water testing
- drawing and sketching
- use of tools
- trouble shooting
- plant scenarios

Evaluation Procedures

This course is a pass/fail based on:

1. Attendance, all students must complete the 135 hours, failure to miss a lab is up to the student to redo the lab missed
2. Demonstration of competencies by two methods
 - oral exam (s) walk through with instructor
 - achieve a 65% in a final exam

Grade Equivalents and Course Pass Requirements

This is a pass/fail course. The mark recorded on the transcript is a "P" for pass or an "F" for fail.

Attendance

100% attendance is mandatory for all 135 hours of the 27 labs -- failure to do so results in an incomplete or fail.

Course Units/Topics

- Lab 14 – Cenovus Lab
 - Manual synch
- Lab 15 – Cenovus Lab
 - Cooling tower
- Lab 16 – Cenovus Lab
 - Sketch fuel oil system
 - Competency checks (10 – 15)
- Lab 17 – Cenovus Lab
 - Firing WTB on oil
 - Competency checks (10 – 15)
- Lab 18 – Cenovus Lab
 - Flue gas testing (WTB)
 - Gas & oil
- Lab 19 – Cenovus Lab
 - Fire tube boiler
 - Flue gas testing (FTB)
- Lab 20 – Cenovus Lab
 - Backup generator
 - Operating positions
- Lab 21 – Cenovus Lab
 - LOTO for backup generator
 - Competency checks (16 – 20)

- Lab 22 – Cenovus Lab
 - PSV's
 - Competency checks (16 – 20)
- Lab 23 – Cenovus Lab
 - Written lab test for EN346
 - Trouble-shooting
- Lab 24 to 28 – Cenovus Lab
 - Trouble-shooting
 - Complete lab requirements
- Lab 29 – Husky Lab
 - Tracing systems
- Lab 30 – Husky Lab
 - Process diagrams
- Lab 31 – Husky Lab
 - WTB
 - FTB
 - Water testing
 - Softener regen
- Lab 32 – Husky Lab
 - Positions crew dynamics
 - Trouble shooting
 - Walk through
- Lab 33 – Husky Lab
 - Turbine generator
 - Oil firing
- Lab 34 – Husky Lab
 - Refrigeration
- Lab 35 – Husky Lab
 - Refrigeration 2

- Lab 36 – Husky Lab
 - Positions
 - Walk throughs
- Lab 37 – Husky Lab
 - Planning a shutdown
 - LOTO
 - Gant charts
- Lab 38 – Husky Lab
 - Annual shutdown
- Lab 39 – Husky Lab
 - Inspections
- Lab 40 – Husky Lab
 - Dry lay up



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