

Thermal Solar Awareness Syllabus

Time: 8 hours

Maximum Class Size: 20

Prerequisites: None

Course Description:

Solar thermal energy is produced solely by energy that comes from the sun. No harm is done to the environment in this process, therefore it is considered to be “green”. There are various ways that energy is collected and stored even when the sun isn’t shining. At the end of this course, the participants will have a basic knowledge of what constitutes “green energy” and the basic concept of geothermal energy. The basic science behind solar thermal energy is covered as well as the types of solar thermal plants, The Rankin Cycle, heat exchangers, heat storage, hydrogen electrolysis, and cathodic protection.

Goals/Objectives/Student Learning Outcomes:

- Identify different types of thermal energy
- Explain how a heat exchanger works
- Explain how steam-driven turbines are used in regards to generating electricity
- Describe different types of power sources for turbines
- Describe the Rankin cycle
- Explain how sodium and potassium nitrate can be used to benefit steam driven turbines
- Describe the dangers of high pressure systems
- Explain how electrolysis could effect a salt brine system
- Describe the process that creates hydrogen gas
- Explain cathodic protection

Standards

- OSHA 29 CFR Part 1926.300 Subpart I: Tools Hand & Power General Requirement
- 1926.301 Subpart I: Hand Tools
- 1926.302 Subpart I: Power Operated Hand Tools
- 1926.303 Subpart I: Abrasive Wheels and Tools
- 1926.304 Subpart I: Woodworking Tools
- 1926.95 Subpart E: Criteria for Personal Protective Equipment
- 1926.404 (a)(2) Subpart K: Electrical Polarity of Connections
- 1926.404 (a)(3) Subpart K: Use of Grounding Terminals and Devices

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- 1926.50 Subpart D: Medical Services and First Aid
- 1926.51 Subpart D: Sanitation
- 1926.53 Subpart D: Ionizing Radiation

Classroom Rules and Procedures

- All classes begin at 6:30 am and end at 3:00 pm
- Upon entering classroom, all participants must sign in and be seated by 6:30 am
- Class will consist of a combination of lecture, video, demonstration, coached group exercises, individual exercises and assessment.
- Students are required to report to class ready to work and maintain the provided PPE

Textbooks/Readings/Materials

Handouts:

Different Types of Thermal Energy

- Geothermal
- Thermal Solar
- Thermal Solar (with molten salt heat storage)
- Thermal Power Stations (powered by natural gas, coal & nuclear)

Heat Exchangers

Steam Driven Turbines

- Energy Story

The Rankin Cycle

Salts & Nitrates

- Sodium Nitrate
- Potassium Nitrate
- Lithium Nitrate

High Pressure Piping

- The Dangers of Uncontrolled Gases in Steam Systems

Hydrogen Gas

- What are the dangers of Hydrogen Electrolysis?

Creating Hydrogen Gas

- Homemade Hydrogen

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Cathodic Protection

- Cathodic Protection: An Overview
- Offshore Cathodic Protection

Personal Protective Equipment

- 20 pairs of gloves
- 20 pairs of Safety Glasses
- 20 pairs of Ear plugs
- 20 hard hats

Course Requirements

To receive credit for the course, participants must:

- Be present for full eight hours
- Participate in all classroom exercises
- Pass a written exam

Course Policies

- Participants must be on-time and ready to work.
- Participants must return from breaks on-time.
- Participants must participate in each exercise and assignment

Assessment and Grading

Participants will be assessed on the following:

- All written exams must be passed with a score of 80% or above.
- All hands-on exercises are graded on performance and participation. They are pass/fail and must be passed with a score of 80% or above.

Safety

Failure to maintain and use PPE may result in dismissal from the course.