

SCOPE AND APPLICABILITY:

Establish minimum requirements for the management of structural integrity of pressure vessels and its interconnecting pipes in aspects related to the installation, inspection, operation and maintenance, aiming the safety and health of workers.

REGULATIONS & STANDARDS

- NR13 - Boilers, Pressure Vessels, Pipes and Metallic Storage Tanks;
- NBR15417 - Pressure vessels - Safety inspection in service;
- NBR ISO16528 - Boilers and pressure vessels Part 1: Performance requirements;

COURSE CONTENT:

Introduction;

1. Notions of applied physics:**1.1 Pressure:**

- 1.1.1 Atmospheric pressure;
- 1.1.2 Gauge pressure and absolute pressure;
- 1.1.3 Internal pressure, external pressure and vacuum;
- 1.1.4 Pressure units;

1.2 Heat transfer:

- 1.2.1 General notions: what is heat, what is temperature;
- 1.2.2 Modes of heat transfer;
- 1.2.3 Specific heat and sensitive heat;
- 1.2.4 Heat transfer at constant temperature.

1.3 Thermodynamics:

- 1.3.1 Concepts;
- 1.3.2 Saturated steam and superheated steam.

1.4 Fluid Mechanics:

- 1.4.1 Fundamental Concepts;
- 1.4.2 Flow Pressure;
- 1.4.3 Flow types: Laminar and Turbulent;
- 1.4.4 Flow of Liquids: Gravity Transfer, Pressure Difference, Siphon;
- 1.4.5 Load Loss: Concept, roughness, accidents;
- 1.4.6 Fluid Pumping Principle.

2. Notions of applied chemistry:

- 2.1 Density;
- 2.2 Solubility;
- 2.3 Diffusion of gases and vapors;
- 2.4 Characterization of Acid and Base (Alkali) Definition of pH;
- 2.5 Basic fundamentals on corrosion.

3. Equipment inspection and maintenance topics and records.**4. Process Equipment:**

- 4.1 Piping accessories;
- 4.2 Electrical accessories and other items;
- 4.3 Water heaters;
- 4.4 Pumps;
- 4.5 Boilers (basic knowledge);
- 4.6 Compressors;
- 4.7 Condenser;
- 4.8 Demineralizer;
- 4.9 Spheres;
- 4.10 Evaporators;
- 4.11 Filters;
- 4.12 Gas washer;
- 4.13 Reactors;
- 4.14 Cooler;
- 4.15 Dryers;
- 4.16 Silos;
- 4.17 Storage tanks;
- 4.18 Towers;
- 4.19 Heat exchangers;
- 4.20 Industrial piping;
- 4.21 Steam turbines;
- 4.22 Injectors and ejectors;
- 4.23 Safety devices;
- 4.24 Others.

5. Instrumentation;**6. Unit Operation:**

- 6.1 Process description;
- 6.2 Start and Stop Procedures;
- 6.3 Emergency procedures;
- 6.4 Disposal of chemicals and preservation of the environment;
- 6.5 Evaluation and control of risks inherent to the process;
- 6.6 Prevention of deterioration, explosion and other risks.

7. Legislation and standardization:

- 7.1 Regulatory Standard No. 13 (NR-13);
- 7.2 Pressure vessel categories
- 7.3 Inspection and maintenance topics for equipment and records.

COURSE DESIGN:

TOTAL: 40 hours

PREREQUISITE(S):

High School certification;

MINIMUM/MAXIMUM NUMBER OF DELEGATES

This course requires a minimum of 1, and a maximum number of 12 trainees.

To offshore trainings, the course number of trainees will comply with the vessels/rig necessity.

MAIN SAFETY ISSUES:

- Care when using the tools;
- Selection of EPI's and tools to protect against electricity;
- Individual and collective protection measures;
- Risk assessment in the workplace;
- Escape Routes;
- Interpretation and correct data reading;
- Work distractions;
- Emergency actions to take control of involved systems;
- Be careful when conducting non-destructive pressures tests;
- Information about the project of the process units;

REQUIRED EQUIPMENT:

- Manual of the equipment;
- Procedures;
- Maintenance tools for pressure vessels;

PROCEDURE FOR PRACTICAL EXERCISES:

- The training is predominantly theoretical, but it is recommended to pass through the area and indicate points of improvement, cares with the equipment and provide application examples of the NR13 standard in equipment, without allowing the operation during training, but simulating and performing questions to the students about the features of the equipment in the company;

CERTIFICATION:

Training certificate signed by responsible Engineer accredited by Brazilian CREA.

CERTIFICATE VALIDITY PERIOD:

Recommendable: 2 years.