Chemical, Mechanical Engineering

SCANDINAVIAN ACADEMY
Training and Development

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Course: Welding Technology

Code	City	hotel	Start	End	price	Hours
142	Yerevan (Armenia)	Hotel Meeting	2024-04-15	2024-04-19	4950 €	25

The Course

Welding is a common and a very important joining process in most industries, and of particular importance in the chemical, oil and gas industries, including for example, pipelines and storage tanks.

This 5-day training programme aim to provide the fundamental principles of welding and welding techniques, helping participants recognise various welding processes.

Principal emphasis is placed on:

- Understanding the types of welding processes.
- Appreciating the different types of welding joints.
- Recognising technical prints and symbols related to welding.
- Recognising weld defects and associated problems and learning about mechanical testing, failure of welds and Non Destructive Testing.
- Learning about basic welding metallurgy.

The Goals

The course will cover the following areas:

- Types of welding process, including oxyacetylene, SMAW, TIG, MIG, and others.
- Types of joints and joint design will be introduced, e.g. but, square, grooved, bevel, butt, U, J and T, flush.
- Various weld defects and imperfections will be presented including, porosity, solidification cracking, hydrogen cracking, incomplete root fusion or penetration, residual stresses, reheat cracking, lamellar tearing, liquation cracking, slag inclusion and trouble shooting.
- Basic metallurgy will be presented and related to welding technology, including the weldabillity of ferrous and non ferrous metals, heat treatment and the significance of the heat affected zone, HAZ.
- Welding parameters, including standards, metal transfer, welding currents, shielding gas and electrode selection will be included in the course.
- Welding engineering drawing including standard welding symbols will be presented.
- Finally, mechanical testing and failure of welds will be presented in addition to non destructive techniques, NDT.

The Process

The course combines presentations and discussions of topics covered with relevant examples. It combines knowledge of fundamental principles related to welding processes, methods, and applicable standards and best industry practices and enforces learning with Question & Answer sessions to maximise the benefits to the participants.
Videos and computer simulation will be presented to emphasise relevant applications Relevant case studies will also be included.
Participants will be provided with comprehensive course notes and copies of presentation material that will be very valuable for detailed study and future reference.

The Benefits

Upon completion of this course, participants will have:

- Gained an understanding of the important principals of welding processes and joint design.
- Gained valuable knowledge, related to weld defects, properties and welding characteristics of various metals, mechanical and non destructive testing of welds.
- Acquire sufficient knowledge and skills to independently evaluate possible welding and design solutions.
- Enhanced their competence and productivity thereby improving their performance level and making additional value added contributions to their organisations

The Results

- The company will be able to understand and specify relevant welding processes, with cost effective outcomes.
- The company will be able to achieve measurable improvement through effective interaction between various engineering disciplines, including design, manufacturing, workshop, operation and maintenance functions.
- This will also lead to improvement in operating and financial performance, and lead to improvement and optimisation of relevant welding processes.

The Core Competencies

At the end of the seminar, the delegates should be able to:

- Understand the use and application of welding techniques and standards
- Understand the various types of welding joints
- Learn about the different types of electrodes and standards
- Appreciate the variations of welding various types of metals
- Know, through the study of basic metallurgy, how heat treatment may be used to overcome some of the problems associated with welding, including the HAZ
- Recognise and define the basic types of welding defects and failure
- Learn how NDT can be used to detect weld defects.

- Understand how to apply materials testing techniques to examine the strength and quality of welded joints
- Gain an understanding of corrosion test methods and interpretation of results

The Programme Content

Day One

Introduction and Weld Joint Design

- Introduction, welding terminology, codes and standards, welding failure and case studies.
- Introduction to quality, meeting requirements, customer satisfaction, quality control, how can quality be achieved?
- Weld joint design, load performance, types of joints, butt joint, square, grooved butt joint, single V, Double V butt Joint, bevel and double bevel butt, U, J and T, flush.
- Welding techniques, positional welding, backing, examples, butt welds without backing

Day Two

Welding Processes

- Welding processes, process options, benefits, problems and applications, oxyacetylene process, fusion welding processes, shielded metal arc welding (SMAW), submerged arc welding, TIG welding, solid wire MIG welding, types of flux/electrodes, metal transfer mode, power source and welding current, arc starting, shielding gas, operating characteristics, applications.
- Arc welding electrodes, US standard electrodes, electrode identification, electrode size and currents, common electrode types, extended electrode classification examples, BS classification of electrodes.

Day Three

Welding Defects and Imperfections

- Welding defects, introduction, heat affected zone, HAZ, weld defects and imperfections, porosity, solidification cracking, hydrogen cracking, incomplete root fusion or penetration, residual stresses and cracking, reheat cracking, lamellar tearing, liquation cracking, slag inclusion.
- Geometric shape imperfections - types and causes, excess weld metal, undercut, overlap (cold lapping), linear misalignment, incomplete filled groove, trouble shooting.

Day Four

Welding Technical Prints, Symbols and Basic Metallurgy

- Welding drawings (symbols), introduction, types of projection, welding joints, symbols for welds, parts of the welding symbols, placement of welding symbols, special welds, weld all around, field weld symbols and

multiple reference lines.

- Basic metallurgy crystalline structure of metals, crystal growth an overall bulk solidification of metals, solid solution, inter-metallic compounds, diffusion, micro-structure of carbon steel, heat treatment of steel, critical cooling rate and mass effect, heat affected zone (HAZ) in Welding, HAZ of carbon and alloy steels, HAZ of stainless steel.
- Materials for welded sections, weldability of steel groups, stainless steels, cast irons, aluminium alloys, filler alloys, avoiding weld imperfections.

Day Five

Materials Testing and Non Destructive Testing (NDT)

- Materials testing and failure, tensile testing, properties obtained from the tensile test, ductility and fracture in metals, impact testing (Izod and Charpy), transition temperature, hardness tests (Vickers and Rockwell), failure due to fracture, stress concentration, fracture toughness, fatigue failure, improving fatigue resistance, creep failure, destructive testing of welds, bend tests, bead-on-plate test, controlled thermal severity (C.T.S.) test, the test and assessment hierarch.
- Non destructive testing (NDT), definition and purpose of non-destructive testing, engineering demands for sounder materials, ensuring the integrity and reliability, maintaining uniform quality level of a product, dye penetrant , magnetic methods, X-ray methods, g - ray methods, ultra-sonic methods, eddy current testing, selection of N. D. T. methods, ISO standards for NDT Inspection.

The Scandinavian Academy employs modern methods in training and skills development, enhancing the efficiency of human resource development. We follow these practices:

- **Theoretical Lectures:**
  - We deliver knowledge through advanced presentations such as PowerPoint and visual materials, including videos and short films.
- **Scientific Assessment:**
  - We evaluate trainees skills before and after the course to ensure their progress.
- **Brainstorming and Interaction:**
  - We encourage active participation through brainstorming sessions and applying concepts through role play.
- **Practical Cases:**
  - We provide practical cases that align with the scientific content and the participants specific needs.
- **Examinations:**
  - Tests are conducted at the end of the program to assess knowledge retention.
- **Educational Materials:**
  - We provide both printed and digital scientific and practical materials to participants.
- **Attendance and Final Result Reports:**
  - We prepare detailed attendance reports for participants and offer a comprehensive program evaluation.
- **Professionals and Experts:**
  - The programs scientific content is prepared by the best professors and trainers in various fields.
- **Professional Completion Certificate:**
  - Participants receive a professional completion certificate issued by the Scandinavian Academy for Training and Development in the Kingdom of Sweden, with the option for international authentication.
- **Program Timings:**
  - Training programs are held from 10:00 AM to 2:00 PM and include buffet sessions for light meals during lectures.