

## Welding Metallurgy – Materials and Their Behaviours Course

**Training Date:** 26 – 30 March, 2012 (5 Days) **Training Time:** 0900 – 1600 hours

**Training Venue:** Kuala Lumpur, Malaysia

**Training Fee:** USD3,500 per participant

### Training Overview

This training course is designed to give a semi-detailed discussion of the subject of Engineering Metallurgy with emphasis on the physical metallurgy aspects and course is designed such that no previous background in metallurgy is necessary.

### Training Outcomes

At the end of the training, the participants will be able to:

- Describe the concepts and technical terms of engineering metallurgy.
- Describe the basic concepts of ferrous and non-ferrous metallurgy.
- Identify the different types of heat treatments for steel and welded fabrication.
- Select the right material in the right condition and assess material suitability for a particular application.
- Understand the types of cracking in welded fabrication causes and avoidance.
- Understand the types of mechanical testing for procedure approval and welder approval.

### Who Should Attend?

- Design Engineers,
- Process Engineers,
- Manufacturing Engineers,
- Product Development Engineers,
- Managers, Mechanical Engineers with or without experience in metallurgy, Inspectors, Quality Control Engineers, Technicians, and
- People involved in welding, fabrication and heat treatment.

### Training Methodology

A highly interactive combination of lectures and discussion sessions will be managed to maximize the amount and quality of information and knowledge transfer. The sessions will start by raising the most relevant questions, and motivate everybody find the right answers.

Participants will also be encouraged to raise your own questions and to share in the development of the right answers using your own analysis and experiences.

### SELECTED CUSTOMERS



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# Course Program

## Module 1

Structure of metals and alloys:-

- Nature of metallic bonding,
- Crystal structure of metals, and
- Imperfections in crystals.

## Module 2

Thermal equilibrium diagrams (phase diagrams):-

- The phase rule and binary equilibrium diagrams,
- Microstructure changes during cooling,
- The iron-carbon (plain carbon steel) equilibrium diagram,
- Effect of alloying elements on the Fe-C diagram,

## Module 3

Phase changes (phase transformations):-

- Types of phase changes,
- Diffusion in solids,
- Nucleation and growth kinetics and solidification,
- Ferrite, pearlite and cementite according to Fe-Fe<sub>3</sub>C diagram,
- Martensitic transformations,
- Precipitation and age-hardening, and
- Re-crystallization and grain growth.

## Module 4

Basic metallurgy of carbon and alloy steels:-

- Basic carbon steel metallurgy
  - ⊕ Crystalline structures,
  - ⊕ Grains,
  - ⊕ Microstructures (alpha ferrite, Austenite, Delta ferrite)
- Using the Fe-Fe<sub>3</sub>C phase diagram in practical terms,
- TTT diagram – Time temperature transformation – Bainite and Martensite

## Module 5

Heat treatment of steels: –

- Typical heat treatment processes:
  - ⊕ Annealing,
  - ⊕ Normalizing,
  - ⊕ Quenching and tempering,
  - ⊕ Pre – heating and Post weld Heat treatment

## Module 6

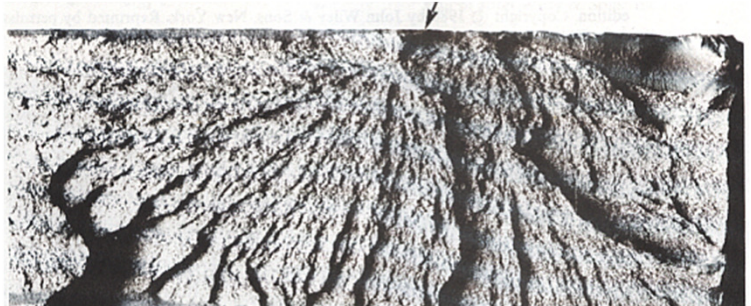
Mechanical properties and testing: –

- Tensile test,
- Impact test
- Bend test
- Harness test
- Nickbreak test
- CTOD

## Module 7

Ferrous and non ferrous material application and weldability:-

- Manufacture of steel
- Carbon steel
- High strength Low alloy steel
- Quench and tempered steel
- Cryogenic steel
- Creep resistance steel
- Stainless steel
- Duplex and super duplex
- Dissimilar joint
- Aluminium and its alloys,
- Cast irons,
- Nickel and its alloys,
- Copper and its alloys
- Titanium



## About the Course Instructor

**Mohd Faisal Yusof** joined TWI in 2001 after spending 17 years in the welding and gas industry and 2 years in teaching in technical subject in University of Kuala Lumpur. Originally trained as a welding instructor and lecturer, Faisal gained training in European Welding Engineer, technologist and specialist at TWI UK .His early experience was spent on the development and maintaining quality of welding machines and gases in Oil and Gas industries and development of welding procedure and customer services.

He is a Fellow member of Welding Institute of Malaysia and Welding Joining Society (WJS TWI UK). He has gained the qualification of European Welding Specialist and Technologist (TWI U.K) and Engineer from The Welding Institute, European Welding Federation and International Institute of Welding. He also very familiar with BS, ASME, AWS, API 510,570, DNV, NACE, PTS ISO 9000 and ABS procedures, codes & standards.

### Educational and Professional Qualifications:

- Diploma in Welding Engineer (TWI/IIW U.K)
- Diploma in welding Technology (TWI/IIW U.K)
- Diploma in Welding Specialist (European Welding Federation )
- Diploma in International Welding Specialist (International Institute of Welding)
- Diploma in Welding (TWI U.K.)
- Diploma in European Inspection Specialist (European Welding Federation )
- Diploma in European Inspection practitioner (European Welding Federation)
- Registered Senior Welding Inspector.
- CSWIP Senior Welding Inspector 3.2
- Registered Welding Inspector.
- CSWIP Welding Inspector 3.1.
- CSWIP Welding Inspector 3.0
- CSWIP Radiographic Interpreter 3.4 (A and B group)
- Certificate in Electrical Engineering (Industrial Training Institute)

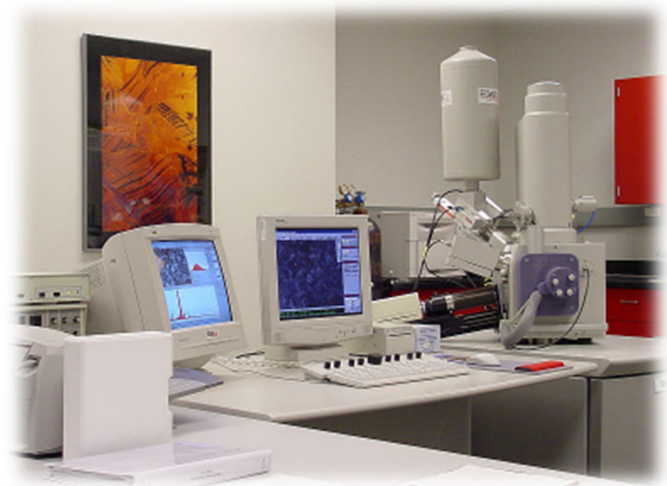
Special Skills and Knowledge:- Welding Processes, Material and Behaviour, Design and Construction, Welding Inspection, Welding Technology, Fabrication and Application, Electrical Engineering, and Non Destructive Testing.

## About CfPE Technology Solutions

The Center for Professional Enhancement Technology Solutions (known as CfPE Technology Solutions) is incorporated in July 2001 and began as a training and consulting company for power plant, oil & gas and petrochemical sectors in Malaysia. With a small team of experienced and dedicated engineers and multi skilled technical staff we have come a long way. From those humble beginnings, we have successfully grown and today we have achieved reorganization as a premier in organizing short training in Malaysia.

Our professional experience and excellent consulting strengths provide insights and understanding of the challenges facing the industries we serve. CfPE Technology Solutions aims to make a difference. The need for leading-edge training has intensified and is advancing beyond all expectation; it is the basis upon which performance can be measured in an increasingly competitive marketplace. In the world of today, it is not simply a case of having the necessary professional skills; people must develop interpersonal skills alongside their ability to handle the changes brought about by technological progress.

CfPE Technology Solutions is a training and consulting company dedicated to increasing our client's competitive edge through the improved performance of their human and capital assets. We aspire to make significant and lasting improvements in our clients' strategic focus and business performance.



# Registration Form

## Please Send Your Registration To:

<b>Tel:</b>	006.013.208.2143	<b>Fax:</b>	006.09.617.8443	<b>E-mail</b>	info@cfpets.com
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## Course Details

<b>Course Name:</b>	Metallurgy – Materials and Their Behaviours	<b>Course Date:</b>	26 – 30 March, 2012
<b>Venue:</b>	Kuala Lumpur, Malaysia.	<b>Fee:</b>	USD3,500.00

## Company Information

<b>Organization</b>	
<b>Address</b>	

### HR / Training Manager

### Invoice to be sent to

<b>Name :</b>		
<b>Tel no.:</b>		
<b>Fax no.:</b>		
<b>E-mail :</b>		

## Participant Information

	Participant # 1	Participant # 2	Participant # 3
<b>Full Name :</b>			
<b>Job Title :</b>			
<b>Department :</b>			
<b>Telephone No. :</b>			
<b>Mobile No. :</b>			
<b>Fax No. :</b>			
<b>E-mail Address :</b>			

## Please Pay by Telegraphic Transfer to:

<b>Account Name :</b>	CFPE TECHNOLOGY SOLUTIONS
<b>Account No. :</b>	563064120047
<b>Bank Name :</b>	Maybank Islamic Berhad
<b>Branch Name &amp; Address :</b>	Malayan Banking Berhad – CPI, JALAN AIR JERNIH, KUALA TERENGGANU, TERENGGANU, MALAYSIA.
<b>SwiftCode :</b>	MBBEMYKL

### CFPE TECHNOLOGY SOLUTIONS

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