

Training Title

## Pipe Stress Analysis Training

Training Duration

5 days

Training Certificate

Define Management Consultants Certificate of course completion will be issued to all attendees.

Training Venue and Dates

**20-24 JUNE 2010 in Abu Dhabi**

At any 5 star hotel. Exact location will be informed later.

Training Fees

- US \$ 3,500 per participant for Public Training includes very useful illustrative Materials/Handouts, tea/coffee breaks, refreshments, Break Fast & International Buffet Lunch each day.

Accommodation

- Accommodation is not included in course fees. However, any accommodation required can be arranged by Define at the time of booking as per your budget and choice.

Who Should Attend

Engineers who are responsible for performing piping system stress analysis and others who must have a good understanding of its requirements are invited to attend this course.

DESCRIPTION

Piping Stress Analysis involves examining the flexibility and stiffness of a particular piping configuration under different types of loading, primary and secondary types. Piping Stress Analysis determines the maximum stresses in the piping system and suggests necessary modifications. Less flexible systems are susceptible to failure more. Stress analysis helps revising the piping layout and its supports to avoid high local stresses. The course will discuss different types of stresses affecting piping flexibility, code criteria and methods of analysis, simple methods and computerized methods. Participant will practice performing such analysis using one of the software's for the same.

OBJECTIVES

Upon completion of this course, attendees will be able to apply the piping system stress analysis requirements of ASME B31.3 to process plant piping systems and understand how to use piping analysis software to meet these requirements.

## **OUTLINE**

### **Ch 1 Piping System Layout, Supports, and Restraints**

Introduction

General System Layout Considerations

Layout Considerations for Specific Piping Systems

Support and Restraint Considerations

Types of Pipe Support

Estimating Maximum Permitted Support Span

Estimating Loads at Supports

Types of Pipe Restraints

### **Ch 2 Engineering Mechanics of Piping**

Piping Criteria

Stress Categories:

Primary and Secondary Stresses

Classification of Loads

Primary loads

Sustained loads

Occasional loads

Expansion loads

Allowable Stress Range for secondary Stresses

Stress Acting on Piping Elements

Stress Calculations

Code Stresses

### **Ch 3 Piping Flexibility and Stiffness**

Introduction

Fundamentals

Flexibility Analysis

Identifying Lines with Adequate Flexibility

Stiffness and Large Piping

Flexibility Method

Pipe Offsets and Loops

Expansion Joints

Pipe Restraints and Anchors

Criteria for Flexibility Analysis

Level of Piping Flexibility Analysis

**Simplified Flexibility Analysis Methods  
Computerized Piping Flexibility Analysis  
Special Considerations for Specific Piping Systems**

**Ch 4 Piping Vibration**

**Introduction  
Basic Concepts  
Fatigue Stress and Other Failure Considerations  
Types of Vibration Analysis  
Common Causes of Piping Vibration  
Vibration Measurement  
Screening Vibration Problems  
Vibration Control  
Overall Design Considerations**

**Ch 5 Piping Support Systems for Process Piping**

**Spring Supports  
Variable Springs  
Constant Springs  
Piping Nozzle Loads on Rotating Equipment  
Pump Nozzle Loads  
Compressor Nozzle Loads  
Piping System without Springs  
Fluid Forces Acting on Piping Systems  
Nozzle Movements and Thermal Displacement  
Case Studies**

**All the above concepts and methods will be examined through pipe modeling using a Piping Stress Analysis Program. (CAESAR II Application)**

**Last Day Review, Discussions will be carried out.**

## **TRAINING INSTRUCTOR**

**Prof. Dr. Taha Khalil Aldoss**

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**Prof. Taha Khalil Aldoss Senior Associate Consultant specialized in Pumps, Compressors, Heat Exchangers, Piping systems and Valves.**

**Professor Aldoss graduated from Case Western Reserve University, USA. He worked in Jordan Petroleum Refinery for a number of years as a maintenance and workshop engineer. As a consultant, he has worked for many industrial projects. He is teaching engineering courses for more than 25 years and delivers technical courses in piping systems, pumps, compressors A/C and heating systems for engineers and technicians.**

**Dr. Also delivers training courses pertaining Piping, pumps, compressors, turbomachinery and gas turbine courses constantly to industry delegates as a public courses and in-house courses for more than twenty years.**

**In addition to public courses on the subject, Dr. Aldoss delivered such courses number of times as in-house training course for many industries, among those were ADCO, TAKREER, GASCO, ADCO, ADNOC in UAE, SABIC in Saudi Arabia, and BANAGAS in Bahrain.**

**He worked in Jordan Petroleum Refinery for a number of years as a maintenance and workshop engineer. As a consultant, he has worked for many industrial projects involving piping systems, valves, heat exchangers, and turbomachinery.**

**Professor Aldoss has worked in the following positions:**

- Dean, Amman College for Engineering Technology, Al-Balqa' Applied University
- Chairman, Mechanical Engineering Department, Jordan University of Science and Technology
- Assistant Dean of Engineering Department, Jordan University of Science and Technology
- Maintenance and Workshop Engineer, Jordan Petroleum Refinery.

**Professor Aldoss has been awarded a number of prizes for his distinguished publications and research work. His awards include the Shoman prize and the Fulbright Fellowship. He has more than 60 publications in international refereed journals and international conferences. He also holds three patents.**

### **Industrial Experience:**

### **Jordan Refinery:**

Prof. Taha worked in Jordan Refinery for four years, during these years he worked as a maintenance engineer and an area engineer.

He participated during that in many shutdowns and maintenance tasks of different process units like Topping and FFC units. Work included all maintenance tasks of the column lining and repairs plus all shutdown works for the heat exchangers, pumps, compressors, furnaces and boilers. Overhaul for the steam turbines, pumps, compressors and blowers were also among those tasks.

During the period as the manager of the workshop the tasks were of different types including all types of machining, repairs, valve testing, fabrication, welding and testing of different welded piping spools.

Preparation of weldments for WPS tests plus that for welder certification were also among the works the workshop was doing. That included destructive and x-rays testing, preheating, and post heat treatment of welded parts.

### **The Third Refinery Expansion:**

He also participated in the third large expansion of the refinery. A project worth of 20 million US\$ in 1977, were new and larger refining units were installed with all types of piping erection, a hydrogen unit were among the new installations. The project involved reviewing the design, the specifications of the machinery and equipments. Follow up the work with the contractor. Observe all tests of the welding work and the hydrostatic leakage tests. And later the comotioning of the machinery.

### **Jordan University (JUST) Heating System: Evaluation Project.**

Recently Dr. Taha was involved with the mechanical installations of the King Abdallah University Hospital in at Jordan University of Science and Technology. Heating system with all involvements, like Boilers, and heating piping systems, design review and installation follow up were among the tasks.

Dr. Taha also lead a team concerning the evaluation of a big steel in steel heating piping system which was leaking due to the failure of the leak detection system. The project is a worth of more than 10 million US \$. A thorough review of the system were executed, many tests and examinations were performed. The task took more than one year of continuous work examining a very large piping system, of 25" of the inside pipe that is installed in 50" casing pipe. The system has no expansion loops nor expansion bellows, and is of pre-stressed type

operated at high pressure (40 bar) and high temperature (150°C). The pipe was buried at more than 10 m below the grade. The team concluded after a lot of measurements, excavations and examinations, that much of the pipe were exposed to corrosion without being detected by the leak detection system, and that the pipe is in a situation where its repair is not economically visible. The report was delivered to the university to decide on that.

### **JUST Heating System: Alternative System**

After taken other technical opinions, the University decided on replacing the whole system with a new one.

The university forms a team under Dr. Taha leadership to prepare a study for new alternative heating system for the whole university. Number of proposals were prepared, trying to use most of the old system good subsystems, like the boilers, water treatment units, main pumps, and of course the portion of the piping distribution system inside the buildings. The issue concentrated on the main lines, from the boiler service room up to the pumps distributing rooms at the buildings, a length of 2000 m piping.

### **JUST Heating System: Follow up team**

The university approved the proposed solution, and tendered it for design and execution. The team under the leadership of Prof. Taha assigned the task of reviewing the design, and after that to follow up the execution. The Project cost two million dollars and took two years to finish. The system running since then successfully with least problems.

Prof. Taha also involved in the projects initiated by the Trade and Economy Ministry, the Department of Measurements and Specification concerning establishment of a National Standards and Specification for more than 15 years.

### **Ties with Industrial Firms and Companies:**

Prof. Taha established very good ties with number of establishments and petrochemical plants in the Gulf region, especially through delivering short courses and workshops in number of engineering topics.

Among those companies are:

ADMA-OPCO, Abu Dhabi, UAE

ADCO, Onshore and off shore, Abu-Dhabi, UAE

Dubai Port, Dubai, UAE

ADGAS, Abu Dhabi, UAE

GASCO, Abu Dhabi, UAE

TAKREER, Ruwais, UAE  
BANAGAS, Manama, Al-Bahrain  
Yanpet Petrochemical Company, Yanbu-Saudi-Arabia  
Saudi Electric Company, AlRiyad, Saudi Arabia  
Cement Company, Jeddah, Saudi Arabia  
Potash Company, Amman, Jordan  
Jordan Refinery, Amman, Jordan

**Industrial Courses and Workshops:**

Topics of the short courses and workshops covering the following topics:

**Turbomachines:** Pumps, Compressors, Fans: Operation, Construction, Control, Troubleshooting and Maintenance.

**Flowmeters & Flow measurements:** Operation, Calibration, Data Analysis, Selection

**Heat Transfer Equipments:** (Heat Exchangers & HVAC Systems): Construction, Designs, Operation, Control, Troubleshooting and Maintenance, Specification and Purchasing, Codes and standards.

**Piping systems:** Design, Material, Welding, Installation, Fittings, Expansion Loops and Expansion Joints, Testing and maintenance, Codes and Standards

**Hydraulic and Pneumatic Systems and Control Valves:** Design, Applications, Selection and Specifications, Operation, and Control

**Failure analysis and Maintenance Strategies:** Function/equipment critical analysis, FMEA, RSA, Maintenance RBM

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