

## Our Instructors

### **Mr. John M Cavote Chairman of the Board United Dynamics - Boiler Tube Failure Prevention Expert**

John is an expert boiler inspector and instructor has performed over one thousand inspections of utility boilers in his thirty eight years plus industry career. His instruction to thousands has advanced the knowledge and techniques of boiler inspection world wide. Mr. Cavote is the author of more than ten training manuals covering inspection techniques of the boiler. He holds licenses and certificates in the repair of pressure parts and is recognized as one of the worlds foremost experts of techniques and methodology of boiler inspection.

### **Dr. David Crowe Technical Director David N. French Metallurgists - Metallurgist Analytical Expert**

Dave's expertise in failure analysis come from over twenty-five years of experience in the power, paper and chemical processing industries. His work includes hundreds of failure analyses of boiler tubes, pressure vessels, tanks and other equipment, and also equipment inspection, vendor quality surveillance and material selection/ specification. He is an accomplished presenter and has published numerous papers. Dave studied Mechanical Engineering and Metallurgical Engineering before performing industrial corrosion research for a number of years.

## Boiler Inspection Techniques

### Power Plant Fundamentals

Types of steam generators \* Coal \* Boiler design \* Natural boiler circulation \* Forced boiler circulation \* Drum type boilers (sub critical) \* Super critical boilers \* Boiler heat transfer \* DNB (departure from nucleate boiling) \* Water attemperation \* Boiler auxiliary components

### Repair Strategies

Shield repairs \* Wall thickness restorations \* Replacements

### Application and Use of Boiler Steels

Carbon steels \* Chrome Moly steels \* Stainless steels

### Outage Preparation

### Planning & Execution

### Non Destructive Testing Techniques

UT, PT, MT, RT

### Inspection Procedures

Unit walk down \* Buck stays \* Piping and supports \* Lower Slope Horizontal Tubes & Ash Pit \* Furnace Water Walls \* Wall Blower & Observation Ports \* Furnace Water Wall Access Door \* Upper Furnace Area \* Water Wall Hanger Tubes \* Water Wall Screen Tubes \* Front Steam Cooled Wall Hanger Tubes \* Back Pass Walls (HRA, SCW, Convection pass) \* Superheat / Reheat Pendants \* Convection Superheat / Reheat primary superheat \* Economizer \* Steam Drum \* Air heaters \* ID & FD Fans

Observances of Operational Factors Affecting Failures    Cycling the Boiler & Associated Failures    Failures: Abrasion Corrosion Fatigue

### Circumferential Cracking

### Inspection Techniques

Dissimilar Metal Weld (DMW) Cracking \* Falling Slag

## A Practical Joint Approach to Boiler Tube Failure Prevention

Ligament Cracking    Thermal Fatigue    Short Term Overheat    Stress Corrosion Cracking    Reduced Load Operation

### Low Temperature Corrosion

### Operational Upsets Relating to:

Ash Erosion \* Creep \* High Temperature \* Sootblower Erosion

Quench Cracking from Water Lances & Water Cannons    Quench Cracking from Water Cleaning

### Techniques for Development of a Water Chemistry Program

### Strategy for Approaching Fuel & Burners:

Ash & Coal Particle

### Fireside Furnace Corrosion:

Causes Methods of Prevention Acceptable Repairs

Boiler Cycle Chemistry    Acid Phosphate Corrosion    Caustic Corrosion/ Gouging    Copper Deposition    Hydrogen Damage    Pitting

### Scale and Water Side Contaminants

### Identifying Deposit Constituents:

Causes, Preventions, and Acceptable Repairs

### Material, Fabrication, Installation Defects

Failures due to Material or Fabrication Error \* Graphitization \* Low Temperature Creep

Boiler Lay-up Procedures: WET lay-up & DRY lay-up    Boiler Fill Water Temperature Requirements

### Lab Visit

**Register online: [www.udc.net](http://www.udc.net)**