

BOILER DESIGN PRINCIPALS COURSE

Based on an undergraduate course originally presented at the University of Manchester, UK.

*The most comprehensive course on boiler
Design ever offered. Topics covered include:*

- BOILER CIRCULATION THEORY
- STOICHIOMETRICS OF COMBUSTION
- BOILER DYNAMICS
- HEAT TRANSFER IN BOILERS
- BOILER DESIGN PRINCIPLES
- CONTROL CONCEPTS
- HRSGs CRITICAL ISSUES



BOILER DESIGN PRINCIPALS

THE CRITICAL ISSUES:

- Competitiveness requires the accurate prediction of Boiler Plant Problems.
- But Boilers produce the main source of refined energy and consume the majority of the primary fuel, and maintenance resources.
- Now we have the necessary fundamental knowledge required to confidently monitor analytically model and control the optimum operation of boiler plant.

This course will train participants in the use of this advanced knowledge.

COURSE AIMS

The course is specifically designed for the engineer in charge of a boiler plant, to give them the necessary fundamental knowledge to:

- Identify problems associated with steam generating equipment;
- Model boiler performance;
- Recognize ways to rectify problems encountered; and
- To construct, modify and operate boilers more efficiently.



ABOUT YOUR INSTRUCTOR

Mr David Parsons

Boiler Design Expert

Originally having trained with three of the world's leading boiler manufacturer licensees, he has been the Principal Design Engineer for Design Boiler for many years.

He has been widely consulted to address common problems encountered with boiler plant and has developed specific expertise to address many of the challenging steam generation issues relating to boilers across a broad range of industrial, marine and off-shore based applications. Mr Parsons has also been engaged as an expert witness to both defend boiler manufactures and also to support claims against them.

In his capacity as design engineer David Parsons has been involved in the design of numerous boiler plants and has personally designed a reference boiler for a 250 MW sub-critical power station. He has been engaged across a broad spectrum of industrial applications including refineries, petrochemical, food processing, timber processing, pharmaceutical, marine, offshore FPSO's and power station sectors. He has written numerous computer programs and designed Heat Recovery Systems for both marine and land based industrial and power generating applications.

David Parsons has lectured extensively throughout the world in the U.S.A, South America, Asia and the United Kingdom and brings to the course a wealth of first hand knowledge and experience.

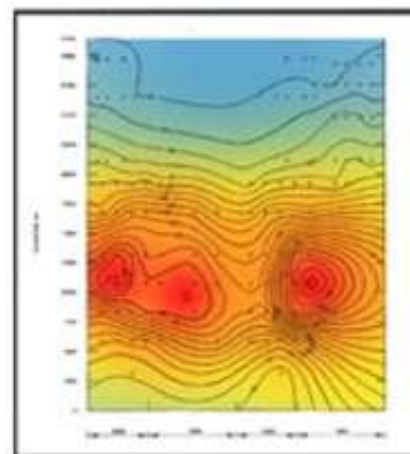
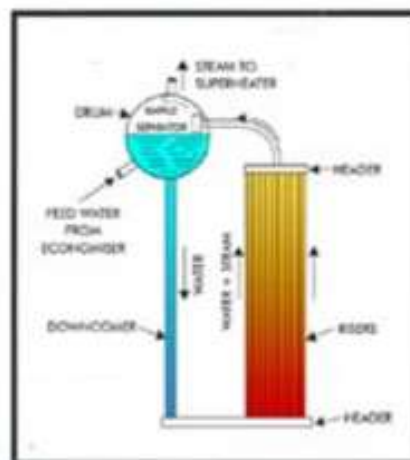


WHO SHOULD ATTEND

- Plant Engineers • Utility Engineers & Managers • Plant Managers & Supervisors • Boiler Equipment Sales Personnel • Facilities Engineers
- Boiler Operators • Energy Managers • Consultants • Maintenance Supervisors • Boiler Water Treatment Specialists • Boiler Control Engineers • Any Engineer engaged in the Boiler Industry
- Co-Generation Project Developer & Engineers

INVOLVED IN A WIDE RANGE OF INDUSTRIES

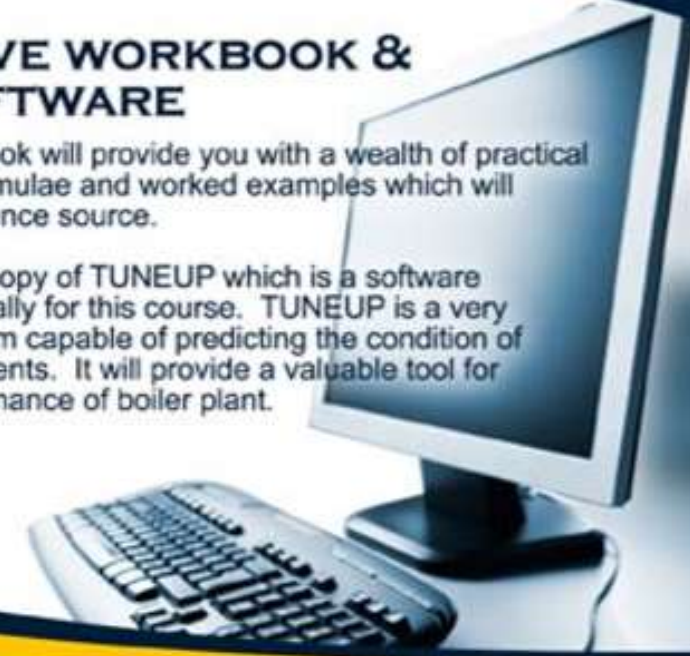
- Power Stations
- Oil Refineries
- Timber Industry
- Food Processing
- Hospitals
- Dairy Industry
- Mineral Processing
- Paper Manufacturers
- Marine FPSO Offshore
- Steel Mills
- Marine Engineering
- Meat Processors
- Chemical Processing



COMPREHENSIVE WORKBOOK & COMPUTER SOFTWARE

Your comprehensive workbook will provide you with a wealth of practical information, procedures, formulae and worked examples which will become an invaluable reference source.

You will also receive a free copy of TUNEUP which is a software package developed specifically for this course. TUNEUP is a very powerful combustion program capable of predicting the condition of specific boiler plant components. It will provide a valuable tool for monitoring the future performance of boiler plant.



*COURSE TIMETABLE

DAY 1

8:30-9:00am	REGISTRATION	2:15-2:25pm	BREAK
9:00-10:00am	INTRODUCTORY CONCEPTS • Introduction of Lecturer • Course Objectives & Course Structure • Basic Terminology, etc	2:25-3:15pm	HEAT TRANSFER BOILER PROCESSES • Heat transfer principles • Heat transfer process • The overall heat transfer co-efficient concept • Heat transfer configurations • Counter-flow parallel flow • Cross-flow evaluation techniques • Boiler surfaces • Parallel-flow • Counter-flow
10:00-10:15am	BREAK	3:15-3:30pm	BREAK
10:15-11:15am	HEAT TRANSFER BASIC CONCEPTS • Forced convection • Introduction to dimensional analysis • forced convection • General case • Flow through tubes • Flow through non-circular passages • flow across tube banks • Overall heat transfer co-efficient theoretical basis • Log mean temperature difference	3:30-4:15pm	BURNER CONCEPTS • Burner types and application • Swirl burners • Critical design criteria • The swirl burner • Modeling Parameters
11:15-11:25am	BREAK	4:15-4:20pm	BREAK
11:25-12:30pm	HEAT TRANSFER (continued) • Heat Exchangers • Extended surfaces • Construction • Shell and tube • Heaters in gas ducts • Pressure drops in heat exchangers • Flow through tubes • Flow across tubes • Heat transfer and friction • Radiant heat transfer • Basic concepts • Normal and oblique radiation • Exchange of radiation between surfaces: • basic principles • Infinite parallel grey surface • Radiation from flames: • General • Emissivity of flames • Absorption co-efficient • Absorption path or beam length	4:20-5:00pm	CASE STUDY: BOILER CIRCULATION DEFECTS
12:30-1:30pm	LUNCH		
30-2:15pm	STOICHIOMETRICS OF COMBUSTION • A Design Engineer's perspective on combustion • Heat to steam (thermal duty) • Stoichiometric analysis of the combustion process • Iterating on the back-end temperature • Gross thermal efficiency of the boiler • Calculation of flue gas, flue and combustion air flows		

9:00-10:15am	CIRCULATION IN WATER-TUBE BOILERS • Circulation theory • The circulation path • Circulation Ratio • Assisted-circulation boilers • Once through boilers • Layout of heating surface
10:15-10:30am	BREAK
10:30-11:30am	CIRCULATION (continued) • Pressure changes in circulation path • Friction pressure drop • Pressure drop due to acceleration • Static pressure in risers & downcomers • Point of commencement of boiling • Water content and drum level (shrink and swell) • Bubble slip
11:30-11:40am	BREAK
11:40-12:30pm	BOILER DYNAMICS • An analysis of the fundamental processes behind the basic mechanisms which occur on the water side of a steam generator. Topics include: • Drum water level • Heat storage in a boiler • Heat storage and evaporation rate

12:30-1:30 pm	LUNCH	10:25-11:30am	BOILER CONTROLS (continued) • Principal closed loop controls: • Master pressure controller • Air/fuel ratio • Furnace Draught • Superheaters • Reheaters
1:30-2:30pm	BOILER DESIGN PRINCIPLES • The furnace sizing techniques: • Gas and Oil • Pulverised coal • Grate firing wood and coal • Furnace performance evaluation: • The effective surface method • Stefan-Boltzman method • Radiant superheaters • Initial radiation to convection pass	11:30-11:40am	BREAK
2:30-2:40pm	BREAK	11:40-12:30pm	BOILER CONTROLS (continued) • Drum level controllers: • Single element • Two element • Three element • Cross limit combustion control • Multiple boiler pressure control
2:40-3:30pm	BOILER DESIGN PRINCIPLES (continued) • Superheaters: • The design life concept • Metal temperature evaluation • Material selection • Boiler Banks • Back-end heat recovery: • Economisers: • Steam blanketing • Carry-over • Airheaters	12:30-1:30pm	LUNCH
3:30-3:45pm	BREAK	1:30-2:30pm	BOILER DIAGNOSTICS • Common problems encountered with boiler plant • Circulation problems • How to identify them • How can you fix them? • Combustion driven noise and vibration: • How do you analyse them? • How can they be rectified? • Excessive back-end corrosion
3:45-4:30pm	CASE STUDY: BOILER VIBRATION	2:30-2:40pm	BREAK
4:30-5:00pm	TUNE-UP PROGRAM	2:40-3:15pm	BOILER DIAGNOSTICS (continued) • Causes of poor combustion • The boiler can't make M.C.R: • Common causes • What to look for • Pulverised coal: • Special problems and considerations
		3:15-3:30pm	BREAK
DAY 3		3:30-4:00pm	CASE STUDY: BOILER TUBE FAILURES Examples and Causes
9:00-10:15am	BOILER CONTROLS • Normal running condition • Functional objectives of operation • Detailed understanding of plant operation • Physical characteristics of plant and system • Steam and water systems • Combustion systems • Rotating machines	4:00-5:00pm	TUNE-UP PROGRAM • An opportunity for the instructor to provide assistance on selected problems from patrons at the seminar.
10:15-10:25am	BREAK		

COURSE BACKGROUND

The course has been presented in the United States, United Kingdom, Asia, New Zealand and Australia.

It has been especially designed to balance the theoretical concepts, with the real world applications of boiler design technology. Difficult theoretical aspects are presented with a practical down to earth approach making the course ideally suited to engineering and supervisory personnel involved in the day to day operation and management of boiler plant.

You will enjoy a unique opportunity to discuss your boiler specific problems with the course instructor (who is a leading expert in his own right) and also exchange experiences with other delegates who may have encountered and possibly solved similar problems that you are currently experiencing.

DELEGATE'S COMMENTS . . .

"The course provides a good overview of all aspects of boiler design."
Hugh Jenkinson – Melbourne

"A very comprehensive introductory course on all aspects of boiler design and control."
Lee Cheong – Jakarta

"The course is well balanced between theory and practical. No subject was dwelt on to excessive detail."
Joe Krusec – Melbourne

"I liked the technical aspect (theory and assumptions) that are behind the boiler design. This will help me evaluate changes from design, identify problems, etc. the overall boiler. The work book is an excellent reference."
John Calhoon – Chicago September

"Taking all the theoretical information and combining it so that I could understand the design philosophy of the overall boiler. The work book is an excellent reference."
Dan Koszykowski – Chicago September

"A lot of material was covered. Fundamentals were presented very well. The course provides a good basis for future learning."
Sikander Khan – Atlantic City August

"An excellent combination of the theoretical and actual aspects of boiler design."
Israel C Telis – Sydney

"Good blend of concepts and real life conditions."
John MacDonald – Jakarta

"Very comprehensive and detailed."
Mark Cladecott – Melbourne

"An excellent presentation of theoretical boiler design fundamentals."
Leon Gertsch

ORGANISATIONS WHO HAVE ALREADY SENT DELEGATES

Altona Petrochemical Co	Exxon Research & Eng. Co
Argonne National Laboratory	Energy Mines & Resources Canada
Arco Products Co	Florida Power & Light
BHP – New Castle	Foster Wheeler
BHP – Port Kembla	gas Research Institute
Basin Electric Power Corp	HJ Heinz
Babcock & Wilcox	Inland Rome
R.W. Beck and Associates	Intevep
Bechtel Corp.	Kelloggs Australia Pty Ltd
B.P. Oil	Mackay Sugar
Carlton United Breweries	Miles Inc
Consumers Power Co	Mobil Oil Corp
El Paso Electric Co	Nabalco
Nova Scotia Power	Quad City Boiler Inc
Pasminco Metals	Tioxide Australia
Ogden Martin Systems	United Engineers & Constructors
Pacific Power	US Army
PVI	US Navy
Public Service Co of Oklahoma	Van ERT Electric



INTERESTED IN ATTENDING THE COURSE

If you are interested in attending the course please register your interest via the "Boiler Course" tab on the designboiler.com web site. We will keep you updated on when a course will be next organized near your location.

We can also arrange to present an **IN HOUSE** course at your work place. This is usually only cost effective if there are 6 or more delegates interested in attending the course.



FEES AND GENERAL INFORMATION

Fees:	\$US 3,150 per Delegate for the 3 Day course 1 - A 10% discount is applicable to groups of 4 or more. Fee does not include housing & meals. Also excludes all Government taxes and levies that may be applicable.
Delivery:	Classroom teaching style
Venue:	Hotel or University function room. Notification of actual venue once course date is finalized.
Cancellations:	Cancellations with full refund will be accepted up to 10 days prior to course start

