

WASTE HEAT RECOVERY

COURSE OVERVIEW

Waste heat recovery (WHR) is very important for both sustainability and profitability of process industries. It is even more important in Singapore because of very high industrial activity and lack of energy resources such as oil, natural gas and coal. WHR has great potential for reducing fresh fuel demand by recovering waste heat and reusing it. It can simultaneously reduce both the heating and cooling loads and hence reduce operating and/or capital costs. It will also reduce CO₂ emissions. Consequently, heat recovery projects can generate credits within the CRM and carbon trade programs, and hence improve financial return on WHR projects. WHR is equally beneficial for both Greenfield (i.e., in new plants) and Brownfield (in existing plants) projects.

COURSE OBJECTIVES

This workshop will present a comprehensive and concise coverage of fundamentals, advanced topics and practical applications of waste heat recovery (WHR) in industrial processes. In the workshop, simple and effective WHR techniques will be illustrated, with suitable industrial examples, to help participants quickly identify, calculate and develop the heat recovery saving potentials within their processes. Key benefits/drivers of WHR projects will be illustrated; these are very useful to decision makers and engineers for developing successful WHR business cases. Wherever possible, Brownfield project technique such as revamping/retrofitting the WHR equipment will be highlighted; this can greatly benefit the companies facing capital constraints, for Greenfield projects. Special emphasis will be given towards major technical risks and mitigation plans, for implementing sound WHR projects. Sustainability techniques for reaping benefits of WHR projects for longer periods will also be outlined.

TARGET AUDIENCES

Managers, Decision Makers, Engineers, Designers, Supervisors and Operators in:

- Petroleum, Petrochemical, Chemical Utilities, Semiconductor, Metallurgical, F&B Industries
- LNG Facilities, Offshore Engineering, Engineering Design Companies, Engineering Consultants
- Project Development, Research Institutes, Process Equipment Suppliers

SCEM & PEB PDUs TO BE AWARDED

APPLICABLE FOR PRODUCTIVITY AND INNOVATION CREDIT (PIC)

7 APRIL 2017

9:00AM - 5:00PM

Venue TBC

WASTE HEAT RECOVERY

PROGRAMME OUTLINE

Morning:

Introduction (10 mins)

Fundamentals with Examples (1.5 hours)

- Heat Transfer, Heat Integration & Pinch Analysis

Heat Exchange Equipment (1 hour)

- Direct contact, Shell & Tube, Plate type, Spiral, Recuperators, Heat Wheels, Economizer, Heat pipes

Costings and Economic Evaluation (20 mins)

Fouling (20 mins)

Afternoon:

Case Studies and Industrial Applications (2 hours)

- WHR with industrial examples from:
 - Steam and condensate systems, waste water systems
 - Boilers, Distillation units, Air compression systems, Fired heaters
 - Heat Recovery Steam Generators (HRSG)
 - Diesel Engines, Multi Stage Steam Jet Ejector Vacuum Systems
- Steam generation from WHR: Waste heat boilers, Heat Pumps (Thermal, mechanical compressors, Lithium Bromide system), etc
- Power recovery from WHR: Organic Rankine Cycle, Kalina Cycle, Steam turbines
- Water production from Waste Heat: Foul Water Stripper, Thermal desalination, Membrane desalination
- Chilled water production from WHR
- Low temperature heat exchanger network

Cogeneration and Tri-generation (20 mins)

Economic/Environmental Benefits with examples (20 mins)

- Lower emissions
- Plant revamps (Capital and/or operating cost savings)
- Better Reliability

Sustainability (30 mins)

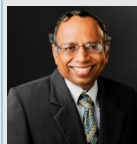
- Corrosion issues and mitigation - Metallurgy, process conditions and chemical usage
- Fouling mitigation strategy
- Maintenance and operation

Discussion and Closure (20 mins)

ABOUT THE TRAINERS



Dr. Chirla Chandra Sekhara Reddy is Technology & Optimization Manager at Singapore Refining Company Private Limited, where he leads a range of activities such as Technology, Optimization, Project Development, Process Engineering, Plant Troubleshooting and Process Safety. He holds Bachelors and Doctoral Degrees in Chemical Engineering from Andhra University and Master Degree in Chemical Engineering from IIT Kanpur. He also holds MBA Degree from Murdoch University. He has 22 years of rich diverse experiences in Process Engineering, Project Management, Technical services, Operations Optimization and Process Safety in Refinery, Petrochemical, Chemical and Utility plants. He has hands-on experience of design and implementation of many Greenfield and Brownfield projects, especially WHR projects. Prior to SRC, he has served diverse industries such as Reliance (IPCL), TPC, SUT and Celanese Singapore Private Limited. Dr. Reddy published 7 papers and delivered many technical presentations in conferences. He contributed 3 chapters in the book "Chemical Process Retrofitting and Revamping: Techniques and Application" edited by G.P. Rangaiah and published by John Wiley.



Prof. Gade Pandu Rangaiah has been with the National University of Singapore (NUS) since 1982, in the Department of Chemical & Biomolecular Engineering. He received his Bachelor, Masters & Doctoral Degrees in Chemical Engineering from Andhra University, IIT Kanpur and Monash University respectively. He worked in Engineers India Limited for 2 years before his Doctoral study. Prof. Rangaiah was recognized with Annual Teaching Excellence Awards by NUS for 4 consecutive years. His research interests are in modeling, design and control of chemical and related processes. Prof. Rangaiah edited 5 books and contributed many chapters to other books. He published 180 journal papers and 132 conferences papers. His publications cover many studies on improving performance and energy efficiency of chemical processes.

RATES

EARLY BIRD (before 24 Feb)	NORMAL FEE	GROUP FEE
S\$380.00 (SEAS Member)	S\$450.00 (SEAS Member)	S\$400.00 (4+ delegates from 1 organization)
S\$450.00 (Non Member)	S\$500.00 (Non Member)	

* Fees inclusive of GST

* SEAS reserves the right to make changes to the trainer, programme, venue, cancel or reschedule the programme if necessary or warranted by circumstances beyond our control

* Payment to be made by the early bird closing date to enjoy early bird rate

* Payment to SEAS & Address: Please send a crossed cheque to:

Sustainable Energy Association of Singapore, 1 Cleantech Loop, #02-16 Cleantech One, Singapore 637141

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REGISTRATION FORM Yes! I would like to register for this programme I am unable to attend but please put me on your mailing list

PARTICIPANT'S DETAILS		Number of Delegates	Fees Payable
1	Name (Dr/Mr/Mrs/Ms)	HP No	Email
	NRIC No		
2	Name (Dr/Mr/Mrs/Ms)	HP No	Email
	NRIC No		

ORGANIZATION'S DETAILS

Company Name	
Company Address	
Contact Name	Tel
Email	Fax