

HYDROGEN INDUSTRY FUNDAMENTALS

Live Online Training Course: The Essential Techno-Commercial Introduction to the Hydrogen Industry and economics of hydrogen production for a Hydrogen Economy.

This course is designed to provide a comprehensive analysis of hydrogen production and use from the current and emerging methods of production, storage options, transport by land or ship and competitive use as an alternative fuel for stationary facilities and transport.

March 2021

Course Parts will commence at **10:00** and end at **14:00 (SGT)**. There will be short breaks during each course Part.

Part 1: **18th March**

Part 2: **19th March**

Part 3: **25th March**

Part 4: **26th March**

October 2021

Course Parts will commence at **10:00** and end at **14:00 (SGT)**. There will be short breaks during each course Part.

Part 1: **21st October**

Part 2: **22nd October**

Part 3: **28th October**

Part 4: **29th October**

4 Part Series



Our Expert Course Instructor



Dr. Duncan Seddon

Started his industrial career in 1974 at the ICI Billingham Works which held major gas to hydrogen, ammonia and methanol plants. He now practices as an independent consultant in energy intensive industries. He has delivered over 50 Master Classes and has written several papers on the costs of producing hydrogen for the Hydrogen Economy.

Key Learning Objectives

- ▶ How hydrogen is currently produced and its cost of production
- ▶ How hydrogen may be produced from renewable sources - electrolysis, bio fuels, photolysis and estimated cost of production
- ▶ How hydrogen can be stored and the estimated storage costs
- ▶ Understand possible future transport methods and their costs for an international trade - as compressed gas, as liquid or via ammonia or naphthenes
- ▶ How hydrogen is transported by pipeline and the cost of transport
- ▶ Learn how hydrogen is used in fuel cells for stationary and vehicle applications
- ▶ Analyse the cost of hydrogen to a consumer from different production, storage and transport scenarios
- ▶ Analyse how hydrogen will compete with conventional fuels for stationary and vehicle applications
- ▶ Develop an understanding of the key hurdles in developing a hydrogen economy

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ABOUT THE COURSE

The Hydrogen Economy seeks to use hydrogen to replace fossil fuels for power generation and transport with a fuel that produces no carbon dioxide emissions. Hydrogen is used widely in the process industries. It is often produced at a considerable scale and often transported by pipelines from producers to users. The first modules of the course will review the current production and uses of hydrogen in the process industries which may be used as a basis for an emerging Hydrogen Economy.

Modules on hydrogen production from renewable sources will outline the technology and costs of alternative approaches to the production of hydrogen. The cost will be critically compared to conventional production methods as they presently stand and with the incorporation of carbon capture and storage.

A module will address storage options and costs for small and large scale storage as gas or liquid hydrogen.

Modules will address the approach to transport of hydrogen and the unit cost of the various options over short and long distances. The principal options considered will be by pipelines, as compressed gas, as liquid or via an intermediate product such as ammonia or as a naphthene. Costs for transport over long shipping distances to markets in North Asia will be estimated for various options.

The use and productivity of hydrogen fuel used in fuel cells for stationary and vehicle applications will be explained and the competitive advantages for hydrogen identified.

The cost position of hydrogen versus conventional fuels will be estimated to set an outline price for a target landed price of Australian produced hydrogen in NE Asia. Scenarios to meet this target will be discussed.

A final module will develop case studies for hydrogen versus conventional fuels in various locations of interest for a fully developed hydrogen economy.

EXPERT COURSE INSTRUCTOR



Dr. Duncan Seddon industrial career started with ICI on Teesside in the UK where he worked on the production of plastics and fibres. He moved to the Billingham Works where he was responsible for the energy management of a large integrated chemical complex. He moved to ICI Australia in 1980 and worked on the conversion of natural gas

to methanol and olefins. In 1983, he moved to BHP and worked on gas to liquids (GTL).

Since 1988, Duncan has practiced as an independent consultant offering a broad range of services to companies and government bodies with an interest in refining and petrochemical processes. He has a particular interest in the production of chemicals and fuels from gas and coal and the technology and economics for producing fuels from renewable sources.

Duncan is the author of over 120 papers, patents, including several papers on the production cost of hydrogen and its competitive position versus conventional fuels.

He has written two books - "Gas Usage and Value - The Technology and Economics of Natural Gas Use in The Process Industries" (PennWell, 2006) and "Petrochemical Economics - Valuing and Selecting Technology in a Carbon Constrained World" (ICP press, 2010). He is the co-editor (with Bo Zhang) of "Hydroprocessing Catalysts and Processes- The Challenges for Biofuels Production" (World Scientific, 2018).

Duncan is a Fellow of the Royal Australian Chemical Institute and a Member of the Society of Petroleum Engineers.

WHO WILL BENEFIT

The main aim of a Hydrogen Economy is to replace fossil fuels with hydrogen as the fuel source. The course is aimed at persons with a interest in fostering and developing a large scale hydrogen industry in Australia and potentially for promoting and developing an international trade. The course is aimed at industry and government commercial managers, economists and engineers interested in gaining and understanding of the costs of the hydrogen economy and the relative costs of various production, storage and transport costs to local and distant markets.

The course would assist business professionals interested in developing commercial opportunities in any emerging hydrogen industry. The course would also benefit research and development engineers and scientists in helping to identify key hurdles which would benefit from further R&D activities to reduce costs to the consumer.

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Course Outline

1. Current Use of Hydrogen in the Process Industries

- Hydrogen properties
- Refineries and hydrogen consuming units
- Petrochemicals
- Ammonia
- Petrochemicals
- Ore processing

2. Current Production Technology

- From coal or biomass
- The gasifier and gasifier island
- Types of gasifier
- Hydrogen from natural gas
- Alternative technology approaches
- Hydrogen extraction and purification
- Electrolysis methods
- Chemical processes
- Refinery operations

3. Production Economics

- Approach to cost analysis
- Development of fixed-variable relationships
- OPEX, CAPEX, Capital Recovery
- Location factors
- Economics of hydrogen from natural gas
- Economics of Hydrogen from coal
- Greenhouse implications
- geo-sequestration
- Cost of geo-sequestration
- Zero emission hydrogen from coal

4. New and Emerging Production Methods and Costs

- Conventional electrolysis
- New electrolysis methods
- Economics of electrolysis
- Photo splitting of water
- Hydrogen from biomass
- Biomass issues
- Economics of hydrogen from biomass

5. Storage and Land Transport and Costs

- Storage costs as gas
- Storage costs as liquid

- Compression technology
- Compression costs
- Pipelines - current practice
- Pipeline costs
- Use of gas distribution network
- Small scale storage and transport

6. Shipping

- Shipping fleet
- Shipping costs
- As compressed gas
- As liquid
- Regasification and costs
- As ammonia
- As naphthenes/aromatics

7. End Uses - Fuel Cells

- Distribution networks
- Operating pressure and compression costs
- Fuel cell technology
- Fuel cell types
- Fuel cell efficiencies
- Power generation
- Fuel cell vehicles
- Case studies

8. Comparison with Fossil Fuels

- Conventional vehicle energy efficiency
- Fuel cell compared to gasoline (petrol)
- Fuel cell compared to diesel
- Fuel cell compared to fuel oil/coal for power
- Unaddressed issues - aircraft
- Cradle-to-Grave analysis
- Case studies

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4 Easy Ways to Register

- 1 Telephone**
Customer Service Hotline +65 6508 2476
- 2 Email**
sgtraining@informa.com
- 3 Fax**
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- 4 Web**
www.informaconnect.com.sg/hydrogenenergy

Hydrogen Industry Fundamentals

Course Codes	Location	Course Dates	Standard Price	4+ Dels Discount
P21GR30SGV	Live Online Training	March 21	SGD 2,076	Great Savings: When you book 4 or more participants! Call us today on +65 6508 2476 or email sgtraining@informa.com to take advantage of the discount offer.
P21GR30SG03V	Live Online Training	October 21	SGD 2,076	

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