

CHEMSYSTEMS

CHEMSYSTEMS **Training**

Get the Competitive Edge

CHEMSYSTEMS *Return on Analysis*

2009 Prospectus

www.chemsystems.com

CHEMSYSTEMS®

PROSPECTUS 2009

CHEMSYSTEMSTraining

44 South Broadway, White Plains, New York 10601, USA
tel: +1 914 609 0300 fax: +1 914 609 0399

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CHEMSYSTEMS – a brand owned by Nexant, Inc. that provides support to decision makers in the petroleum, chemical and petrochemical industries

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SECTION 1



Introduction to the Program

ChemSystems Training provides training courses on commercial and technical aspects of the global oil, gas, chemicals and petrochemicals industry. Training courses are available on many topics, delivered in either public forum or as a custom course for a private company.

ChemSystems Training public courses:

ChemSystems Public courses are held in the United States, Europe and Asia throughout the year.

- Courses include the world famous ***“The Global Petrochemical Industry: Understanding the Complex Interactions between Technology, Economics and Markets”*** developed by Dr. Harold A. Wittcoff. This three day course has been presented in 28 countries and to several thousand delegates.

ChemSystems Training also provides courses through joint ventures with:

- The Oxford Princeton Programme - www.oxfordprinceton.com
- ICIS Training – www.icistrainingsite.com

ChemSystems Training custom courses:

In-house custom courses are tailored to your organisation’s specific requirements, built on our experience giving public and private courses and consulting to the industry over the last 30 years.

Tailored: Courses can be from one day to five days. Each day will typically include four sessions of 1.5 to 2 hours duration. Sessions can be lectures, classroom exercises, case studies and/or group discussions/workshops.

Professional: Only highly-experienced ChemSystems professionals with considerable experience in the subject matter run sessions.

Focussed on participants: Our recommended size for corporate in-house training is 12 to 16 participants, although class sizes may vary from eight to 24.

Use ChemSystems Training to:

Get insight into commercial, technological and economic aspects of the petroleum and petrochemical industry, and in particular to fast track the breadth of understanding of new starters in your business.

Allow experienced employees to gain a global overview and wider understanding of the value chains in the business of petroleum and chemicals.

Learn the fascinating and critically important history of the development of the petrochemical industry, and how lessons from the past can be used to understand its future development.

SECTION 2

Value of the Program



ChemSystems Training provides tailored corporate training for groups of employees including new graduates, new recruits to specific departments or as refresher training on commercial aspects of the industry for operations staff.

The objective of the training course can be to provide commercial understanding for engineers and technologists, or chemical industry understanding for business functions and for all to develop abilities and provide competitive advantage to all attendees. The emphasis can be agreed in advance with course material readily tailored to the target audience.

Employees with a broad understanding of the commercial drivers of the industry will be able to react more quickly to industry events, and make better decisions that improve the profitability of their organisation.

Recent feedback from our courses include the following:

“Exceptional course. I took the course 5 years ago, got so much out of it, I returned for a refresher and brought 4 associates with me. (ExxonMobil)”

“This excellent course enabled me to fit all the jigsaw pieces together. (ICIS)”

“Very helpful for me to understand my customer’s applications and critical needs. (Praxair)”

“Knowledge of basic raw materials provides a strong basis for understanding the major cost drives”

Scope of the Program



ChemSystems Training courses are built from a selection of modules. The foundations of these modules are common between our public and private courses, with an element of tailoring possible for in-house private courses.

Courses may be from one day to five days and each day will typically include four sessions of 1.5 to 2 hours duration. The sessions may be lectures, classroom exercises and case studies, and group discussions/workshops. A typical day would consist of two lectures in the morning then a case study and a further lecture in the afternoon.

Analysis of the global petroleum and petrochemical industry through the ChemSystems programs provides a sound database to support the training programs and much of the content of the training modules has been developed from the ChemSystems programs including:

- PERP – Process Evaluation/Research Planning
- PPE – Petroleum and Petrochemical Economics
- POPS – PolyOlefins Planning Service
- SBA – Strategic Business Analysis

Topics may be developed specifically for each client but typical training courses may cover sectors of the industry including:

- Crude oil and natural gas
- Oil refining and refined products
- Petrochemical feedstocks
- Olefins
- Aromatics
- Gas (methane) based chemicals
- Polyolefins
- Styrenics
- Vinyls
- Polyester and Intermediates
- Propylene and Intermediates
- Butadiene and Intermediates

In addition to industry sectors our program can deliver training on functional aspects of the industry including:

- Production technology
- Techno-economics, cost of production and competitive position
- Market analysis and research
- Profitability analysis and forecasting
- Strategy analysis and development
- Project analysis and planning

SECTION 4



Detailed Description of the Program

Public Courses in 2009

ChemSystems **Global Petrochemical Industry** Course uses an intensive three day classroom format.

This course is planned to run the following program in 2009. Latest information on timing and venues can be found on our website (www.chemsystems.com).

February	London, UK
April	Houston, Texas, USA
June	White Plains, New York, USA
June	Bangkok, Thailand
September	London, UK
November	Houston, Texas, USA
November	Shanghai, China

Typical agenda for these courses are shown in Appendix B.

Private in-house Courses

Training modules are available covering different commercial, technological and economic aspects of the petroleum and petrochemical industry including the selection shown here:

Introduction Modules

ChemSystems Training Introduction Modules are designed to provide an overview of the petrochemical industry. No previous knowledge is necessary to benefit from these courses. The Petrochemical Nomenclature course is particularly useful for those with weak or long forgotten chemistry backgrounds in helping navigate around the terms used by the industry.

Module	Content
Crude Oil and Gas	Overview of the exploration, production and valuation of primary hydrocarbons.
History of Petrochemicals	Overview of the development of the petrochemical industry (one hour session).
Natural Gas and Petrochemicals	Overview of petrochemical and fertiliser production from natural gas.
Petrochemical Nomenclature	Explanation of the names and jargon of petrochemicals (for new entrants to the industry).
The Seven Basic Building Blocks of the Petrochemical Industry	Tour around the seven key building blocks that have built the petrochemical industry as we know it today.

Industry Structure Modules

ChemSystems Training Industry Structure Modules address the core commodity business areas of the petrochemical industry. These modules will examine the key value chains affecting the main branches in the petrochemical industry. All modules cover both the market supply and demand for key products and the cost competitiveness and profitability of the key conversion processes.

Module	Content
Oil Refining and Petrochemical Feedstocks	Refining processes, valuation of refined products, consumption, production and valuation/pricing of methane, ethane, LPG, naphtha and gas oil.
Olefins	The markets, economics, technology, operation of steam crackers and olefin production. The impact of feedstock cost on business strategy and competitive position is examined.
Polymers	Brief descriptions of the production, uses, trade and economics of production for polymers (overview lecture).
Chlor-alkali Business	Technology, markets, production and economics of chlor-alkali.

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Detailed Description of the Program

Gas Based Chemicals	Business derived from methane (and in particular adding value to stranded gas).
Aromatics	The aromatics businesses (benzene, toluene and xylene) are different due to their strong linkage to the refinery. This course explains those links and explains how the aromatics sector has grown to add value to these feedstocks.
C ₄ Businesses	The C ₄ market is built around synthetic rubber, however included in the value chain are alpha-olefins for polyethylene production and butene-2 for MTBE/propylene production. This course covers the technologies, markets and economics of the C ₄ business.
The Location of Production	Close to market or cheap feedstock – the petrochemical producers' dilemma?

Economics Modules

ChemSystems Training Economics Modules examine the economic forces driving each of the main commodity petrochemical value chains and provide detailed instruction on analysing the economics in each of these areas. The Economic Modules offerings include a session on conducting project based economic analysis as opposed to the more general competitive analysis of existing producers.

Module	Content
Aromatics Economics	Calculations of cost of production and profitability of benzene and mixed xylenes from different processes (one or two sessions plus a two session case study).
Olefins Economics	Calculations of cost of production and profitability of ethylene from different feeds, propylene and butadiene (one or two sessions plus a two session case study).
Petrochemical Value Chain and Economics	Analysis of the economics of production, costs, margins and prices of petrochemicals (methodology lecture).
Project Evaluation	Lecture and case study on typical elements of project feasibility study, cost estimation, cash flow analysis, measures of profitability, financing, sensitivity analysis etc. (one to three lectures plus workshop).

Forecasting Methodology Modules

ChemSystems Training Forecasting Methodology Modules cover the key aspects of commodity theory applicable to the petrochemical industry. Courses are available covering both market side (supply, demand and trade forecasting) as well as price and profitability forecasting.

Module	Content
Consumption and Trade Forecasting	Workshop on methodology of market demand and consumption forecasting, trade and production.
Price and Profitability Forecasting	Workshop on methodology of price and profitability forecasting.
Profitability and Cyclicalilty	Analysis of causes of cyclicalilty of profits in the petrochemical industry.

Business Issues Modules

ChemSystems Training Business Issues Modules cover more general business considerations and social impacts on the petrochemical industry.

Module	Content
Aromatics Strategy	Analysis of the applicability of different business strategies using several company case studies.
Olefins Strategy	Analysis of the applicability of different business strategies using several company case studies.
Petrochemical Strategy	Discussion and case study of oil companies, chemical companies, regional players, Middle Eastern producers etc.
Polymer Environmental Issues	Recycling, reuse and conservation – lecture and case study.

Product Market Modules

ChemSystems Training Product Market Modules provide building block instruction on the key drivers (both market and economic) for a wide range of petrochemicals.

Module	Content
Ammonia and Derivatives	Analysis of production, consumption and uses of ammonia – lecture and case study on production economics (three sessions).
Aromatics Markets	Description of consumption, production and trade of benzene, toluene and mixed xylenes.
Benzene Derivatives	Brief descriptions of the production, uses, trade and economics of production for benzene derivatives.
Butadiene Derivatives	Brief descriptions of the production, uses, trade and economics of production for butadiene derivatives.

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Detailed Description of the Program

Ethylene Derivatives	Brief descriptions of the production, uses, trade and economics of production for ethylene derivatives.
Methanol and Derivatives	Analysis of methanol production, consumption and economics.
Olefins	Description of consumption, production and trade of olefins.
PET and Intermediates	Production technology, properties and markets of polyester, economics of production and profitability.
Polyethylenes	Production technology, properties and markets of polyethylenes (HDPE, LDPE, LLDPE), economics of production and profitability.
Polypropylene	Production technology, properties and markets of polypropylene, economics of production and profitability.
Polystyrene	Production technology, properties and markets of polystyrene, economics of production and profitability.
Propylene Derivatives	Brief descriptions of the production, uses, trade and economics of production for propylene derivatives.
Toluene and Xylene Derivatives	Brief descriptions of the production, uses, trade and economics of production for toluene and xylene isomers derivatives

Technology Modules

ChemSystems Training Technology Modules are based on ChemSystems highly regarded Process Evaluation and Research Planning (PERP) program and provide a detailed review of competing and upcoming technologies affect key areas of the petrochemical industry.

Module	Content
Aromatics technology	Production and conversion processes for benzene, xylenes and xylene isomers
Olefins technology	Production processes for olefins including olefins conversion
Polymers technology	Processes for production of commodity polymers

Additional topics and petrochemical value chains may be developed to suit the needs of individual clients and customised to cover the petrochemicals produced by the client. ChemSystems Training reserves the right to use the public information contained in these customised modules in future training courses.

Class sizes may vary from eight to 24 participants although 12 to 16 is ideal. Typically one lecturer would be used for courses up to three days, two lecturers for courses up to five days. The selection of the lecturer and number of lecturers depends on the scope of the course as we only use lecturers with considerable experience in the subject matter.

Contact Details

AMERICAS

Nexant, Inc.

44 South Broadway
White Plains, NY 10601-4425
U.S.A.

Attn: Dr. Jeffrey Plotkin
Vice President, ChemSystems Training
Tel: + 1 (914) 609 0315
Fax: + 1 (914) 609 0399
e-mail: jplotkin@nexant.com

EUROPE

Nexant Ltd.

Griffin House
161 Hammersmith Road
London, W6 8BS
United Kingdom

Attn: Alastair Hensman
ChemSystems Marketing Manager
Tel: + 44 (20) 7950 1577
Fax: + 44 (20) 7950 1550
Email: ahensman@nexant.com

ASIA

Nexant Asia Ltd.

22nd Floor, Rasa Tower 1
555 Phahonyothin Road
Kwaeng Chatuchak, Khet Chatuchak
Bangkok 10900
Thailand

Attn: Maoliosa Denye
ChemSystems Marketing Manager
Tel: +66-2-793 4626
Fax: +66-2-937 5145
Email: mdenye@nexant.com

Public Course Agenda

The Global Petrochemical Industry: Understanding the Complex Interactions between Technology, Economics and Markets



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DAY 1

8:40 Industry Cyclicity – Are We Doomed to Ride this Cycle Forever?

- The “Old (and current?) Paradigm”
- Industry restructuring
- The impact of private equity
- Some thoughts on profitability

The Chemical Industry

- Size
- Commodity versus specialty
- Historical beginnings of the industry
- Emergence of a true global business
- Key success factors
- The importance of the Middle East and China
- Major players

10:00 Coffee Break

10:20 How to Organize the Industry – The 7 Basic Building Blocks

- Ethylene
- Propylene
- Butadiene/Butylenes
- Benzene
- Toluene
- Xylenes
- Methane

The Petroleum Refinery/Petrochemical Interface

- Catalytic Cracking
- Catalytic Reforming
- Steam Cracking

Economics

- Cost of production calculations
- Capex categories
- Economy of scale – why size matters
- Transfer pricing issues – who shows the profit?
- Cost curves – what are they and what they can predict
- The concept of “shut-down” economics

12:00 Lunch

1:00 The Businesses from Ethylene*

Polyethylenes – The Single Largest Segment in the Industry

- LDPE – the accidental discovery
- HDPE – Ziegler’s invention revolutionizes the business
- LLDPE – the best of both worlds!

Linear Alpha Olefins – A Diverse and Challenging Segment

- Full range processes – make one, make them all
- Sasol – coal to comonomers
- New On-purpose technologies – changing the LAO landscape
- Detergent Alcohols – synthetic versus natural
- Biodiesel and glycerine – the tyranny of 2 for 1 processes

3:00 Coffee Break

3:20 VCM and PVC Business

- Value chains and integration
- How technology saved the day
- China – going back to the future with acetylene
- Vinyls – fraught with environmental, health and safety issues

Ethylene Oxide/Ethylene Glycol Business

- Why the Middle East dominates production
- Why Asia dominates demand
- Who controls the technology

Ethanol

- Synthetic versus natural
- Fuel use versus industrial use
- Is ethanol in gasoline a good thing?

5:00 Finish of Day 1



The Global Petrochemical Industry: Understanding the Complex Interactions between Technology, Economics, and Markets

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DAY 2

8:30 The Businesses from Propylene*

Regional Propylene Supply/Demand Dynamics – Propylene no Longer Ethylene’s Step-Child

- Introduction to the propylene value chain
- Historical, current, and forecast demand by region
- Supply sources and limitations – where will all the propylene come from?
- New and developing on-purpose propylene production technologies

Polypropylene – The Versatile Plastic Driving Propylene Growth

- Natta and Phillips discover polypropylene catalysts at the same time and a patent fight ensues
- Evolution and massive restructuring in the polypropylene business in an effort to maintain profitability
- Major global players
- Trade flows – who makes it/who uses it
- End-uses and intermaterial competition

10:00 Coffee Break

10:20 The Acrylonitrile Business – Technology Still a Barrier

- Ammoxidation technology is discovered and leads to another patent dispute – settled in a most unusual way!
- HCN by-product – provides a barrier to entry
- Major global players but only a few Asian producers
- Trade – the US maintains a major presence
- End-uses – synthetic wool, ABS, and HMDA

The Acrylic Acid Business – A Nicely Profitable Segment

- Key players – a few players dominate the market
- Polyacrylic acid – superabsorbent polymers (SAPs)
- Acrylates – water based paints and UV curing

12:00 Lunch

1:00 The Propylene Oxide Business – New Technologies Changing Industry Dynamics

- Technology evolution – from chlorohydrin to PO/SM
- New co-product free routes driving change
- How to analyze a business – a brief case study

The Styrene/Polystyrene Business – Will New PO-Only Routes Help?

- Feast or famine business
- PO/SM versus conventional EB dehydro
- General purpose, HIPS, expandable
- The Huntsman story
- How a Donald Duck cartoon became prior art

The Phenol Value Chain – The Other 2 for 1 Process

- Phenol and acetone – the magic of chemistry
- How acetone over-supply hurts phenol economics
- Will a co-product free route emerge?
- Phenolics – thermosets versus thermoplastics
- Bisphenol A – toxicity issues at the forefront

3:00 Coffee Break

3:20 The Phenol Value Chain (Cont.)

- Epoxy resins – a business in transition
- Polycarbonate – will the growth abate?
- Acetone/Methyl Methacrylate (MMA)

The Oxo Alcohols Business – Regulation and Biofuels Affecting this Segment

- Technology – the power of homogeneous catalysis
- n-Butanol – Is biobutanol a threat?
- 2-Ethylhexanol and plasticizer business – health and safety concerns impacting demand

5:00 Finish of Day 2



The Global Petrochemical Industry: Understanding the Complex Interactions between Technology, Economics, and Markets

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DAY 3

8:30 The Businesses from the C₄'s

Separation of the C₄ Olefins

Natural and Synthetic Elastomers

- Historical development of the rubber industry
- Charles Goodyear finds the key to curing rubber but dies penniless
- Why rubbers are elastomeric
- WW II spurs development of synthetic rubbers
- Polybutadiene rubber (BR)
- Styrene butadiene rubber (SBR)
- Butyl rubber, EP, EPDM
- Thermoplastic elastomers – a neat trick

Other C₄ Derivatives

- ABS – the Chi Mei story
- MTBE and alternatives
- Maleic Anhydride

10:00 Coffee Break

10:20 Sources of Aromatics – A Question of Balance

- Primary sources – pyrolysis gasoline, reformate, coke oven oil
- Secondary sources – hydrodealkylation, toluene disproportionation, transalkylation
- Regional differences

Businesses from Benzene*

- Styrene (already covered)
- Cumene/Phenol (already covered)
- The Nylon business – how DuPont invented it and how BASF got around their patents
- The Isocyanate and Polyurethane business – a versatile and protected business

12:00 Lunch

1:00 The Businesses From Toluene – TDI*

The Business from Xylenes*

- Separating the xylenes
- PTA/Polyester business – the fastest growing segment in the industry
- Polyester film, fiber, bottles
- 1,3-PDO and PTT – A new monomer and polymer
- Phthalic anhydride – a mature product
- Unsaturated Polyester Resin (UPR)
- Alkyd Resins

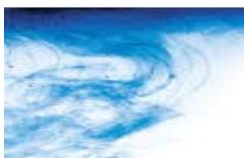
2:30 Coffee Break

3:20 The Businesses From Methane – A Shift To Low Cost Gas Regions*

- Natural gas sources and terminology
- Routes to synthesis gas
- Gas to liquids (GTL)
- Ammonia
- Methanol
- Formaldehyde
- Acetic acid/Acetic Anhydride
- 1,4-Butanediol/THF (A sad, but true story of how one company did not understand “shut-down” economics)

Review of Key Concepts

4:30 Conclusion of Course



The Global Petrochemical Industry: Understanding the Complex Interactions between Technology, Economics, and Markets

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About The Presenters

DR. HAROLD A. WITTCOFF

In his capacity as Scientific Adviser at Nexant, Inc., Dr. Harold A. Wittcoff has presented The Organic Chemical Industry course in-house to about 50 of Nexant's client companies as well as to over several thousand industrial and academic participants in 28 countries. Prior to that, he was Vice-President and Director of Chemical Research for General Mills Chemicals. Concurrently, he taught industrial organic chemistry for nine years at the University of Minnesota.

Dr. Wittcoff is senior co-author with B. G. Reuben of Industrial Organic Chemicals (Wiley, 1996), a revised edition issued in 2004. Organic Chemistry Principles and Industrial Practice, co-authored with M.M. Green, was published in July 2003 (Wiley-VCH). He has contributed articles to ChemTech, The Journal of Chemical Education and other journals. He is the author/co-author of well over 130 patents and 60 technical publications.

DR. JEFFREY S. PLOTKIN

Jeffrey Plotkin is Vice President of Nexant ChemSystems Training Programs and the Process Evaluation/Research Planning (PERP) program. Managing these activities often involves working closely with technology developers, including operating companies and engineering contractors. Jeff's interests are in all phases of process research and development with special emphasis on gas to chemicals, selective oxidations, alkane activation and biocatalyzed routes to chemicals.

Jeff is co-editor of the American Chemical Society's Patent Watch website at Chemistry.org, co-author of "Industrial Organic Chemistry, 2nd Edition" (Wiley Interscience), and is a frequent contributor of technology-oriented articles to ICIS Chemical News. Jeff holds more than thirty U.S. patents and is author of 25 publications in peer reviewed academic journals.