Overview of the Petrochemical and Refining Business

Program Objectives
This program provides a comprehensive overview of today’s international refining, gas processing, and petrochemicals business and how they can be effectively integrated to maximize overall performance. The program consists of a careful balance of lectures by a recognized industry specialist and team participation in a challenging business simulation game mentored by a workshop facilitator. This unique blended learning format has proven to be the best way for participants to internalize the lecture content in a challenging and enjoyable team-based environment. In the process, attendees learn the complexities and business challenges of the emerging petrochemical industry and the opportunities that exist to integrate these three petroleum sectors, i.e., petrochemicals, gas processing, and refining, to maximize competitiveness. Secondary benefits include extensive participant networking, team leadership development, decision-making skills, and making formal presentations.

Key Benefits
Upon completing this program, you will understand:

- The evolution of refining, gas processing, and petrochemical industries.
- Petrochemical industry structure, key players, competitiveness factors. The nature of petrochemical markets, market cycles, supply and demand perspectives. Key challenges and success factors in the petrochemical business.
- The seven basic building blocks of petrochemicals. The benefits of integrating refining, gas processing, and petrochemical complexes, and advantaged feedstocks.
- The emerging shale revolution in the U.S. and its implications on global petrochemical business.
- Petrochemical trading, marketing, supply chain aspects, and customer interfaces.
- Identification of investment opportunities, methodologies in selecting robust investments.

Who Should Attend
This program is ideal for individuals who seek an integrated understanding of the international refining and petrochemicals business, as it provides an excellent foundation to achieve a company’s strategic objectives and action plans in petrochemicals. This may include managers, planners, operations personnel, technologists, support staff, and other specialists who wish to learn about this important segment of the value chain. As an introductory course, it is beneficial to individuals from the upstream, downstream, and support functions.

Instructional Format
The instructional format consists of a careful balance of lectures by seasoned experts and a practical business simulation game. The lectures will address the complexities and challenges of the petrochemical, gas, and refining business and all of the key considerations in developing a sound investment and operating plan that maintains long-term competitiveness. During the workshop sessions teams of participants manage the development and operation of an integrated refining and petrochemical complex, within the fictitious Republic of Bilitan, located within the rapidly growing markets of Southeast Asia. In the process, teams will plan and evaluate various options to design and optimize the facilities and manage their performance over 20 years of realistic decisions. Real-life external events will be simulated to provide attendees a deeper understanding of the nature of these businesses and ways to adapt to uncertainties.

Program Location and Schedule
Daily sessions will start at 8:00 AM and run until 5:00 PM. Participants will receive further information on location and schedule upon registration.
Overview of the Energy Industry
Oil and gas measurements and units, value chain, market structures, oil and gas resources and production, unconventional resources, major players, energy outlook, sector analysis, long-term geographical areas of emphasis.

Petrochemical Industry Overview
End uses of petrochemical products, seven basic chemicals, characteristics of the industry, major players, competitiveness, global supply and demand balances, feedstock needs, netback pricing concepts.

Industry Perspectives and Challenges
Global supply and demand balances and fundamental drivers, global capacity additions, major players in petrochemicals, business cyclicality perspectives.

Strategic Initiatives of the Business Enterprise
Strategic intent of the company, current market position, desired growth, areas of focus, attributes of top companies, desired product portfolio, emerging business model of top competitors, key steps to achieve leadership position.

Fundamentals of the Refining Industry: Foundation for Petrochemicals
Evolution of the industry, fuels products supply and demand balances, crude oil characteristics, worldwide crude avails, process configuration options, product yields, refining investments and economics, long-term trends, synergy with petrochemicals.

Manufacture of Petrochemicals from Gas Processing and Refinery Feedstocks
Petrochemical manufacturing process, steam crackers, ethylene, polyethylene, ethylene glycols, polypropylene, aromatics, paraxylene and other derivatives, refinery interfaces.

Steam Cracking Fundamentals
Steam cracking technology, ethylene and propylene production, olefin derivative plants, co-product disposition and valuation, refinery interfaces, interactions with aromatics plants.

Energy Project Economics
Financial models, project cash flow analysis, discounted cash flow and internal rate of returns, sensitivities to changes in key variables. Application of netback pricing concepts. Price forecasting concepts.

Advantaged Feedstock and Transfer Pricing Concepts
Advantaged feedstock definition, factors impacting advantaged feedstock selection, transfer pricing basics, market place driven commercial basis for transfer price evaluation.

Petrochemicals from Gas Processing and Methanol to Olefins
Gas processing, natural gas liquids, potential feedstock for steam cracking, interfaces with refining and petrochemicals, methane conversion to methanol, ammonia, urea and fertilizer production, methanol to olefin technologies.

Technology Development and Applications
Importance of R&D, technology development and innovation for long-term competitiveness, importance of understanding evolving customer needs and adapting to changes.

Integration of Gas Processing, Refining, and Petrochemical Plants to Maximize Financial Results
Capital and operating costs synergies with integration, feedstock and co-product optimization, enhanced value creation and flexibility in designing and operating a complex.

Petrochemicals Marketing and Trading
Key elements of the supply chain, sales, customer, service and support, relationship building, logistics and transportation, product marketing.

Emerging Trends and Disruptive Technologies
External factors that could impact long-term performance, examples of disruptive technologies, impact on design and operations, need for investment robustness.

U.S. Shale Gas Development and Implications
Emerging shale gas and shale oil plays in the U.S., impact on NGL feedstock availability for crackers and competitiveness, ethylene projects in the U.S. and potential implications on global trade flows, impact on propylene manufacturing, interplay with aromatics.
International Petrochemicals Business Game: Bilitan

The workshop setting is the Republic of Bilitan, a republic in the Asia Pacific region located off the coast of Indonesia. As a result of a major oil field discovery, your company, in a joint venture with the Bilitan National Oil Company (“BNOC”), is designing a new 400,000 bbl/day refinery to process the crude into finished products. Given the relatively low domestic demand for fuels products, it is anticipated that substantial naphtha will be available from the refining complex for potential sales. Your parent company wants your team to evaluate the possibility of adding a petrochemicals complex using naphtha and associated gas as a feed to take advantage of the rapid growth in petrochemicals markets in the Asia Pacific region and to provide employment opportunities for local nationals. Your parent company anticipates that the highest value for the crude and associated gas will be achieved with an integrated refining / petrochemical complex.

Participants, divided into teams, compete to win the “team prize” as they build a petrochemical complex that optimizes the product slate and feedstock selection from the refinery and gas processing plant. In order to provide rapid feedback on each team’s ongoing performance, IHRDC has developed the International Petrochemical Business Simulator, which allows teams to make ongoing decisions and simulate many years of performance in a short time. This classic IHRDC business game and workshop consistently earns very high praise from participants for its realism, stimulation of learning process, incorporation of real world situations and the benefits of working in teams with delegates from many countries.

The sessions include:

- Introduction to activities and goals
- Material balances across the refining and petrochemical complexes
- Evaluation of a naphtha and reforming based aromatics plant for production of paraxylene
- Evaluation of a naphtha cracker for the manufacture of polyethylene, ethylene glycol, and polypropylene
- Evaluation of associated gas as a feedstock to the cracker
- Integrated petrochemical business decision involving aromatics plant and ethylene cracker: Feedstock, configuration, investments, economics, sensitivities
- Year 5 industry outlook: New challenges for evaluation
- Review of results and preparation of team presentations
- Presentations of team decisions and performance results
This program will be led by a senior lecturer (Dr. Kris Ramanadhan). He will be assisted by a Workshop Facilitator who will direct the business simulation sessions. Their backgrounds are as follows:

**Dr. Kris Ramanadhan** joined IHRDC as an Executive Consultant in 2012. Prior to that, Dr. Ramanadhan spent 40 years with ExxonMobil Corporation in a variety of technical, managerial, and executive assignments on a global basis with focus on the refining and petrochemicals sectors. Fifteen of these years were spent in the Asia Pacific region, specifically in China, Singapore, and Hong Kong. He began his career as an engineer with Exxon in its refining and petrochemicals complex in Baytown, Texas and progressed through technical and operational management positions in its downstream business. During this period he served as a Corporate and Strategic Planning Advisor in Houston and then returned to Baytown as Engineering and Operations Support Manager. In these positions Dr. Ramanadhan handled personnel recruiting, training, profitability maximization, technology applications, and capital investments including the development and execution of large complex projects. In 1990 Dr. Ramanadhan began his international assignments serving as the Project Executive in Singapore for three years on a major refinery conversion project and then moved to New Jersey, as Corporate Advisor for Exxon International with responsibilities for Asia Pacific, Europe, and other regions. In 1994 Dr. Ramanadhan was appointed as Vice President for Business Development for ExxonMobil China Petroleum and Petrochemical Company, Hong Kong, to develop a multi-billion dollar, integrated refining and petrochemical complex on a joint basis with two major National Oil Companies. In 2006 he became a Project Executive and was involved in a successful petrochemical complex in Singapore. In 2010 Dr. Ramanadhan returned to Fairfax, U.S. as a Planning Executive for Corporate Strategy Development in several emerging markets. Dr. Ramanadhan received a Ph.D. degree in Chemical Engineering from Purdue University, attended the MBA program at the University of Houston, and is a graduate of the New Leadership Program at Thunderbird University (School of International Business).

**Dr. Charles Brankman**, Director of Instructional Programs with IHRDC, is a professional geologist and project developer who has been actively involved in a range of activities in the energy business, including E&P, engineering geologic consulting for the gas transmission and power generation sectors, and CO\(_2\) enhanced oil recovery. After receiving a B.S. in geological engineering from Princeton University, Dr. Brankman earned an M.S. in structural geology from Stanford University. During his studies, he spent time at Mobil Oil Company in exploration and reservoir characterization. After Stanford, he worked in northern California as an engineering geologist on projects related to the siting of gas pipelines and power plants. He then pursued a Ph.D. in structural geology and earth resources at Harvard University, during which he taught several undergraduate courses and received several teaching awards. After receiving his degree from Harvard, he cofounded and served as Vice President of Geosciences at C12 Energy, a company focused on CO\(_2\) oil recovery projects using anthropogenic CO\(_2\).