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## 82U6DU - KEELY STEPHANIE

This report presents a cost analysis of Polymer Grade (PG) Propylene production from propane using a dehydrogenation process. The process examined is similar to Uhde STAR process. In this process, Propylene is produced through two dehydrogenation steps: a steam reforming step followed by oxyreaction. This report examines one-time costs associated with the construction of a United States-based plant and the continuing costs associated with the daily operation of such a plant. More specifically, it discusses: \* Capital Investment, broken down by: - Total fixed capital required, divided in production unit (ISBL); infrastructure (OSBL) and contingency - Alternative perspective on the total fixed capital, divided in direct costs, indirect costs and contingency - Working capital and costs incurred during industrial plant commissioning and start-up \* Production cost, broken down by: - Manufacturing variable costs (raw materials, utilities) - Manufacturing fixed costs (maintenance costs, operating charges, plant overhead, local taxes and insurance) - Depreciation and corporate overhead costs \* Raw materials consumption, products generation and labor requirements \* Process block flow diagram and description of industrial site installations (production unit and infrastructure)

This report was developed based essentially on the following reference(s): US Patent 7678956, issued to Uhde in 2010 Keywords: PG Propylene, Steam Active Reforming, Thyssenkrupp, Propene, PDH, On-Purpose Propylene Production

Polypropylene is a thermoplastic polymer with exceptional properties, which have made it one of the most widely used polymers, second only to polyethylene in terms of global demand. The second most usual way to make polypropylene are through gas phase technologies. In this report, the production of homopolymer polypropylene by the use of a fluidized bed polymerization reactor, in a process similar to Dow UNIPOL technology, is re-

viewed. It is presented a detailed technical and economic evaluation of a unit located in the US Gulf Coast, including a comparison between a stand-alone unit and a facility integrated with a propane dehydrogenation plant. Also, the evaluation is conducted for a plant constructed in China. While China presented the most attractive return of investment, propylene elevated market prices in the USA make it profitable only when integrated with a propylene production unit. About the Publication Program The Technology Economics Program is a program that provides, by way of periodic reports, in-depth techno-economic assessments covering mature process technologies used by the chemical, polymer, refining and allied industries. Each report presents the following topics: process flow diagrams and description heat and material balances major equipment list equipment cost estimates bulk material and installation costs inside and outside battery limits capital costs process yields, raw material and utility consumptions fixed costs contributions process profitability by location

This report presents alternatives for producing PG Propylene from different feedstocks and a cost comparison of these alternatives, across different countries. More specifically, the report compares the costs of PG Propylene production through the following pathways: \* Pathway 1: Propylene Production from Light Naphtha \* Pathway 2: Propylene Production from Ethylene and Butenes \* Pathway 3: Propylene Production from Propane (with Hydrogen Generation) - Pathway 1 corresponds to a steam cracker for Propylene production (ethylene as co-product). In Pathway 2, Propylene is produced via metathesis reaction of ethylene with 2-butene (present in raffinate-2 feedstock). In Pathway 3, propane is dehydrogenated to Propylene with hydrogen generated being valued as fuel. The analysis presented in this report includes: \* A comparison of the economic potential of the pathways listed above in several countries, comprising: \* Comparative analysis of capi-

tal costs \* Comparative analysis of production costs \* Comparison between product price and raw materials costs of each pathway \* An overview of each production pathway, including: \* Raw material(s) consumption figures and product(s) generated \* Related technology licensors and block flow diagram of representative industrial processes Keywords: Propene, Ethene, Steam Cracking, PDH, Propane Dehydrogenation, Olefins Conversion Technology, OCT Supplying nearly 350 expertly-written articles on technologies that can maximize and enhance the research and production phases of current and emerging chemical manufacturing practices and techniques, this second edition provides gold standard articles on the methods, practices, products, and standards recently influencing the chemical industries. New material includes: design of key unit operations involved with chemical processes; design, unit operation, and integration of reactors and separation systems; process system peripherals such as pumps, valves, and controllers; analytical techniques and equipment; current industry practices; and pilot plant design and scale-up criteria.

With the recent advent of nanotechnology, research and development in the area of nanostructured materials has gained unprecedented prominence. Novel materials with potentially exciting new applications are being discovered at a much higher rate than ever before. Innovative tools to fabricate, manipulate, characterize and evaluate such materials are being developed and expanded. To keep pace with this extremely rapid growth, it is necessary to take a breath from time to time, to critically assess the current knowledge and provide thoughts for future developments. This book represents one of these moments, as a number of prominent scientists in nanostructured materials join forces to provide insightful reviews of their areas of expertise, thus offering an overall picture of the state-- the art of the field. Nanostructured materials designate an in-

creasing number of materials with designed shapes, surfaces, structures, pore systems, etc. Nanostructured materials with modified surfaces include those whose surfaces have been altered via such techniques as grafting and tethering of organic or organometallic species, or through various deposition procedures including electro, electroless and vapor deposition, or simple adsorption. These materials find important applications in catalysis, separation and environmental remediation. Materials with patterned surfaces, which are essential for the optoelectronics industry, constitute another important class of surface-modified nanostructured materials. Other materials are considered nanostructured because of their composition and internal organization.

Elements of Petrochemical Engineering book is meant for the students, teachers and practicing Engineers. This book contains the manufacture, properties and applications of important petrochemicals. Important information's about feedstocks and applications of petrochemical derived products, status of Indian Petrochemical Industry and environment standards for the petrochemical plant are given in the appendices. It also contains short questions and answers and multiple choice questions and answers drawn from examination papers of various engineering colleges for the benefits of the students. The book is targeted to benefit the following : Diploma in Engineering Students, Degree in Engineering Students, AMIE AMIIM, AMIICHE students, Faculty members and teaching staff, Practicing Engineers/Professionals. Latest and updated informations/ data/statistics pertaining to the subject matter has been included in the edition for the benefit of the readers.

The future of the precious metals is shiny and resistant. Although expensive and potentially replaceable by transition metal catalysts, precious metal implementation in research and industry shows potential. These metals catalyze oxidation and hydrogenation due to their dissociative behavior toward hydrogen and oxygen, dehydrogenation, isomerization, and aromatization, etc. The precious metal catalysts, especially platinum-based catalysts, are involved in a variety of industrial processes. Examples include Pt-Rh gauze for nitric acid production, the Pt/Al<sub>2</sub>O<sub>3</sub> catalyst for cyclohexane and propylene production, and Pd/Al<sub>2</sub>O<sub>3</sub> catalysts for petrochemical hydropurification reactions, etc. A quick search of the number of published articles in the last five years containing a combination of corresponding "metals" (Pt, Pd, Ru, Rh and Au) and "catalysts" as keywords indicates the importance of the Pt catalysts, but also

the continuous increase in the contribution of Pd and Au. This Special Issue reveals the importance of precious metals in catalysis and focuses on mono- and bi-metallic formulations of any supported precious metals and their promotional catalytic effect of other transition metals. The application of precious metals in diverse reactions, either homogeneous or heterogeneous, and studies of the preparation, characterization, and applications of the supported precious metal catalysts, are presented.

The petrochemical industry is a scientific and engineering field that encompasses the production of a wide range of chemicals and polymers. The purpose of this book is not only to provide a follow-on to form the later chapters of the highly successful Chemistry and Technology of Petroleum 5th Edition but also provides a simplified approach to a very diverse chemical subject dealing with the chemistry and technology of various petroleum and petrochemical process. Following from the introductory chapters, this book provides the readers with a valuable source of information containing insights into petrochemical reactions and products, process technology, and polymer synthesis. Provides readers with a valuable source of information containing insights into petrochemical reactions and products, process technology, and polymer synthesis. Introduces the reader to the various petrochemical intermediates are generally produced by chemical conversion of primary petrochemicals to form more complicated derivative products. The reactions and processes involved in transforming petroleum-based hydrocarbons into the chemicals that form the basis of the multi-billion dollar petrochemical industry are reviewed and described. The book includes information on new process developments for the production of raw materials and intermediates for petrochemicals. Includes a description of the origin of the raw materials for the petrochemicals industry - including an overview of the coal chemicals industry.

Polypropylene is a thermoplastic polymer with exceptional properties, which have made it one of the most widely used polymers, second only to polyethylene in terms of global demand. The second most usual way to make polypropylene are through gas phase technologies. In this report, the production of homopolymer polypropylene by the use of a vertical stirred-bed polymerization reactor, in a process similar to Lummus Novolen technology, is reviewed. It is presented a detailed technical and economic evaluation of a unit located in the US Gulf Coast, including a comparison between a stand-alone unit

and a facility integrated with a propane dehydrogenation plant. Also, the evaluation is conducted for a plant constructed in China. While China presented the most attractive return of investment, propylene elevated market prices in the USA make it profitable only when integrated with a propylene production unit. About the Publication Program The Technology Economics Program is a program that provides, by way of periodic reports, in-depth techno-economic assessments covering mature process technologies used by the chemical, polymer, refining and allied industries. Each report presents the following topics: process flow diagrams and description heat and material balances major equipment list equipment cost estimates bulk material and installation costs inside and outside battery limits capital costs process yields, raw material and utility consumptions fixed costs contributions process profitability by location

An essential introduction to the organic chemicals industry—in the context of globalization, advances in technology, and environmental concerns. Providing 95 percent of the 500 billion pounds of organic chemicals produced in the world, the petroleum and natural gas industries are responsible for products that ensure our present quality of life. Products as diverse as gasoline, plastics, detergents, fibers, pesticides, tires, lipstick, shampoo, and sunscreens are based on seven raw materials derived from petroleum and natural gas. In an updated and expanded Third Edition, Industrial Organic Chemicals examines why each of these chemical building blocks—ethylene, propylene, C<sub>4</sub> olefins (butenes and butadiene), benzene toluene, the xylenes, and methane—is preferred over another in the context of an environmental issue or manufacturing process, as well as their individual chemistry, derivatives, method of manufacture, uses, and economic significance. The new edition details the seismic shifts in the world's chemistry industry away from the United States, Western Europe and Japan, transforming the Middle East and Asia-Pacific region, especially China, into major players. The book also details: The impact of globalization on the patterns of worldwide transportation of chemicals, including methods of shipping-chemicals. The technological advances in the area of polymerization and catalysis, including catalyst design and single-site catalysts. Chemicals for electronics, with much new material on conducting polymers, photovoltaic cells, and related materials. The discovery of vast reserves of shale gas and shale oil, altering long-term predictions of resource depletion in the United States and other countries. Commer-

cial and market aspects of the chemical industry, with coverage of emerging new companies such as INEOS, Formosa Plastics, LyondellBasell, and SABIC. With expanded coverage on the vital role of green chemistry, renewables, chemicals and fuels on issues of sustainability and climate change, Industrial Organic Chemicals offers an unparalleled examination of what is at the heart of this multi-billion dollar industry, how globalization has transformed it, and its ever growing role in preserving the Earth and its resources.

Authored by a top-level team of both academic and industrial researchers in the field, this is an up-to-date review of mesoporous zeolites. The leading experts cover novel preparation methods that allow for a purpose-oriented fine-tuning of zeolite properties, as well as the related materials, discussing the specific characterization methods and the applications in close relation to each individual preparation approach. The result is a self-contained treatment of the different classes of mesoporous zeolites. With its academic insights and practical relevance this is a comprehensive handbook for researchers in the field and related areas, as well as for developers from the chemical industry.

Ethylene is most frequently produced from petroleum-based feedstock. However, rising oil prices coupled with global concerns about sustainability and global warming have motivated research into ethylene manufacture from renewable sources. Fermentation-derived ethanol has been increasingly used as raw material for renewable ethylene production, presenting the primary advantage of being made from CO<sub>2</sub> removed from the atmosphere. The technical aspects of a process to produce ethylene via ethanol dehydration are reviewed, as well as the key economic parameters for the profitability of an ethanol dehydration plant. This study follows the same pattern as all Technology Economics studies developed by Intratec. About Technology Economics Technology Economics studies are advisory services ordered by leading chemical companies, which are disclosed to public if they allow so. All Technology Economics studies are based on the same rigorous methodology and well-defined structure, encompassing: Process flow diagrams and material balances Raw material and utility consumptions Major equipment sizing Inside and outside battery limits capital costs Detailed fixed and variable manufacturing expenses

This report presents a cost analysis of Polymer Grade (PG) Propylene production from propane using a dehydrogenation process. The process examined is similar to CB&I

Lummus CATOFIN process. In this process, the dehydrogenation reaction is carried out in a fixed-bed reactor. This report was developed based essentially on the following reference(s): (1) US Patent 20120014846, issued to Lummus Technology in 2012 (2) US Patent 8101541, issued to Sud-Chemie in 2012 Keywords: PG Propylene, Clariant, Sud-Chemie, Propene, PDH, On-Purpose Propylene Production

A comprehensive study about on-purpose propylene production via propane dehydrogenation (PDH), a promising alternative that arises from the growing availability of low-cost propane in the United States, due to the exploitation of shale gas in the country. The technical aspects of a PDH process similar to the UOP Oleflex technology are reviewed. The analysis also includes estimates for both the capital investment and the operating costs of typical plants on the US Gulf Coast and in China. This study follows the same pattern as all Technology Economics studies developed by Intratec. About Technology Economics Technology Economics studies are advisory services ordered by leading chemical companies, which are disclosed to public after an agreed upon period of time. All Technology Economics studies are based on the same rigorous methodology and well-defined structure, encompassing: Process flow diagrams and material balances Raw material and utility consumptions Major equipment sizing Inside and outside battery limits capital costs Detailed fixed and variable manufacturing expenses

This book is part of a two-volume work that offers a unique blend of information on realistic evaluations of catalyst-based synthesis processes using green chemistry principles and the environmental sustainability applications of such processes for biomass conversion, refining, and petrochemical production. The volumes provide a comprehensive resource of state-of-the-art technologies and green chemistry methodologies from researchers, academics, and chemical and manufacturing industrial scientists. The work will be of interest to professors, researchers, and practitioners in clean energy catalysis, green chemistry, chemical engineering and manufacturing, and environmental sustainability. This volume focuses on catalyst synthesis and green chemistry applications for petrochemical and refining processes. While most books on the subject focus on catalyst use for conventional crude, fuel-oriented refineries, this book emphasizes recent transitions to petrochemical refineries with the goal of evaluating how green chemistry applications can produce clean energy through petrochemical industrial means. The majority of the chapters are

contributed by industrial researchers and technicians and address various petrochemical processes, including hydrotreating, hydrocracking, flue gas treatment and isomerization catalysts.

This report presents a cost analysis of Polymer Grade (PG) Propylene production from ethylene and raffinate-2 using a metathesis process. The process examined is similar to CB&I Lummus Technology's Olefins Conversion Technology (OCT). In this process, Polymer Grade Propylene is produced through a metathesis reaction of ethylene with 2-butene, present in raffinate-2 feedstock. This report examines one-time costs associated with the construction of a plant and the continuing costs associated with the daily operation of such a plant. More specifically, it discusses: \* Capital Investment, broken down by: - Total fixed capital required, divided in process unit (ISBL); infrastructure (OSBL), contingency and owner's cost - Total fixed capital required, divided in process unit (ISBL); infrastructure (OSBL), contingency and owner's cost - Working capital and costs incurred during industrial plant commissioning and start-up \* Operating cost, broken down by: - Variable operating costs (raw materials, utilities) - Fixed operating costs (maintenance, operating charges, plant overhead, local taxes and insurance) - Depreciation This report was developed based essentially on the following reference(s): (1) US Patent 8440874, issued to Lummus Technology and BASF in 2013 (2) US Patent 20050124839, issued to Lummus Technology in 2005 Keywords: PG Propylene, Olefins Disproportionation, Lummus OCT, Olefins Metathesis, Phillips Triolefin, Propene, Ethene, Butylene, On-Purpose Propylene Production

The tight propylene market contributed to the rising of new and novel lower-cost chemical processes for on-purpose propylene production technologies, like the Propane Dehydrogenation (PDH) technology. This report analyzes a PDH process similar to the licensed by Lummus CATOFIN(r). It is presented a technical and economic evaluation of a unit located in the US Gulf Coast, China and Brazil. While China presented the lowest CAPEX, the USA presented the most advantageous operational margins, due to the rise of shale gas and reduction in propane prices. Although China still depends on imported propane from Middle East, being subjected to shortages of supply, the historical operational margins are high enough to explain the number of PDH planned projects in the country. About the Publication Program The Technology Economics Program is a program that provides, by way of periodic re-

ports, in-depth techno-economic assessments covering mature process technologies used by the chemical, polymer, refining and allied industries. Each report presents the following topics: process flow diagrams and description heat and material balances major equipment list equipment cost estimates bulk material and installation costs inside and outside battery limits capital costs process yields, raw material and utility consumptions fixed costs contributions process profitability by location

The tight propylene market contributed to the rising of new and novel lower-cost chemical processes for on-purpose propylene production technologies. Propane Dehydrogenation (PDH) technology is one of the promising processes that arises to fulfill this need. This report analyzes a PDH process similar to UOP Oleflex. It is presented a detailed technical and economic evaluation of a unit located in the US Gulf Coast. Also, the evaluation is conducted for a plant constructed in Brazil and China. Although China presented the lowest CAPEX, the USA presented the most attractive return of investment, due to the availability of low price propane, obtained from shale gas. The rising number of planned plants for both regions confirms such trends. About the Technology Economics Program It is a program that provides, by way of periodic reports, in-depth techno-economic assessments covering mature process technologies used by the chemical, polymer, refining and allied industries. Each report presents the following topics: process flow diagrams and description heat and material balances major equipment list equipment cost estimates bulk material and installation costs inside and outside battery limits capital costs process yields, raw material and utility consumptions fixed costs contributions process profitability by location

Membrane Reactors for Hydrogen Production Processes deals with technological and economic aspects of hydrogen selective membranes application in hydrogen production chemical processes. Membrane Reactors for Hydrogen Production Processes starts with an overview of membrane integration in the chemical reaction environment, formulating the thermodynamics and kinetics of membrane reactors and assessing the performance of different process architectures. Then, the state of the art of hydrogen selective membranes, membrane manufacturing processes and the mathematical modeling of membrane reactors are discussed. A review of the most useful applications from an industrial point of view is given. These applications include: natural gas steam reforming, autothermal reforming, water gas shift reac-

tion, decomposition of hydrogen sulphide, and alkanes dehydrogenation. The final part is dedicated to the description of a pilot plant where the novel configuration was implemented at a semi-industrial scale. Plant engineers, researchers and postgraduate students will find Membrane Reactors for Hydrogen Production Processes a comprehensive guide to the state of the art of membrane reactor technology.

Leveraging Synergies Between Refining and Petrochemical Processes provides a detailed description of the interfaces and connections between crude oil refining and petrochemicals. It offers a view of global and regional markets and economic opportunities for synergies between these sectors. Features: Shows a global and regional market outlook for crude oil refining and petrochemical sectors Explores economic and market opportunities for taking advantage of the synergies between both sectors Analyzes the technical challenges and opportunities that come with these synergies Gives an outlook and prediction of what companies will be able to achieve in the mid-term future Provides introductory and explanatory material as well as in-depth insight into future technology and market developments This book serves as a reference for professionals in chemical engineering, oil and gas engineering, and industrial chemistry. It aims to help engineers and industry professionals understand the challenges and the potential benefits of developing expansion or optimization projects that may bridge the gap between refining and petrochemicals.

Metal Oxides in Heterogeneous Catalysis is an overview of the past, present and future of heterogeneous catalysis using metal oxides catalysts. The book presents the historical, theoretical, and practical aspects of metal oxide-based heterogeneous catalysis. Metal Oxides in Heterogeneous Catalysis deals with fundamental information on heterogeneous catalysis, including reaction mechanisms and kinetics approaches. There is also a focus on the classification of metal oxides used as catalysts, preparation methods and touches on zeolites, mesoporous materials and Metal-organic frameworks (MOFs) in catalysis. It will touch on acid or base-type reactions, selective (partial) and total oxidation reactions, and enzymatic type reactions The book also touches heavily on the biomass applications of metal oxide catalysts and environmentally related/depollution reactions such as COVs elimination, DeNOx, and DeSOx. Finally, the book also deals with future trends and prospects in metal oxide-based heterogeneous catalysis. Presents case studies in each chapter that pro-

vide a focus on the industrial applications Includes fundamentals, key theories and practical applications of metal oxide-based heterogeneous catalysis in one comprehensive resource Edited, and contributed, by leading experts who provide perspectives on synthesis, characterization and applications

Kinetics of Chemical Processes details the concepts associated with the kinetic study of the chemical processes. The book is comprised of 10 chapters that present information relevant to applied research. The text first covers the elementary chemical kinetics of elementary steps, and then proceeds to discussing catalysis. The next chapter tackles simplified kinetics of sequences at the steady state. Chapter 5 deals with coupled sequences in reaction networks, while Chapter 6 talks about autocatalysis and inhibition. The seventh chapter describes the irreducible transport phenomena in chemical kinetics. The next two chapters discuss the correlations in homogeneous kinetics and heterogeneous catalysis, respectively. The last chapter covers the analysis of reaction networks. The book will be of great use to students, researchers, and practitioners of scientific disciplines that deal with chemical reaction, particularly chemistry and chemical engineering.

This report presents a cost analysis of Polymer Grade (PG) Propylene production from methanol using a methanol-to-olefins (MTO) process. The process examined is similar to UOP/Norsk Hydro (now Ineos) MTO process. In this process, methanol is converted to light olefins. Besides Propylene, polymer grade ethylene is also generated as co-product in the process. This report was developed based essentially on the following reference(s): Funk, G.A., et al., "A Different Game Plan", Hydrocarbon Engineering, December 2013. Keywords: PG Propylene, Fluidized-Bed Reactor, Propene, Ethene, Methyl Alcohol, On-Purpose Propylene Production

This compendium gives an overview of the technologies and economics in the production of olefins in the petrochemical industries. It highlights the options and costs for producing olefins using different technologies and different feedstocks at a time when the cost of carbon dioxide emissions are set to be included in the production cost. Industry professionals, engineers, research scientists and financiers will find this title a valuable resource.

Rising oil prices and global concerns about sustainability and global warming have motivated research into ethylene manufacture from renewable sources. This report reviews the production of ethylene from

ethanol dehydration in a process based on the patent published by BP Chemicals. It is presented a technical and economic evaluation of a unit located in the US Gulf Coast. In addition, a sensitivity analysis was performed in which the effects of variations in prices and technical parameters on the investment and the operating costs were studied. Green ethylene must be sold with an increased premium over fossil-based ethylene of about 50% in order to make the investment attractive. This study follows the same pattern as all Research Potential studies developed by Intratec. About Research Potential Research Potential studies are advisory services ordered by leading chemical companies, which are disclosed to public after an agreed upon period of time. All Research Potential studies are based on the same rigorous methodology and well-defined structure, encompassing: Process flow diagrams and material balances Raw material and utility consumptions Major equipment sizing Inside and outside battery limits capital costs Detailed fixed and variable manufacturing expenses Sensitivity analysis

This multivolume work covers all aspects of membrane science and technology - from basic phenomena to the most advanced applications and future perspectives. Modern membrane engineering is critical to the development of process-intensification strategies and to the stimulation of industrial growth. The work presents researchers and industrial managers with an indispensable tool toward achieving these aims. Covers membrane science theory and economics, as well as applications ranging from chemical purification and natural gas enrichment to potable water Includes contributions and case studies from internationally recognized experts and from up-and-coming researchers working in this multi-billion dollar field Takes a unique, multidisciplinary approach that stimulates research in hybrid technologies for current (and future) life-saving applications (artificial organs, drug delivery)

Surface organometallic chemistry is a new field bringing together researchers from organometallic, inorganic, and surface chemistry and catalysis. Topics ranging from reaction mechanisms to catalyst preparation are considered from a molecular basis, according to which the "active site" on a catalyst surface has a supra-molecular character. This, the first book on the subject, is the outcome of a NATO Workshop held in Le Rouret, France, in May, 1986. It is our hope that the following chapters and the concluding summary of recommendations for research may help to provide a definition of surface

organometallic chemistry. Besides catalysis, the central theme of the Workshop, four main topics are considered: 1) Reactions of organometallics with surfaces of metal oxides, metals, and zeolites; 2) Molecular models of surfaces, metal oxides, and metals; 3) Molecular approaches to the mechanisms of surface reactions; 4) Synthesis and modification of zeolites and related microporous solids. Most surface organometallic chemistry has been carried out on amorphous high-surface area metal oxides such as silica, alumina, magnesia, and titania. The first chapter, contributed by KNOZINGER, gives a short summary of the structure and reactivity of metal oxide surfaces. Most of our understanding of these surfaces is based on acid base and redox chemistry; this chemistry has developed from X-ray and spectroscopic data, and much has been inferred from the structures and reactivities of adsorbed organic probe molecules. There are major opportunities for extending this understanding by use of well-defined (single crystal) oxide surfaces and organometallic probe molecules.

This is a free full sample report offered by Intratec Solutions to demonstrate, in advance, the type of information you will get when you buy one of our reports, offering the same standard and structure (types of graphs, tables and descriptions) that you will find in all of our Cost Analysis Overview reports. This report presents alternatives for producing PG Propylene from different feedstocks and a cost comparison of these alternatives, across different countries. More specifically, the report compares the costs of PG Propylene production through the following pathways: \* Pathway 1: Propylene Production from Light Naphtha \* Pathway 2: Propylene Production from Ethylene and Butenes \* Pathway 3: Propylene Production from Propane (with Hydrogen Generation) Pathway 1 corresponds to a steam cracker for Propylene production (ethylene as co-product). In Pathway 2, Propylene is produced via metathesis reaction of ethylene with 2-butene (present in raffinate-2 feedstock). In Pathway 3, propane is dehydrogenated to Propylene with hydrogen generated being valued as fuel. The analysis presented in this report includes: \* A comparison of the economic potential of the pathways listed above in several countries, comprising: - Comparative analysis of capital costs - Comparative analysis of production costs \* Comparison between product price and raw materials costs of each pathway - An overview of each production pathway, including: - Raw material(s) consumption figures and product(s) generated - Related technology licensors and block flow dia-

gram of representative industrial processes Keywords: Propene, Ethene, Steam Cracking, PDH, Propane Dehydrogenation, Olefins Conversion Technology, OCT

This report presents a cost analysis of Polymer Grade (PG) Propylene production from propane using a dehydrogenation process. The process examined is similar to CB&I Lummus CATOFIN process. In this process, the dehydrogenation reaction is carried out in a fixed-bed reactor. This report examines one-time costs associated with the construction of a United States-based plant and the continuing costs associated with the daily operation of such a plant. More specifically, it discusses: \* Capital Investment, broken down by: - Total fixed capital required, divided in production unit (ISBL); infrastructure (OSBL) and contingency - Alternative perspective on the total fixed capital, divided in direct costs, indirect costs and contingency - Working capital and costs incurred during industrial plant commissioning and start-up \* Production cost, broken down by: - Manufacturing variable costs (raw materials, utilities) - Manufacturing fixed costs (maintenance costs, operating charges, plant overhead, local taxes and insurance) - Depreciation and corporate overhead costs \* Raw materials consumption, products generation and labor requirements \* Process block flow diagram and description of industrial site installations (production unit and infrastructure) This report was developed based essentially on the following reference(s): (1) US Patent 20120014846, issued to Lummus Technology in 2012; (2) US Patent 8101541, issued to Sud-Chemie in 2012 Keywords: PG Propylene, Clariant, Sud-Chemie, Propene, PDH, On-Purpose Propylene Production

This report presents a cost analysis of Polymer Grade (PG) Propylene production from propane using a dehydrogenation process The process examined is similar to UOP Oleflex process. In this process, the dehydrogenation reaction is carried out in a moving-bed reactor. This report was developed based essentially on the following reference(s): (1) US Patent 20120108877, issued to UOP in 2012 (2) US Patent 5457256, issued to UOP in 1995 Keywords: PG Propylene, Continuous Catalyst Regeneration, CCR, Propene, PDH, On-Purpose Propylene Production

Gas separation by membranes has acquired increasing importance in the petrochemical industry and is now a relatively well-established unit operation, especially in the monomer recovery of polymer production processes. Considering the current tight monomers market, polymer degassing steps present potential improvement

opportunities, through the recovery of vent streams containing monomers. The economic analysis presented in this report is based upon the installation of a membrane-based propylene recovery unit in a polypropylene plant, a unit similar to MTR VaporSep(r). Such measure was demonstrated to be attractive in the US Gulf Coast, due to propylene scarcity, which has recently raised its market value. The alternative of using such vent streams as fuel showed to be less interesting, since fuel prices are low, due to natural gas growing offerings. About the Publication Program The Improvement Economics Program is a program that provides, by way of periodic reports, insightful and unbiased reviews on process improvement opportunities, from both a technical and economic perspective. Each report presents the following topics: opportunity description schematics, such as flow diagrams technical details, such as heat and material balances, key performance indicators environmental impact analysis capital and operating costs breakdown alternative solutions overview

Presents state-of-the-art information concerning the syntheses of valuable functionalized organic compounds from alkanes, with a focus on simple, mild, and green catalytic processes Alkane Functionalization offers a comprehensive review of the state-of-the-art of catalytic functionalization of alkanes under mild and green conditions. Written by a team of leading experts on the topic, the book examines the latest research developments in the synthesis of valuable functionalized organic compounds from alkanes. The authors describe the various modes of interaction of alkanes with metal centres and examine the oxidative alkane functionalization upon C-O bond formation. They address the many types of mechanisms, discuss typical catalytic systems and highlight the strategies inspired by biological catalytic systems. The book also describes alkane functionalization upon C-heteroatom bond formation as well as oxidative and non-oxidative approaches. In addition, the book explores non-transition metal catalysts and metal-free catalytic systems and presents selected types of functionalization of sp<sup>3</sup> C-H bonds pertaining to substrates other than alkanes. This important resource: Presents a guide to the most recent advances concerning the syntheses of valuable functionalized organic compounds from alkanes Contains information from leading experts on the topic Offers information on the catalytic functionalization of alkanes that allows for improved simplicity and sustainability compared to current multi-stage industrial processes Explores

the challenges inherent with the application of alkanes as starting materials for syntheses of added value functionalized organic compounds Written for academic researchers and industrial scientists working in the fields of coordination chemistry, organometallic chemistry, catalysis, organic synthesis and green chemistry, Alkane Functionalization is an important resource for accessing the most up-to-date information available in the field of catalytic functionalization of alkanes.

The growing exploitation of shale gas in the United States raised the propane availability, reducing its prices. This, coupled with growing demand for propylene, made of the propane dehydrogenation (PDH) a promising alternative for on-purpose propylene production. The technical aspects of a PDH process similar to the Lummus CATOFIN technology are reviewed. The analysis also includes estimates for both the capital investment and the operating costs of typical plants on the US Gulf Coast and in China. This study follows the same pattern as all Technology Economics studies developed by Intratec. About Technology Economics Technology Economics studies are advisory services ordered by leading chemical companies, which are disclosed to public after an agreed upon period of time. All Technology Economics studies are based on the same rigorous methodology and well-defined structure, encompassing: Process flow diagrams and material balances Raw material and utility consumptions Major equipment sizing Inside and outside battery limits capital costs Detailed fixed and variable manufacturing expenses

This report presents a cost analysis of Polymer Grade (PG) Propylene production from methanol using a methanol-to-propylene (MTP) process. The process examined is similar to Lurgi MTP process. This process is carried out in two steps: first, methanol is converted to dimethyl ether (DME), and then DME is converted to Propylene. Gasoline is also generated as by-product in the process. This report examines one-time costs associated with the construction of a United States-based plant and the continuing costs associated with the daily operation of such a plant. More specifically, it discusses: \* Capital Investment, broken down by: - Total fixed capital required, divided in production unit (ISBL); infrastructure (OSBL) and contingency - Alternative perspective on the total fixed capital, divided in direct costs, indirect costs and contingency - Working capital and costs incurred during industrial plant commissioning and start-up \* Production cost, broken down by: - Manufacturing variable costs (raw ma-

terials, utilities) - Manufacturing fixed costs (maintenance costs, operating charges, plant overhead, local taxes and insurance) - Depreciation and corporate overhead costs \* Raw materials consumption, products generation and labor requirements \* Process block flow diagram and description of industrial site installations (production unit and infrastructure) This report was developed based essentially on the following reference(s): US Patent 20100063337, issued to Lurgi in 2010 Keywords: PG Propylene, Methyl Alcohol, Propene, On-Purpose Propylene Production This book summarizes recent advances in the processing of waste biomass resources to produce biofuels and biochemicals. Worldwide interest in clean energy sources, environmental protection, and mitigating global warming is rapidly gaining momentum and spurring on the search for alternative energy sources, especially for the transportation and industrial sectors. This book reviews the opportunities presented by low-cost organic waste materials, discussing their suitability for alternative fuel and fine chemical production, physicochemical characterization, conversion technologies, feedstock and fuel chemistry, refining technologies, fuel upgrading, residue management, and the circular economy. In addition, it explores applied aspects of biomass conversion by highlighting several significant thermochemical, hydrothermal and biological technologies. In summary, the book offers comprehensive and representative descriptions of key fuel processing technologies, energy conversion and management, waste valorization, eco-friendly waste remediation, biomass supply chain, lifecycle assessment, techno-economic analysis and the circular bioeconomy.

The rise of shale gas and the consequent reduction in propane prices added to the interest about Propane Dehydrogenation (PDH) processes - one of on-purpose propylene production technologies. This publication reviews the technical aspects of a PDH technology similar to the Uhde STAR process(r), which employs an oxydehydrogenation step. The analysis also includes estimates for both the capital investment and the operating costs of typical plants on the US Gulf Coast and in China. This study follows the same pattern as all Technology Economics studies developed by Intratec. About Technology Economics Technology Economics studies are advisory services ordered by leading chemical companies, which are disclosed to public after an agreed upon period of time. All Technology Economics studies are based on the same rigorous methodology and well-defined structure, encompassing: Process

flow diagrams and material balances Raw material and utility consumptions Major equipment sizing Inside and outside battery limits capital costs Detailed fixed and variable manufacturing expenses

The essential new edition of the book that put hypercarbon chemistry on the map A comprehensive and contemporary treatment of the chemistry of hydrocarbons (alkanes, alkenes, alkynes, and aromatics) towards electrophiles, Hypercarbon Chemistry, Second Edition deals with all major aspects of such chemistry involved in hydrocarbon transformations, and of the structural and reaction chemistry of carboranes, mixed hydrides in which both carbon and boron atoms participate in the polyhedral molecular frameworks. Despite the firmly established tetravalency, carbon can bond simultaneously to five or more other atoms. "Hypercarbon" bonding permeates much organic, inorganic and organometallic chemistry, and the book serves as the compendium for this phenomenon. Copious diagrams illustrate the rich variety of hypercarbon structures now known, and patterns therein. Individual chapters deal with specific categories of compound (e.g. organometallics, carboranes, carbocations) or transformations that proceed through transient hypercarbon species, detailing fundamental chemistry, including reactivity, selectivity, stereochemistry, mechanistic factors and more. A decade ago, the U.S. chemical industry was in decline. Of the more than 40 chemical manufacturing plants being built worldwide in the mid-2000s with more than \$1 billion in capitalization, none were under construction in the United States. Today, as a result of abundant domestic supplies of affordable natural gas and natural gas liquids resulting from the dramatic rise in shale gas production, the U.S. chemical in-

dustry has gone from the world's highest-cost producer in 2005 to among the lowest-cost producers today. The low cost and increased supply of natural gas and natural gas liquids provides an opportunity to discover and develop new catalysts and processes to enable the direct conversion of natural gas and natural gas liquids into value-added chemicals with a lower carbon footprint. The economic implications of developing advanced technologies to utilize and process natural gas and natural gas liquids for chemical production could be significant, as commodity, intermediate, and fine chemicals represent a higher-economic-value use of shale gas compared with its use as a fuel. To better understand the opportunities for catalysis research in an era of shifting feedstocks for chemical production and to identify the gaps in the current research portfolio, the National Academies of Sciences, Engineering, and Medicine conducted an interactive, multidisciplinary workshop in March 2016. The goal of this workshop was to identify advances in catalysis that can enable the United States to fully realize the potential of the shale gas revolution for the U.S. chemical industry and, as a result, to help target the efforts of U.S. researchers and funding agencies on those areas of science and technology development that are most critical to achieving these advances. This publication summarizes the presentations and discussions from the workshop.

This unique reference is the only one-stop source for details on licensed petrochemical processes for the major organic chemicals, a \$200 billion annual market. With chapters prepared by some of the largest petrochemical and petroleum companies in the world, Handbook of Petrochemicals Production Processes provides in-depth process detail for commercial evaluation

and covers plastics and polymers such as ethylene and polyethylene; propylene; ethylbenzene, styrene, and polystyrenes; vinyl chloride and polyvinyl chloride; and many others. This handbook answers questions on yields, unit operations, chemical and physical values, economics, and much more.

The second edition of Comprehensive Organic Synthesis—winner of the 2015 PROSE Award for Multivolume Reference/Science from the Association of American Publishers—builds upon the highly respected first edition in drawing together the new common themes that underlie the many disparate areas of organic chemistry. These themes support effective and efficient synthetic strategies, thus providing a comprehensive overview of this important discipline. Fully revised and updated, this new set forms an essential reference work for all those seeking information on the solution of synthetic problems, whether they are experienced practitioners or chemists whose major interests lie outside organic synthesis. In addition, synthetic chemists requiring the essential facts in new areas, as well as students completely new to the field, will find Comprehensive Organic Synthesis, Second Edition an invaluable source, providing an authoritative overview of core concepts. Winner of the 2015 PROSE Award for Multivolume Reference/Science from the Association of American Publishers Contains more than 170 articles across nine volumes, including detailed analysis of core topics such as bonds, oxidation, and reduction Includes more than 10,000 schemes and images Fully revised and updated; important growth areas—including combinatorial chemistry, new technological, industrial, and green chemistry developments—are covered extensively