## Petroleum & Petroleum Products Technology Handbook (Thermal Cracking of Pure Saturated Hydrocarbons, Petroleum Asphalts, Refinery Products, Blending and Compounding, Oil Refining and Residual Fuel Oils)

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Petroleum asphalt is a sticky, black and highly viscous liquid or semi-solid that is present in most petroleum crude oils and in some natural deposits. Petroleum crude oil is a complex mixture of a great many different hydrocarbons. Refined petroleum products are derived from crude oils through processes such as catalytic cracking and fractional distillation. Refining is a necessary step before oil can be burned as fuel or used to create end products. Residual fuel oil is a complex mixture of hydrocarbons prepared by blending a residuum component with a flux stock which is a distillate component diluent, to give the desired viscosity of the fuel oil produced. Petroleum refining is the process of separating the many compoundspresent in crude petroleum. An Oil refinery or petroleum refinery is an industrial process plant wherecrude oil is processed and refined into more useful products The global Petroleum Asphalt market is valued at USD 48.8 Billion in 2017 and is expected to reach USD 77.67 Billion by the end of 2024, growing at a Growth Rate of 6.87% between 2017 and 2024. The global bunker fuel market was valued at \$137,215.5 million in 2017 and is expected to reach \$273,050.4 million by 2025, registering a CAGR of 9.4% from 2018 to 2025. Some of the fundamentals of the book are composition of radiation effects on lubricants, thermal cracking of pure saturated hydrocarbons, petroleum asphalts, refinery products, refinery feedstocks, blending and compounding, oil refining, residual fuel oils, distillate heating oils, formulations of petroleum, photographs of machinery withsuppliers contact details. A total guide to manufacturing and entrepreneurial success in one of today's most lucrative petroleum industry. This book is one-stop guide to one of the fastest growing sectors of the petroleum industry, where opportunities abound for manufacturers, retailers, and entrepreneurs. This is the only complete handbook on the commercial production of petroleum products. It serves up a feast of how-to information, from concept to purchasing equipment.

1. RADIATION EFFECTS ON LUBRICANTS Introduction Interaction of Radiation with Organic Matter General Physical Effects of Radiolysis Base Oils

The Radiation Environment Hydrocarbons (Petroleum Oils) Alkylaromatics Ethers Esters Silicones Halogenated Compounds Additives **Radiation Damage Inhibitors** Antioxidants Viscosity Index Improvers Antiwear Additives Extreme Pressure (EP) Agents Foam Inhibitors **Rust Inhibitors Environmental Factors** Effects of Radiation Type and Intensity Role of Temperature Influence of Oxygen **Oil Lubricants** General: Commerical formulations Based on Alkylaromatic Fluids Fluids Based on Poly (phenyl ethers) Steam Turbine Oils Aircraft Turbine Oils Hydraulic Fluids Lubricating Greases **Gelling Agents** CONTENTS **Base Oils Commerical Greases** Greases of Enhanced Radiation Resistance **Dynamic Tests Principles** 2. THERMAL CRACKING OF PURE SATURATED HYDROCARBONS 65-102 Introduction **Experimental Methods Batch Reactors** Flow Reactors **Residence** Time Volume Change on Reaction Kinetics of the Cracking Process Rates of Decomposition Straight Chain Paraffins Correlation of the Rate Constants for n-Paraffins Effect of Branching on the Rate of Decomposition Effect of Pressure on the Decomposition of Paraffinic Hydrocarbons Rates of Decomposition–Saturated Cyclic Hydrocarbons Estimation of Rate Constant of Decomposition

**APPENDIX** 

Calculation of Product Distribution from Paraffin Cracking by the Rice-Kossiakoff Method.

3. PETROLEUM ASPHALTS Chemical and Physical Composition Possible Structures of the Nuclei in Resins and Asphaltenes Manufacture of Asphalt from Petroleum uses of Asphalts

4. REFINERY PRODUCTS

Low-boiling Products Gasoline Gasoline Specifications Distillate Fuels Jet and Turbine Fuels Automotive Diesel Fuels Railroad Diesel Fuels Heating Oils Residual Fuel Oils

## 5. REFINERY FEEDSTOCKS

- **Crude Oil Properties**
- 1. API Gravity
- 2. Sulfur Content, Wt%
- 3. Pour Point, °F (°C)
- 4. Carbon Residue, Wt%
- 5. Salt Content, 1lb/1000 bbl
- 6. Characterization Factors
- 7. Nitrogen Content, Wt%
- 8. Distilation Range
- 9. Metals Content, ppm
- 10. Total Acid Number
- Composition of Petroleum
- 1. Paraffins
- 2. Olefins
- 3. Naphthenes (Cycloparaffins)
- 4. Aromatics
- Crudes Suitable for Asphalt Manufacture Crude Distillation Curves Problems

## 6. BLENDING AND COMPOUNDING

7. OIL REFINING
Introduction
General Aspects of Oil Refining
Crude Oils and Products
Crude Oil Constituents
Classification of Crude Oils
Oil Products
1. Gas Fuels
2. Liquid Fuels
Nonfuel Applications
Oil Refining Processes

Crude Oil Distillation Atmospheric Distillation Vacuum Distillation Crude Oil Desalting Catalytic Cracking (Cat Cracking) Hydrotreating **Distillate Hydrotreating** Pyrolysis Gasoline Hydrotreating Desulfurizing by Adsorption Catalytic Reforming Introduction Semiregenerative Reformer **Fully Regenerative Reformer Continuously Regenerative Reformer** Hydrocracking **Residue Conversation Process Introduction** Fundamentals of Residue Conversion and Process Options Hydrogen Addition ("H-in") Processes Residue Hydrotreating (Demetallization, Desulfurization, Denitrification) Residue Hydrocracking (Hydroconversion) Carbon Rejection ("C-out") Processes Thermal Processes (Visbreaking, Coking) Catalytic Processes (Residue Cat Cracking) Other Processes **Extraction of Asphaltenes** Partial Oxidation **Process Combinations** Gasoline Upgrading Processes 1. Alkylation 2. Polymerization 3. Isomerization 4. Production of Ethers (MTBE, ETBE) Other Processes Gas Treating Sulfur Recovery Catalysts **Environmental Protection in Oil Refining** Introduction Manufacturing Emissions **Hydrocarbons** Hydrocarbons in Air Hydrocarbons in Wastewater Hydrocarbons in Soil and Groundwater Sulfur and Nitrogen Compounds Sulfur Compounds Nitrogen Compounds **Consumer Related Emissions Transportation Fuels** Motor Gasoline **Diesel Fuel** Marine Fules **Fuels for Heat Generation** 

Cost of Environmental Conservation Integrated Refinery Models Trends of Refinery Structures Hydroskimming Refinery Conversion Concepts Cat Cracking – Visbreaking Refinery Hydrocraking- Cat Cracking Refinery Hydrocracking – Coking Refinery Integration of Existing Refineries Corrosion and Materials Testing and Analysis Crude Oil and Product Properties Testing Methods and Standards Storage and Transport 8. RESIDUAL FUEL OILS History

History **Specifications For Residual Fuels** Fluidity **Thermal Stability Explosiveness** Pacific Specifications for Fuel Oils **Detailed Inspections of Heavy Fuels** End uses of Residual Fuel Oils Steam Boilers Industrial Applications **Diesel Engines** Gas Turbines **Gas-enrichment Oils** Problems Associated with Utilization Sulfur in Residual Fuel Oils Ash Possible Source of Contaminants Soot and Carbon Particles Instability and Incompatibility The Combustion of Residual Fuels **Heating Value** Chemistry of Combustion Flue-gas Analysis Humidity in Air and Flue Gases Heat Content of Flue Gases Specific Heat of Fuel Oils **Residual Fuel Oil Burners** 

DISTILLATE HEATING OILS
 Status of the Heating-Oil Industry
 Burners, Controls and Tanks
 Central-Heating Systems
 Burning Qualities in Oils
 Stability in Heating Oils
 Handling and Delivery
 FORMULATIONS OF PETROLEUM

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