REFINING 101
(NON-TECHNICAL)

Presented by Energy Management Institute

EMI

WWW.EMI.ORG

Understand refining and its impact on the energy marketplace as you examine one of the FUNDAMENTAL BUILDING BLOCKS of the petroleum industry.

COURSE DATES & LOCATIONS

- February 23-24, 2017: Atlanta, GA
- March 29-30, 2017: Houston, TX
- April 26-27, 2017: Calgary, Alberta
- May 24-25, 2017: Houston, TX

REGISTER TODAY!

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DETAILS INSIDE

What You Will Learn

The refinery is at the center of the petroleum industry, linking all upstream and downstream activities. The refinery provides the key conversions from crude oil and other feedstocks into an array of petroleum products needed by the energy marketplace. This course presents a "low-to-mid-tech" view of the basics of petroleum refining, the processing units that make up typical refining configurations in world markets, and the key factors comprising the economic "drivers" of refinery operations.

There are about 150 operating refineries in the U.S., and their technology, processes, and market significance vary widely. EMI will guide you through each complex refining stage along the way to distill diverse crude grades into a host of refined products from gasoline to residual products.

The key processing operations involved in a refinery will be discussed. We'll apply just enough "chemistry" to understand the "big picture" of what conversions are taking place and why. You will also learn how value is added in the refinery, and you'll learn about the derivation of "relative value" among the various crude oil and feedstock choices in the global marketplace.

Topics covered include:

- Crude oil characteristics
- Oil sands production
- Refinery types and degrees of complexity
- Distillation (atmospheric and vacuum)
- Cracking (thermal and catalytic)
- Hydrogen treatment
- Alteration (such as Catalytic Reforming and Isomerization)
- Unification (such as Alkylation and Polymerization)
- Gas treatment
- Hydrogen production
- Primary product pools
- Alternative energy sources
- Blending operations and primary product pools

Course Content

- We'll thoroughly explain separation processes such as atmospheric and vacuum distillation.
- We'll have an entire section on the cracking processes including thermal (steam and coking) as well as catalytic cracking (FCCU and hydrocracking).

(Continued on Next Page)

COURSE DATES & LOCATIONS

- **February 23-24, 2017 - Atlanta, GA**
  Regus Conference Center
  8:30am - 4:30pm both days
- **March 29-30, 2017 - Houston, TX**
  Norris Conference Center
  Houston-Westchase
  8am - 4pm both days
- **April 26-27, 2017 - Calgary, Alberta**
  Regus Bankers Hall Business Center
  8:30am - 4:30pm both days
- **May 24-25, 2017 - Houston, TX**
  Norris Conference Center
  8am - 4pm both days

See last page for venue addresses.

REGISTER ONLINE

EMI CERTIFICATION CREDIT

This course earns 6 credits towards EMI Certification.

REGISTRATION FEES

1st delegate:	$1,995
2nd delegate:	$1,795
3rd delegate:	$1,600

Course Content

- We'll closely examine the opposite of the cracking process with unification processes (alkylation and polymerization) and alteration processes (catalytic reforming and isomerization).
- We'll look at chemical processes such as desalting, hydrotreating, and solvent recovery.
- We'll cover specifications as set by the EPA and ASTM, and you'll understand how refineries have adapted to produce new boutique gasolines and how they will deal with even tougher mandates involving highway diesel.
- We'll study the components including: Steam generation, water treatment, pumps, valves, pressure relief systems, and safety procedures.
- You will understand the impact of how refinery turn-arounds, fires, and unscheduled maintenance can pressure market volatility, price and upset supply balance.
- We'll delve into North American and world refinery capacity, utilization, and yields. See how long-term demand might outstrip capacity. Explore the need for global refinery growth.
- Finally examine some alternative energy sources as well as refinery margins and how the fundamentals drive the overall economic strategy of integrated oil companies.

Who Should Attend

New employees, or those newly assigned to responsibilities in the various aspects of the petroleum industry would find this course very helpful in understanding the role of the operating units and how these units fit together to efficiently produce a wide array of products. For example schedulers and pipeline personnel and those assigned in Upstream, Mid-Stream, Marketing, Tax, Legal, and Information Technology functions typically have little or no knowledge of the refinery, which is one of the fundamental building blocks of the petroleum industry.

Learn From The Best!

Russ Mehl has over 45 years of experience in the petroleum industry. He has worked in refinery operations, in the refinery laboratory, and as a process engineer. He has been the manager of petroleum supply and distribution for a Fortune 200 company. He is also an accountant and has experience in economic research, financial analysis, and as Director of the Budget. He received a national award for an article published in an accounting journal.

Russ has taught college classes in Finance and Accounting as well as Strategic Planning. He is also active in civic affairs in Kansas City and has served as Chairman of the Board for a number of agencies. He is an accomplished photographer having numerous pictures appearing on magazine covers and in books.

CPE CREDITS

This course earns 12 CPE credits.

Energy Management Institute is registered with the National Association of State Boards of Accountancy (NASBA) as a sponsor of continuing professional education on the National Registry of CPE Sponsors.

State boards of accountancy have final authority on the acceptance of individual courses for CPE credit. Complaints regarding registered sponsors may be addressed to the National Registry of CPE Sponsors, 150 Fourth Avenue North, Suite 700, Nashville, TN, 37219-2417. Web site: www.learningmarket.org.

Course Syllabus: DAY ONE

Session 1: Context and History of Refining

Why are all eyes focused on the refinery sector? Why has there been a considerable amount of consolidation in this sector? Is there a shortage of refining capacity? What expansions and new refineries are on tap? What is on the horizon? How is the refining sector impacting energy price? Let's get started by looking back to set the stage followed by a look into the future of this ever evolving sector of the energy industry.

Session 2: Crude Oil

Crude oil is the life blood of a refinery. The most efficient and profitable way to run a refinery is based on which crude oils are processed. How was crude oil formed? What is in crude oil? How are crude oils classified? We will also look at the Canadian synthetic crude and who imports and exports crude oil.

Session 3: Overview of Products and Refining Operations

This section will explain what a refinery is. It will take an in-depth look at the products produced and their specifications. The session will offer a macro overview of the major refinery operations and how they fit together. We will discuss the various complexity categories and take a look at the Nelson Complexity Index.

Session 4: Petroleum Chemistry

This session will not be a substitute for an advanced chemistry course, rather it will introduce all of the necessary jargon and relationships related to the organic chemistry of hydrocarbons. We will also take a brief look at alcohols, sulfur compounds and amines as they relate to the refining process. This section is a very important primer which will be helpful in understanding the many chemical conversion processes discussed in the remainder of the program.

Session 5: The Refinery Distillation Process

This session will delve into the atmospheric and vacuum distillation processes. This is the first step in the refinery process, after desalting the crude oil. We will discuss the ever important process of separating crude oil into a number of important fractions. Although this is not the most complicated process in a refinery, it is where it all begins.

Session 6: The Refinery Cracking Process

Cracking of hydrocarbons is one of the more important processes in a refinery. The cracking process relies on process of rearranging or breaking down complex hydrocarbons into lighter more valuable hydrocarbons. This session will discuss catalytic cracking, hydrocracking and thermal cracking. We will discuss the details of each of these processes as well as the feedstock and end result product characteristics.

Course Syllabus: DAY TWO

Session 1: Conversion and Chemical Treatment

Gasoline has historically been the petroleum product of choice in the marketplace. We will see how engineers addressed the need for increased quantities of high octane gasoline with the development of such processes as alkylation, polymerization, catalytic reforming, and isomerization. However, diesel fuel is rapidly taking on an increased importance. We will see how refiners are addressing that change. In the early 70's the world was focused on getting the lead out of gasoline, but in today's world the industry is focused on getting the sulfur out of all oil products. Hydrotreating of oil has never been more important.

Session 2: Refinery Gas Plants

This session will delve into the operations of both the Saturated and Unsaturated Gas Plant operations. We will discuss how the Saturate (sat) gas plants separate refinery gas components including butanes for alkylation, pentanes for gasoline blending, LPG's for fuel, and ethane for petrochemicals. Because sat gas processes depend on the feedstock and product demand, each refinery uses different systems, usually absorption-fractionation or straight fractionation. In addition the session will review how the Unsaturated (unsat) gas plants recover light hydrocarbons (C3 and C4 olefins) from wet gas streams from the FCC, TCC, and delayed coker overhead accumulators or fractionation receivers.

Session 3: Product Blending, Distribution, and Economics

Once the refiner accumulates all of the various components how do they get it into usable, marketable products? How is it done and how do economics and government mandated specification intermix? This discussion will lead to the second part of this session regarding the valuation of crude oil. We will discuss crude oil netbacks, refinery optimization using linear programming models and how refiners ultimately select the optimum slate of feedstock's to maximize the profit of the oil products sold from the refinery.

Session 4: Other Processes

There are other less known but important processes done on the refinery. This section will look at sweetening and treating, asphalt production, hydrogen production, and lubricant, wax, and grease manufacturing. In addition, we will look at some other operations such as heating and cooling, steam production, and the important subject of water treatment. Much equipment is used on refineries and we will examine the need for compressors, turbines, pumps, valves and piping and why refiners have moved toward standardization of parts. We will also examine the need for pressure relief systems (including the often misunderstood nature of flaring) and the constantly critical subject of plant safety.

Session 5: Refinery Turnarounds

During the past few years the refining system in both the US and elsewhere went through a very difficult period with many unscheduled shut downs adding to a relatively aggressive schedule of planned maintenance turnarounds. This session will delve into the ramifications of various types of unit shut downs and how they each impact the total refinery operations and how they get interpreted by the marketplace. Let's also take a look at some of the programs on the schedule for the future.

Session 6: Industry Overview

The session will delve into every aspect of this dynamic and evolving segment of the world's economies. How will alternative energy sources affect the petroleum industry? Why are energy prices where they are? History will help understand the reason. What are causes for high prices and what are simply symptoms? Why are Geopolitics and security of supply so important today and significantly less important just 10 years ago? What is the energy price model and what does that mean for the next few years? This session will delve into the major market drivers with a detailed description as to what to expect going forward. This session will help identify the risks and challenges facing the refining sector.

Learn From the Experts that Experts Trust

EMI experts are frequent editorial contributors to petroleum magazines & are trusted by today's leading news sources.

Our experts have been featured in:

Futures Magazine • The Wall Street Journal • USA Today • The New York Times • The Washington Post • Journal of Commerce • CNN • NBC • CBS • ABC • Bloomberg • Reuters

EMI's leading industry experts have an average of over 30 years of knowledge and experience in:

Energy • Commodity trading • Risk management • Education • Consulting • Financial services

Plus many years of managing marketing, international trading, manufacturing, consulting, start-up operations and project finance operations of well-known companies; integrated major oil companies as well as international trading companies.

EMI's industry experts have also provided risk and value management analysis, advice, information, and services to a variety of companies in the electric power industry. Clients have included power marketers, integrated utilities, retail power providers, hedge funds, and power plants.

Highlights of our instructors' experience include: • Developing a suite of models for a variety of power markets that quantify value and risk • Managing spark spread portfolios for hedge funds in the power markets • Operating in futures trading pits as a market observer in the power markets• Developing working papers for investigations and performing compliance audits in the power industry• Helping Texaco initiate its first use of futures exchanges as an integral part of hedging/trading strategy • Chief Operating Officer of Triwell Marketing and refining • Director of OPIS, Oil Price Information Service, a management-consulting and educational services group that solely focused on the downstream energy industry • Member of Board of Directors of Longview Refinery • Member of the New York Mercantile Exchange Petroleum Advisory Board • Expert witness for a hearing before the subcommittee on surface transportation for the Commerce, Science, and Transportation Committee of the US Senate • Supplied expert testimony to a US Senate sub-committee hearing on diesel petroleum product pricing • Supplied testimony to the Federal Highway Administration regarding fuel tax evasion • Expert witness in a MTBE litigation against the major oil companies • Publishers of The Daily Hedger, BTU's Daily Gas Wire and BTU's Daily Power Report, which advise thousands of petroleum professionals daily.

Our instructors are frequent expert speakers for numerous petroleum industry events and trade associations including: • DOE DESC World Energy Conference • OPIS Fleet Fueling • CME NYMEX • Fuel Management University • NATSO • ATA • AAA • Dairy Distribution • eyeforEnergy eCommerce • OPIS Supply Summit • CIOMA • American Society of Mechanical Engineers • American Society of Lubricating Engineers • Ambrust Aviation • NACHA.

Over the years EMI has developed a series of intensive courses covering all aspects of Energy from production all the way to managing the impact price and volatility on the margin of end-users, resellers, traders, marketers, shippers, retailers and refiners. Our instructors have had the privilege to instruct thousands of professionals representing all aspects of the energy industry, including every major oil company (i.e. Exxon Mobil, BP, Shell, Equilon, Motiva) major power utilities (i.e. Sempra, Edison Mission, Berkley, Toronto Hydro, Dominion, Conectiv) small marketers (i.e. Sprague, Getty, Southern Counties, Western Petroleum) trucking fleets from 50 to 10,000 (i.e. UPS, U.S. Postal Service, Yellow, Pepsi, Werner), gasoline-powered fleets hyper-markets (i.e. The Pantry, Wawa, BJs Wholesale) and many fortune 500 energy consumers.

REGISTER ONLINE

Registration Fees:

1st Attendee: $1,995 for full program 2nd Attendee: $1,795 3rd Attendee: $1,600

1 CHOOSE YOUR COURSE DATE/LOCATION

☐ **February 23-24, 2017**
Regus Promenade Business Center
Promenade II
1230 Peachtree Street North East
19th Floor
Atlanta, GA 30309
PH: 404.942.3400

☐ **March 29-30, 2017**
Norris Conference Center
Houston-Westchase
9990 Richmond Ave.
Suite 102
Meeting Room: Live Oak
Houston, TX 77042
713.780.9300

☐ **April 26-27, 2017**
Regus Bankers Hall Business Center
888 3rd Street, South West
10th Floor, West Tower
Calgary, AlbertaT2P 5C5
PH: 403.668.6000

☐ **May 24-25, 2017**
Norris Conference Center
Houston/City Centre I/
10 Katy Freeway Area
803 Town & Country Blvd.
Houston, TX 77024
PH: 713.590.0950

Hotel recommendations for select course locations available online at www.energyinstitution.org/hotels

2 ENTER ENROLLMENT DETAILS

First Name: _____ Last Name: _____

Company Name: _____

Address: _____

City: _____ State: _____ Zip: _____

Phone: _____ Fax: _____ Email Address: _____

3 MAKE PAYMENT CHOICE

Please make checks payable to: "PMA"

☐ Please invoice my company (payment must be received prior to course date)

☐ Pay by credit card (circle one): Mastercard Visa American Express

Card Number: _____ Expiration Date: / /

Card Holder Name: _____

Card Holder Signature: _____

4 SUMBIT REGISTRATION FORM

EMAIL: Send form to register@pmaconference.com.

TEL: Call PMA Conference Management at 201.871.0474

FAX: 253.663.7224

POST: PMA Conference Management
POB 2303
Falls Church, VA 22042

REFUND/CANCELLATION POLICY

Attendees may reschedule for a different date or course with no penalty. Attendees may substitute a colleague in place of themselves as long as prior notice is given to EMI.

Course fees are 100% refundable up to 14 days prior to course date, 80% refundable up to 5 days prior to course date and 50% refundable up to 2 days prior to course date. Cancellations are non-refundable thereafter.