

FINA 7373/4373
Petrochemical and Refining Economics

Spring 2017

D. H. Bellman
Office: CBB 302J
e-mail: d.h.bellman@gmail.com

The course applies economic concepts and analysis to understanding the structure and behavior of the global refining and petrochemical industries. The class will use various analytical tools to explore current issues facing the industry such as profitability and investment economics, optimizing operating economics, impact of changes in relative hydrocarbon values, regulatory impacts, refining unconventional crudes, and alternative transportation fuels.

The course will provide persons interested in operations or planning in the refining and/or petrochemical industries with a sound economic foundation and a head start in those career areas. For those aiming at general management and leadership positions in these industries, the course provides an understanding of industry structure and trends and where value is created or lost. And, those who expect to see refining and/or petrochemical businesses as customers, suppliers, clients, partners, or as investment or trading opportunities will gain understanding of the issues, opportunities and constraints confronting their counterparts in these important industries. Students with a more general interest in applied economics will find the lessons learned from refining and petrochemicals to be broadly applicable to other basic industries as well.

The instructor is D. H. Bellman. Prior to working with the Global Energy Management Institute, Professor Bellman spent thirty-five years at Exxon. He gained experience in a wide variety of functions, from acquiring raw materials, to plant operations, to sales. He was Business Analysis and Strategic Planning Manager for Exxon Chemical's worldwide polymers businesses. Subsequently, he was Business Development Manager for the company's Global Polyethylene Business and involved in creating new joint-ventures, acquisitions, and investments in olefin and polymer complexes in East Asia, West Europe, Australia, Latin America, and the Arabian Gulf, as well as in the US. He earned a bachelor's degree in mechanical engineering at Duke University, and a master's degree in business administration at Stanford University.

Course Materials

Textbooks: W. L. Leffler, "Petroleum Refining In Nontechnical Language", Fourth Edition, 2008

D. L. Burdick and W. L. Leffler, "Petrochemicals In NonTechnical Language", Fourth Edition, 2010

Selected articles and presentations available online

Discussion cases and problems

Grade information for the course will be provided on Blackboard. Blackboard will also be used to accumulate answers to tests and to some homework assignments.

Assignments, required readings, lecture slides, other resources and answers to course related questions will be found on another system, Piazza. You can also find the latest version of the syllabus on Piazza. To utilize Piazza you need to signup with them. It's easy and it's free. Here is the signup link:
piazza.com/uh/spring2018/fina73734373

Course Requirements

Homework problems and cases to be discussed in class.

Three in-class tests

A concise presentation proposing how Petrol Isteria, a national oil company in an oil producing nation described in a case study, should exploit its resources, in terms of refining and petrochemical investment. The proposal will be submitted in three stages. A paper identifying the issues to be considered will be due at the end of February. An preliminary PowerPoint presentation will be due following spring break. A final, proposal will be due at the time scheduled for a final exam.

Grading: 40% Petrol Isteria proposal, 20 - 40% homework and class participation, 20 - 40% tests.

Class Schedule and Topics

Session 1, January 23

- Course introduction and administration
- Molecules, fuels and crude oil characteristics

Preparation: Exercises 1 and 2 in Petroleum Refining, chapter 3

Read: Leffler, "Petroleum Refining ...," chapters 1, 2, 3 and 6 (26 pages)

Session 2, January 30

- Homework discussion
- Refining processes: adding value in refining
- Refinery configurations
- Spreads and value calculations
- Test #1 review

Preparation: "Crude Cutting" homework

Exercises 1 and 2 in "Petroleum Refining" chapter 15

Read: "Petroleum Refining," chapters 14 and 15 (31 pages)

Session 3, February 6

- Test #1 (Material in sessions 1 and 2)
- Complexity and investment costs
- In-class stream value problems
- Planning refining operations

Preparation: Study for test

Session 4, February 13

- Review and discussion of test results
- Homework discussion
- Value calculations and accounting definitions
- Petrol Isteria case, and investment strategy proposal, introduction

Preparation: "Complexity" homework
Exercise 2 in "Petroleum Refining" chapter 20

Read: "Petroleum Refining," chapters 4, 5, 10, and 20 (48 pages)
"Petrol Isteria 2010" case
Johnston, "Complexity Index Indicates Refinery Capability, Value", Oil & Gas Journal, 3/18/1996
Kaiser & Gary, "Study Updates Refinery Investment Cost Curves", Oil & Gas Journal, 4/23/2007

Session 5, February 20

- Homework discussion
- Crude oil valuation
- Refining support facilities
- Natural gas processing
- Petrochemical introduction

Preparation: "Crude Switching" homework
Exercise 2 in "Petroleum Refining" chapter 4
Exercise 2 in "Petroleum Refining" chapter 5

Read: Simple refinery description
"Petrochemicals," chapter 2 (10 pages)
"Petroleum Refining," chapters 8, 9, 11, and 13 (37 pages)

Session 6, February 27

- Conversion economics
- Investment evaluation
- Product blending
- Petrol Isthria issues

Preparation: Petrol Isthria paper, part 1 (1 – 2 pages)

Session 7, March 6

- Homework discussion
- Blending economics
- Blending mystery
- Value of capacity
- Structure and profitability of the global refining industry
- Test #2 review

Preparation: Reformer Investment homework

Spring Break, March 13 (No Class)

Session 8, March 20

- Homework discussion
- Refining “unconventional” crude oil
- Capacity and markets
- Test #2 (Processes and valuation)
- Review and discussion of test results

Preparation: “Biodiesel Deal” homework
Study for test

Session 9, March 27

- Homework discussion
- Olefin production
- Stream values and costs
- Aromatics production

Preparation: “Uncertain Future Part 1” homework

Read: “Petrochemicals,” chapters 3, 4, 5 and 6 (38 pages)

Session 10, April 3

Homework discussion

- Synthesis gas
- Biofuels
- Real options in refining and petrochemicals
- Polymers and petrochemical derivative chains (PP, PVC, PET, PU)

Preparation: "Uncertain Future Part 2" homework

Read: "Petrochemicals," chapters 26, 27, 31 (46 pages)

Session 11, April 10

- Homework discussion
- Stochastic analysis of investments
- Petrol Isthria proposal preliminary reviews

Preparation: "Olefin Cost" homework

Petrol Isthria preliminary proposal

Session 12, April 17

- Homework discussion
- Refining-petrochemical integration
- Transfer prices
- Petrol Isthria proposal preliminary reviews
- Test #3 review

Preparation: "Product Profitability" homework:

Session 13, April 24

- Test #3 (Petrochemicals, biofuels)
- Review and discussion of test results
- Review of Petrol Isthria proposal requirements

Preparation: Study for test

Final Petrol Isthria proposal due, in specified format, by 8:00 pm on May 8 (the time scheduled for a final exam).