
REFINING ECONOMICS COURSE CONTENT

Course content: summary table

	Title
1	Introduction to refining
2	Overview of refinery operations
3	Calculation of refining margins
4	The crude oil market: crude oil prices and crude slate optimization
5	The market for refined products: pricing of products, netbacks, arbitrage
6	Production planning and optimization
7	Blending and blending optimization
8	Retrospective refinery performance analysis with back-casts
9	Exposure to price volatility and hedging
10	Performance benchmarking and competitiveness
11	Return on capital invested
12	Petrochemicals integration
13	Economic analysis of projects
14	The future of refining: energy transition, challenges, decarbonization, crude-to-chemicals

Module-1: Introduction to refining

- The refining business within the oil industry value chain:
 - Historical evolution
 - Current structure
 - Future developments
 - Overview of drivers of refinery profitability
- Global demand for crude oil and refined products
 - Historical trends
 - Current development

Module-2: Overview of refinery operations

- Crude oil distillation
- Refined products and specifications
- Main types of process units
- Simple refineries and complex refineries
- Key aspects of crude oil quality
- Blending of refined products

Module-3: Calculation of refining margins

- Calculate refining margins from a yield statement and prices
- Variable and fixed operating costs
- Margins of representative refineries
 - Historical trends
 - Identification of market fundamentals in past margin cycles
- Carbon emissions and carbon costs

Module-4: Crude oil supply agreements and prices

- Gross Product Worth and the refining value of crude oils
- Main forms of crude oil supply agreements: spot vs term
- Crude oil pricing: benchmarks, differentials and OSPs
- Crude oil delivery costs
- Overview of the global market for crude oil
 - Global trade patterns
 - Price differences between regions
 - Light crudes vs heavy crude prices

Module-5: Pricing of refined products

- Main forms of product supply agreements: spot vs term
- Main market locations and benchmark prices
- Incoterms, CIF prices, FOB prices
- Pricing products at non-market locations:
 - Import parity, export parity, netbacks
- Refining-marketing integration and the value of products at the refinery gate
- Arbitrage and relative prices in different markets

Module-6: Production planning and optimization

- Key activities and work processes
- What is an LP model and what it does?
- The concept of marginal capacity and optimum refinery utilization
- Optimum modes of operation
 - Swing cuts
 - Gasoline mode vs diesel mode
- Crude oil selection
 - How to develop a simple pecking order
 - Optimization

Module-7: Blending optimization

- Blending calculations
- Blending optimization
 - Gasoline blending
 - Fuel oil blending
 - Middle distillates
- Pricing of refining streams based on blending values
 - Gasoline blending value of light ends
 - Fuel oil blending value of residues
- Calculate the value of intermediate products based on blending values

Module-8: Performance analysis and back-casting

- Using the refinery LP model to make back-casts
- Estimating the cost of production losses with retrospective analysis of performance
- Analysis of quality give away with blending calculations

Module-9: Risk management and hedging

- Exposure to price volatility
- What is hedging and how is done?
- The “oil paper market”: futures, swaps and options
- Example of hedging crude oil prices with futures
- Example of hedging jet fuel prices with swaps
- Hedging refining margins
- Hedging to capture contango

Module-10: Benchmarking and competitiveness

- Factors of refinery competitiveness and their typical value
 - Configuration
 - Location & Logistics
 - Scale and operating costs
 - Energy efficiency
- Relative competitive advantage (or disadvantage) of refining in major regions
 - Europe vs Asia vs Middle East vs US Gulf Coast
- Benchmarking operating performance and competitiveness with the Solomon Survey

Module-11: Return on capital invested

- Representative replacement cost of different refineries
- Typical Working capital requirements
- Typical sustaining capital requirements
- Simple metrics of return on capital invested in refineries
- Historical trends

Module-12: Petrochemicals integration

- Aromatics integration:
 - Xylene and Benzene production process
 - Yields and configurations with different options
 - Key margin drivers and integration synergies
 - Overview of the aromatics value chain
- Steam cracking integration:
 - Steam cracking technology
 - Yield patterns with different feedstocks
 - Feedstock economics
 - Main synergies of refinery integration
 - Overview of the olefins value chain

Module-13: Economic analysis of projects

- The concept of time value of money and discounted cashflows
- Cost of capital and hurdle rate: how to estimate the WACC and set the discount rate for a project
- Calculating cash flows and discounted cash flows
- Key metrics of project return and their merits
- Risk analysis of projects

Module-14: Where next for refining?

- Scope 1 and Scope 2 decarbonization
- Energy transition, peak oil demand and the Scope 3 challenge
- Crude-to-chemical refineries
- The refinery of the future