

**UNIVERSITY OF PETROLEUM
AND ENERGY STUDIES**



End Semester Examination, May 2017

Program/course: MBA OG
Subject: FUNDAMENTALS OF REFINING
Code :MDSO 804
No. of page/s:4

Semester – II
Max. Marks : 100
Duration : 3 Hrs

Please answer all sections.

SECTION A

(10X1=10Marks)

Please fill up the blanks:

I.

1. The catalysts used in cracking are _____ and _____.
2. The economic advantages of cracking are that there are _____.
3. In ADU crude is heated to _____ deg C to vaporize most of it.
4. Pour point and freezing point are equal for _____.
5. A good lubricant should have high _____.
6. _____ is the most important component in kerosene.
7. If the smoke point of kerosene is 15mm on removal of _____ it will be 25mm.
8. Max gravity API will be for _____ as a fraction of crude oil.
9. The color of gasoline is an indication of its _____ tendency.
10. Sulfur is removed from products because the products would _____.

Please answer in very brief:

(5X3= 15 Marks)

II.

1. Explain the conceptual difference between 87 and 90 Octane gasoline?
2. The Hydroskimming and a Complex refinery differences?
3. Principles involved dehydration and desalting of crudes.
4. It usual to use distillation under reduced pressure carried out on high boiling residues. Explain the theory behind it.
5. Explain briefly decoking in a complex refinery.

SECTION B

(5x5=25 Marks)

Please answer in brief:

1. What do you understand by the layout of a refinery? Explain with a neat diagram the importance of designing a layout with six most important considerations. Give a brief a brief description about the utilities of a refinery.
2. Explain in detail the benefits of refinery-petrochemical integration in the production of Benzene and SBR. Write a comprehensive description of the process advantages for the crude input-intermediate and end stages.
3. “With more emphasis being laid on health , safety and environmental concerns and increased efficiency”, how do you think, a good layout effort shall help in achieving this, specially the cost control.
4. Please outline and explain the methods of obtaining petrol from reforming. Explain it’s uniqueness .
5. Explain Crude oil procurement procedure with the given data. If a Mumbai coastal refinery has to receive crude on 29th August 2017 (Benchmark crude Price \$59 in the same day)? The crude is a superior one (premium & discount \$0.50 & \$ 0.75 respectively). Calculate the landed price at the refinery. (Use all charges and taxes).

SECTION C

(2x15= 30 Marks)

Please answer in detail:

Q1.Consider a hypothetical refinery, manufacturing products like Naphtha, Gasoline , Kerosene and Diesel to name a few totaling 90 million tonne per year.
It purchases crude at \$ 55 per barrel .The percentage break up of composition for gasoline in the product is 20%.

Fuel Loss: 5%

Energy Cost: 5%

Operational Loss: 5%

Let the price of natural gas = \$3.00 per mmbtu for hydrogen generation for Hydrocracking operation.

Consider a change in operational situation necessitating the increase of gasoline percentage to 30% .

Calculate the change in Netback price as a result of increase in gasoline production .

Normally the crude input is 100 MT/year

Product Slate:

1. Naptha: 30MT
2. Gasoline : 20MT increases to 26MT
3. Diesel : 20MT
4. Kerosene: 30MT

Q2. Consider the given details:

1. Oil price: \$58.8/barrel
2. Gasoline price:\$3.00/barrel
3. Heating oil price:\$3.10/barrel

Calculate the 3-2-1 crack spread. Is crack spread a perfect a perfect measure of refinery profitability?
What do they really measure?

SECTION D

(2x10= Marks)

Petroleum, Oil and Lubricants (POL) commands a strategic and critical role in the growth and development of nations. These constitute a major part of energy used in India's economy, second only to coal as source of primary energy, and can spur growth in most sectors. India has been traditionally a net importer of POL products. The country is being forced to spend valuable foreign exchange to procure additional energy resources. In the recent past, there has been a growing concern to boost production of petroleum and natural gas from domestic sources as well as hydrocarbons equity abroad. At present India imports nearly three-fourths of its crude requirements. Investing in domestic oil and natural gas exploration is a long-term solution that will help quench India's growing energy demands. Since oil and natural gas also play a critical role in deciding the inflation rate, the rising prices for these energy commodities have long been a point of contention in Indian politics. After Government of India allowed private participation in petroleum refining in India, Essar Oil set up a 9 MMTPA oil refinery at Vadinar in Gujarat, which started commercial production on May 1, 2008. The current capacity of the refinery now stands at 20 MMTPA. With state-of-the-art technology, it has the capability to produce petrol and diesel that meets the latest Euro IV and Euro V emission standards. The refinery produces LPG, Naphtha, light diesel oil, Aviation Turbine Fuel (ATF) and kerosene. It has been designed to handle a diverse range of crude — from sweet to sour and light to heavy. It is supported by an end-to-end infrastructure setup, including SBM (Single Buoy Mooring), crude oil tanker facility, water intake facilities, a captive power plant, product jetty and dispatch facilities by both rail and road. To date, Essar Oil's Vadinar refinery has successfully processed more than 75 varieties of crude from across the world, including some of the "toughest crudes". This comes with an increase in its complexity from 6.1 to 11.8 on the Nelson index, making it India's second largest single-location refinery and amongst the most complex globally. In this study, the researchers propose to conduct a preliminary study on social costbenefit analysis (SCBA) for the Vadinar refinery using up-to-date information to estimate the costs and benefits associated with the project. The purpose of the study is to briefly examine whether the commercial refinery project at Vadinar is socially beneficial overall for the refinery business. The economics of a refinery are complex and depend on many factors. Profits or losses result primarily from the difference between the cost of inputs and the price of outputs. In the oil refining business, the cost of inputs (crude oil) and the price of outputs (refined products) are 3 both highly volatile, influenced by global, regional, and local supply and demand

changes. The question of whether the business of refining in aggregate is socially desirable and economically beneficial is adequate to justify the aggregate cost of running the refinery. A mega-project like the Vadinar Oil Refinery has wide-ranging external consequences to the economy and society, and this needs to be assessed for India in the larger political economic context which has major implications for concerns and consequences at the highest policy circles. This is done in what follows. Some of these effects and follow up measures, howsoever important they might be, may not be amenable to measureable techniques. They are nevertheless important to note for their strategic fallout.

Q1. Analyze the scenario that led to the turn of events that necessitate the setting up of Vadinar refinery. Explain with a perspective on the economic need for increased profitability for the refineries.(10)

Q2. *“The question of whether the business of refining in aggregate is socially desirable and economically beneficial is adequate to justify the aggregate cost of running the refinery.”* Please justify the above statement analytically in your own words, in context with the given case. (10)