**Introduction**

In this course, the followings will be covered and the book given below will be followed:

Ghazi A. Karim, Fuels, Energy and the Environment, 1st Edition, CRCPress.

Course contents:

Fuels in general and classification of fuels

Petroleum – its refinery and major products

Heat engines – 2nd Law of Thermodynamics

Fuel Energy Systems

Combustion engines

Exhaust emissions

Air pollution

Combustion and Flame propagation

**Fuels in general**

Major desirable properties of fuels:

* Release of high energy per mass or volume depending on the fuel being
* Elevated combustion rates, elevated combustion temperatures
* Can be readily extracted and purified
* Good thermal stability and less tendency towards deposit formation
* Easy transportation, handling, storage
* Low levels of ash and sulfur

Volume units such as cubic meter, cubic feets, gallons and barrels can be used for expressing the amounts of fuels. Tonnes can also be used as a mass unit.

There are two different ways to relate barrels and gallons of petroleum. Normally 1 barrel is equal to 0.159 m3. However, 1 barrel is equal to 42 U.S. Gallons or 35 Imperial Gallons.

**Reserves and resources**

The meanings of reserves and resources differ according to the followings:

-the level of uncertainty or certainty that they are found on earth

-the possibility of bringing in profit

PRMS (petroleum resources management system) differentiates reserves and resources according to the chart below:



This chart is taken from the below web site:

https://www.unece.org/fileadmin/DAM/energy/se/pp/unfc\_egrc/egrc4\_april2013/unfc\_ws\_23april/4\_Seager\_PRMS\_UNFC.pdf

In the first raw of chart, reserves are split into three groups; proved, probable and possible. Proved reserves are considered to recoverable and their status can be shown by technical data. Probable reserves need more technical data to demonstrate the status of the reserve. Possible reserves has the least likelihood to be recovered.

There are two axis of the chart – range of uncertainty and chance of commerciality. While the range of uncertainty means the possibility of their existence, chance of commerciality is related to their profitability.

Classification of reserves are made according to the range of uncertainty.

Below table gives the share of proved oil reserves and production by regions:

|  |  |
| --- | --- |
| **Region** | **Share (%)** |
| North America | 8.5 |
| Central America | 7.8 |
| UK | 0.4 |
| Europe | 1.7 |
| Former USSR | 5.5 |
| Middle East | 64.9 |
| Total Africa | 7.2 |
| Asia and Australia | 4.4 |

While the largest share for proved oil belongs to Middle East, on country basis the largest proved oil reserves are located in Venezuela.

Reference: Ghazi A. Karim, Fuels, Energy and the Environment, 1st Edition, CRCPress.