Surface Facilities for Oil and Gas Handling

Prof. Abdus Samad

Department of Ocean Engineering

IIT Madras

Introduction To Oil And Gas-02

Petroleum formation, when you go for petroleum formation you will have diagenesis. So, diagenesis means that around 500 degrees centigrade H, hydrogen, nitrogen, and sulfur are removed hydrogen a certain amount of hydrogen will still be there, but the total amount will be reduced. If you go for catagenesis, so 60 to 200 degrees centigrade temperature the transformation or change will occur. So, this will be thermal degradation of occurring thermal degradation will be occurring reaction double bond reduces double bond like carbon double bond this will be reduced and ok. So, plants and elements die this sink settles on the seabed and finally, one layer another layer will be deposited on the seabed. So, decomposition will be occurring for millions of years.

So, millions of decomposition will occur for millions of years and this decomposition is helped by bacteria. So, diagenesis catagenesis how works it will be like this, diagenesis catagenesis. So, initially, you take lignin lignin carbohydrate carbohydrate petroleum protein then you have lipids ok? Then microbial degradation will be happening polymerization will be happening and then you are reaching kerogen.

So, kerogen so that time you are getting bitumen ok. So, kerogen here thermal degradation happening catagenesis happening thermal degradation thermal degradation happening cracking ok. So, further, if you go then gas formation will be there ok. So, when thermal degradation happens here you are getting heavy crude heavy crude heavy crude you are getting light oil light oil you are getting. So, different crude oil you are getting after kerogen steps.

So, the first step in diagenesis happening. So, diagenesis microbial degradation happening the temperature pressure you are giving, and thermal cracking will happen in the catagenesis stage and then you are getting gas formation if you go further with time and temperature then maybe you can get diamond also ok. Natural gas when you are talking

about natural gas is odorless, but whenever you have a gas cylinder at your home. So, that contains a certain amount of smell. So, that is added flavor added smell.

So, that is called t butyl mercaptan, or isopropyl mercaptan. So, these are added orders later people add. So, that is for safety purposes. So, typically the composition will be like CH 4 70 to 90 percent C 2 H 6 will be C 3 H 8 C 4 H 10. So, about this sort of thing 0 to 20 percent.

So, carbon dioxide is also possible CO 2 will be 0 up to 8 percent and O 2 will be 0.02 percent nitrogen can be 0 to 5 percent and H 2 S can be there. So, H 2 S is 0 to 5 percent. So, that is dangerous actually if you have H 2 S and when you are burning methane. So, the chemical reaction will be like this CH 4 plus O 2 will give CO 2 plus 2 H 2 O plus energy.

So, you can get a huge amount of energy there. Principally CH 4 with some ethane and propane and impurities such CO 2 H 2 S N 2 will be there in natural gas. So, then what we learned first is you get microorganisms or animals everything got deposited in seabed covered by sand and other rocks then with time it got changed. Then exploration engineers like geophysicists and geoscientists will go and they will explore whether oil and gas is there or not. So, this is the exploration phase of finding oil and gas how much amount will be there the exploration engineers will be finding?

See if they find it is very much economical and you get a huge amount. So, then drilling engineers will go. So, the drilling engineer will be drilling a hole they will be drilling a wellbore from the earth's surface. When they are drilling so, they will get oil and gas. So, oil and gas will come.

So, oil and gas when it comes to the surface contain sand water other gases also. Then you have to handle things properly you cannot get uncontrolled way. So, the things must be controlled using the completion stage. So, completion stage will be putting sand control system perforations will be done during the completion stage. So, after drilling you complete a wellbore.

So, that it will be ready for production, once completion is done wellbore is safe then you hand over the wellbore to the production engineer. So, production engineers give a stable production they will get stable production means with time the productivity will not

change. So, we are getting a longer duration a certain amount of production with no difficulty then there will be separation. So, once you got production of the surface you got oil and gas oil and gas then you cannot send the same oil and gas to your customer.

So, what do you have to do to separate oil and gas? So, the separation stage will involve oil gas oil water sand. There will be a certain mechanism to separate all this gas oil water gas water and sand. So, that mechanism I will discuss in the whole course. Then once you have separate gas oil water and gas can go through the gas pipeline oil you may have an oil pipeline tanker.

And water if you are getting the water you have to dispose of there because water is not economical anyway and if you have sand also you can dispose there. But disposing of water and sand is not so easy because you have to remove all the hydrocarbons or make certain mechanisms so, that you will not be harming your aquifer zone where trees or other drinking water zones will be there. So, we will discuss later how to handle water and sand. Once the pipeline tanker again it will be reaching to your refineries like Jamnagar refinery is there for example, Jamnagar One oil refinery is there.

So, many other oil refineries will be there in India. So, outside India or in India if you see this they will take fluid or crude oil and crude oil will go to the refinery they will be producing diesel petrol gas diesel petrol kerosene, and other fluids and other fluids ok. Once diesel petrol kerosene is done then it will go to the customer. So, several stages are there when you are getting oil and gas. So, drill then you complete weld bow then you produce you get under the surface when you get on the surface you have to separate properly oil gas water sand on separation done oil you send to refineries gas you send to customer big marketing agency will be there they will take for example, this Henderson petroleum company Indian oil they will be taking when you see other companies and they will be sending to a customer right.

Then the customer will get diesel petrol kerosene separately when the customer is getting this fluid diesel kerosene petrol they will not take sand they will not take water in petrol. So, the refinery people and those separation people will be ensuring that things are correct like no sand sedimentation and no water particles are there. So, that your combustion will be proper burning when you are putting petrol into your car combustion is proper there will be no unnecessary chemicals in the fluid.