Surface Facilities for Oil and Gas Handling

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Gunbarrel: Numericals

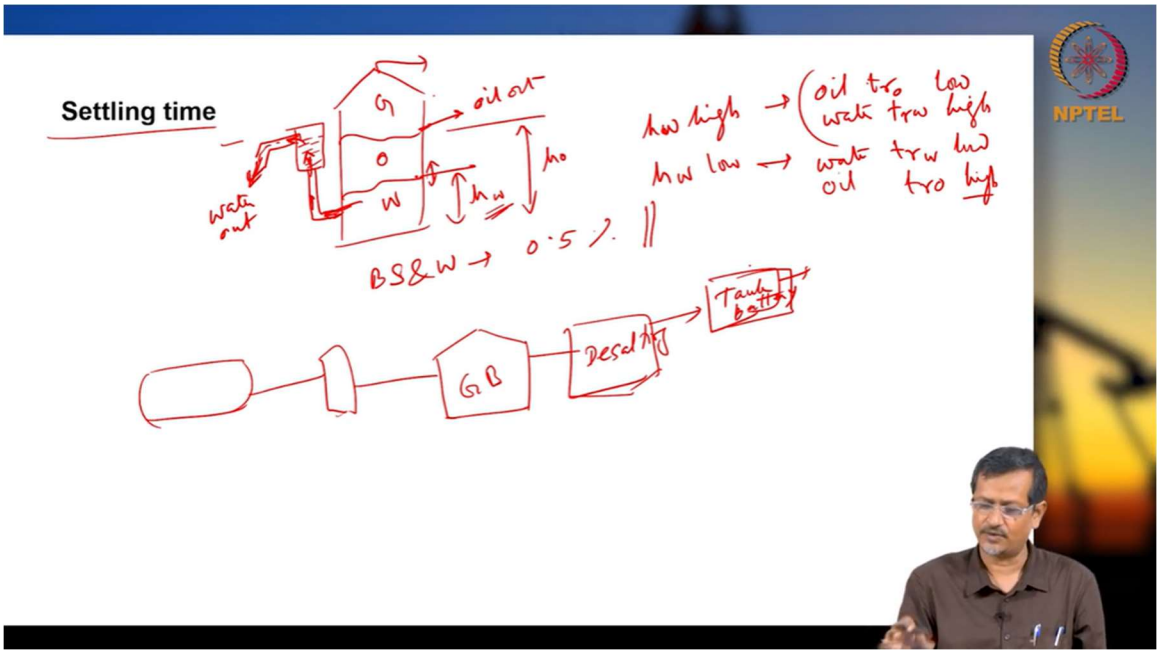
Good morning, today I will start the topic gun barrel. We already studied the topic on oil treating system ok. When we are treating oil actually we are trying to remove water from oil ok. And oil water if you are creating stable emulsion because of certain chemical or certain reason and they say very small particles are there certain chemical present. So, in that case oil and water separation very difficult. So, in that what people will be doing they will be using some mechanical arrangement.

So, that separation can be quicker or they will be using heating mechanism or electrical mechanism. So, different way people will try to separate oil and water emulsion. In some cases they will be giving longer time. So, that is oil particle will be separating from water water particles will be separating from oil.

And in this today's lecture is gun barrel. Gun barrel actually when you are trying to get what oil with minimum amount of water ok. So, in that case you have a big tank there you give lots of longer settling time. In previous case 2 phase 3 phase separation system you have given separation time 3 minute 4 minute 5 minute half an hour. But in this case you can give settlement time like 12 hours 24 hours a longer settlement time we are allowing.

So, in that case your separation will be slower. So, in that case low flow rate option low pressure option in that case you can use gun barrel. Gun barrel has certain limitation gun barrel means once separating tank actually low pressure system. Ah older system they will be will be will be using gun barrel. And if you are having multiple well bore and ah little bit warmer temperature that area gun barrel can be used.

So, normally gun barrel will be used for older ah fields ah ok. ah Because newer development is that heater teeter ok. So, older system is gun barrel where heat is not being used. So, if you have warmer weather. So, in that case you are not using heat already and you can use gun barrel ok.



So, warm weather if you have if you are using gun barrel in the colder region is a optic region. So, in that case what happen because of low temperature ah already whole system is cooled down and you want to increase temperature. So, you have to give lots of fuel. So, fuel cost will be higher. So, in that case gun barrel will not be may be efficient or ah economical.

So, in that case you can use normally heater, teeter or closed system compact system ah. Offshore application normally you do not use ok. So, this will be like onshore application ok because it needs larger footprint. So, when you are using larger footprint onshore off shore application for example, you are using some offshore production systems. So, their space may not be so much available ok.

So, in that case and you do not allow oil to be staying for longer period of time. So, that way you try to avoid gun barrel on offshore location for onshore location or land wells ah gun barrel can be used. And again single oil well bore multi well bore if you have multiple well bore. So, in that case gun barrel will be good, but single well bore people are using this is heater heater. So, it will be compact system and small heater heater you can use and you can separate oil and water actually water from oil ok.

So, gun barrel you are using for onshore location offshore no ok, offshore almost no and single well bore single well bore ah. In that case you are using normally heater heater ok. So, multiple well bore is there multiple well bore in that case you can use gun barrel I am using GB for gun barrel. So, short form and it is at it is called atmospheric vessel this different names are there atmospheric vessel atmospheric vessel sometime you say wash tank wash tank why wash tank term here wash tank T A N K. Now why are you using wash tank the term actually you are washing oil using water.

So, that is why they are using the term wash tank and pressure is low. So, that is why they are saying atmospheric vessel. So, before putting into your tank battery storage device you are putting into gun barrel you are reducing water content then you are putting there. And how much water should be there like BSW basic sedimentation water content that requirement will be there normally 0.5 percent, but if many countries or many field or many company they are having their own definition of how much percentage will be there then there is otherwise normally 0.

5 percent BSW maximum will be for your separation systems ok. So, your gun barrel will be assuring that you are giving that much of BSW for your system ok. So, gun barrel is actually settling tank this is settling tank normally it is gravity based settling. So, normally you are not using any centrifugal pump or other pumping mechanism or pumping system to give more energy ok. So, this is settling tank normally gravity based gravity based brine or an oil brine or water plus salt content whatever is there the you are separating oil and water ok.

And if there is any sand content is there. So, at the bottom it will be deposited slowly in main normally the gun barrel will not have any heating element, but there are some cases where heating element also used inside system like one fire tube you are using or inlet heater before putting into gun barrel you are increasing temperature of inlet fluid using some other tank then you are giving that fluid into your gun barrel. So, that viscosity you are changing when you are heating actually you are changing viscosity ok. Basically viscosity changing they say some oil is having API 10 ok, API degree 10 degree. So, in that case it is almost equal viscosity will be with water density ok.

So, the separation is very difficult. So, in that case you increase temperature change density viscosity of oil water density viscosity changing is very difficult right. So, when you are changing oil viscosity. So, oil and density. So, oil will be trying to be settling quickly ok.

And water viscosity is not changing. So, whether you are changing temperature not water it is not much effective, but for oil temperature is very much effective ok. But normally gun barrel will not have any heating element, but if required you can give ok. So, this content of the topic whatever I am covering actually normally I have taken basically from this book emulsion oil heating equipment Morris institute can alone. So, there are other volume surface production system operation volume 1 I am using for other lectures for this gun barrel I am basically using this book ok.

And some other extra material also you can get from Sussar this website and this Bilbaul separation oil fill operation that he has an article you can go through this Kimbre the company they have lots of videos and text document. So, you can go through it related to separation surface production systems videos there text there. So, lots of good pictures will also be there. So, you can go through their website ok. If I take any other document or material to prepare this lecture I will give accordingly on slides ok.

So, one typical gun barrel first you see ok. Gun barrel actually 1860 is more than 150 years 1960 yeah more than 150 years before people develop this gun barrel system like it just storage tank store for longer period and you separate ok. So, gun barrel shape will be like this ok. You can draw in exam sometime I give I ask you to draw gun barrel and show fluid direction fluid and give name of different sections show arrow mark how the fluid is flowing from which point to which point ok those things many time I ask in exam. So, please practice the different systems drawing and show different systems ok.

So, there will be one gas boot and there will be one pipe like this ok and this is gas I am writing G for gas O for oil and W for water ok. And down comer in 3 phase separator I have shown down comer will be inside. So, it is possible also that your system will have

down comer inside and you are spreading ok. This is spreader or this is also down comer ok. So, if you want to work in the oil field surface production systems

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So, different company will have different combination of down comer inside some outside, but basic philosophy will be same, but the company will be varying their design because of they want to keep their own IP intellectual property or they want to do not want to overlap with other companies intellectual property. So, that is why they will try to differentiate sometime they will have some basic extra features some extra benefit for certain different type of arrangement. So, their company will be explaining, but basic arrangement will be like this 3 phase gas oil water it will not be like this water be your top gas will be the bottom ok because of density difference. So, down comer is there this is spreader actually ok and you are giving this fluid in water zone. So, so that water washing possible.

So, whenever oil will be moving up oil particle moving up and it is creating oil layer ok. So, oil particles should be washed by water ok, when oil water particle will be creating bigger particle bigger bubbles and they will be staying there and small small water oil particle they will be washed and will be moving up slowly ok. And you are creating one layer oil and there may be some emulsification zone will be there emulsification emulsion zone ok. And this is gas. So, gas you can take from out top definitely this lighter weight.

So, you have to take from top and water you have to take from bottom somewhere ok water out and oil oil oil out ok and this is gas boot ok. Sometime this gas boot will be outside sometime they will be putting inside based on their own definition of the different definition of different companies. Settling time. So, settling time in gun barrel you have to give sufficient amount of time. So, that oil particle will be moving up water particle will be settling there ok.

So, settle time the criteria is that the control point of gas gun barrel is at interface between oil water ok. So, gas oil water. So, this is the control point how much increasing or decreasing this level you are doing ok. Let us say this is H water H oil and this remaining area gas ok. So, this controlling point is there how much amount of the H w is there.

If H w very high then oil will get very low lower number of lower amount of space lower space means your retention time should be lower ok. Because oil will not be staying for longer time is space is very low ok. The location of the interface will fix the settling time. If interface is at higher level interface or H w is at higher level then oil settling time is lower because oil is getting very lower space you say total H w plus H o fix ok.

Now water space you are giving more. So, oil space is lower. So, oil space lower that means, oil will get less time retention time will lower for oil ok. But opposite will also happen if oil total amount of oil is higher then retention time also is higher ok water time will be lower in that case fine. If H w high then oil retention time d R o low right and water T R w high right for fixed amount of volume of oil plus water right H H w low then it will be opposite just water T R water low and oil T R oil high ok. Now interface level should be set that the basic sedimentation and water B s w B s and w they say ok.

It should be like 0.5 percent ok. Basic sedimentation water that content company or it is refinery they will be specifying. If they are not specifying then assume there is less than 0.5 percent can be allowed ok. If they are specifying how much they need then you have to follow that rule otherwise your buyer will not buy ok. Interface level ok, now interface level is control using a water leg.

So, there will be one water leg actually normally water leg will be there. So, because inside separator controlling everything is difficult. So, there will be even water leg. So, water level will be rising up here ok. Then from here you can create wear and it take water out ok.

Oil you are taking from oil out and water you are taking out from here actually water is going this this this and you are maintaining wear and water will be going out ok. So, one water leg will be there outside. So, using that one you are controlling water level or inter water level you are controlling means interface level you are changing. When interface level you are changing means you are changing retention time actually how much time you are allowing ok. Normally this gun barrel will have like from wellbore you are getting one

separator then again another separator may vertical may horizontal then almost before the settling storage tank battery gun barrel ok.

There may be some another arrangement called desalting, desalting arrangement then your gun tank battery, battery or maybe offshore case FPS of or other mechanism we can use to transfer oil from the separator systems ok. So, normally it will be low pressure system high pressure system will be two phase three phase those are high pressure system three phase also lower pressure system, but when you are reaching to gun barrel pressure is very low ok. It is almost atmospheric pressure ok gun tank battery also will have at atmospheric pressure ok. Tank battery means several tanks will be there just storing oil before you sending to your customer or refineries ok. So, we will discuss later how this tank battery will be working ok or the safety equipment other thing we will not know, but later some lectures will be there for tank battery and storage systems ok.

Some more information regarding gun barrel ok, it is a vertical flow rate will be very low it is called atmospheric vessel and oil and water gas separation is done inside gun barrel using gun barrel ok. Vertical large installation warm weather condition you are using ok, for colder weather condition normally you are not using because you will be requiring very high amount of heat ok. Gun barrel are still used for older fields or very large installation for single well bore in that case you are using normally heater heater ok. Vertical heater heater in your invention actually these are little bit lower so, people are using previously it was expensive now gradually because of technology development it will become cheaper. So, people are using more and more this vertical heater heater ok.

So, we will go to one calculation thing settling time it will be 12 to 24 hours normally settling time. The thumb rule I mean it may be lower more or lower higher also possible why thumb rule you should remember actually when I was working in the industry. So, many time company will be supplying me data for calculation purpose, but many time you have to assume ok. So, assume is initially when you are guessing so, that guess will be little bit practical. So, let us say you do not have any idea how much settling time.

So, take within 22 12 and 24 some data start calculating reiterate and go back to basic calculation again do this ok. If you do not have idea let us say 3 minutes some separation you have seen and if you start with 3 minute and you need 24 hours there will be too many

iterations. So, your calculation will be your life will be difficult ok. So, you should have certain idea ok this much of big system can be possible this much of time will be possible. So, that thumb rule you should remember that many time it your calculation after finally, when you do calculation it may be 10 hours or 30 hours ok.

But if you start let us say 15 hours then you are nearby, but if you are starting with 3 minutes you are not nearby ok. So, that is why this thumb rule also you should know what is the roughly how much it will be the main time in interview also we ask a student ah ok. You are doing the calculation what will be roughly value of Darcy of porosity of permeability or maybe like say Ganvala settling time or two phase separator on settling time rough value. If you say 24 hours then I will say ok you do not have any idea right and Ganvala also if you say 3 minute again it is impractical. So, you should remember rough thumb rules if possible especially for interview purpose they can ask can you guess what will be the values ok.

So, in that case you should give almost nearer values ok this is also approximated. So, thumb rule means like approximated values that people are commonly using ok. Most Ganvalas are not heated though heating possible.