Surface Facilities for Oil and Gas Handling

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Flow Control-02

Yeah, whenever you are talking about temperature control, you are controlling temperature. The symbol is the T c right. So, whenever you are talking about temperature control, temperature control means if you see like in the heater to heater system, temperature going up beyond a certain value. So, in that case, you have to control the fuel system. So, you have to sense the first temperature, then you have to instruct the fuel handling system. Temperature is going up, so reduce fuel supply, fuel supply.

The temperature will go down slowly and if the temperature is below a certain limit, again you increase the fuel supply and you control the system. It will be these days everything is automatic. The temperature you are sensing may be a thermocouple or other system and that signal will go to your fuel handling system automatically. So, that will control your fuel system.

And flow control normally a surface production system you are not controlling separate flow, you are controlling pressure that will control your flow system. Level control, if you level control you have seen somewhere can you remember the toilet flush chamber? If you see the toilet flush chamber, you will have one flush chamber right and you will have one knob maybe sometime you will press some knob sometime you pull a push-down knob will be there. How does it work? So, that is actually there is inside if you open there will be one water is there one ball type system will be there, one stylus will be there like this. A ball or floating device floats when the water level in the toilet flush chamber is right, it will be like this some pipe will go and it will be flushing right.

This ball when you press it so will be opening certain valve open a certain valve when opening a certain valve fluid will be coming directly to your flush chamber, flushing this portion right. When completely water gone so, that time your exhaust or exit valve must be closed here and your fluid must enter right from the main pipe. So, this valve will be

controlling minimum and maximum limits. Again when fluid let us say this is closed bottom valve says valve A is closed and valve B is open. And B open, but again it should not be overfilling after a certain time it must stop also.

If it stops then the whole toilet area will be splashed with water right? And if you are in a city area so, there will be water limitations also all right. You cannot splash unnecessary water. So, what happens this one will be connected to some valve mechanism. So, that valve will be controlling this one, and this one both valves A and B valve will be controlled using that floating arrangement.

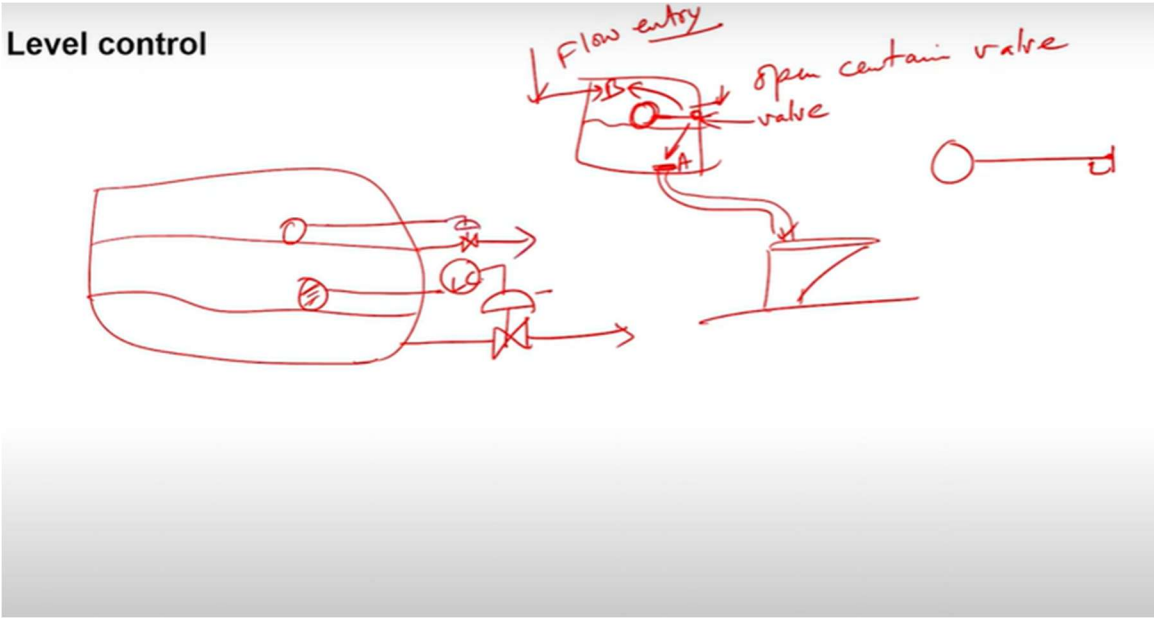
So, how it is working let us say this is here and there will be some mechanism. So, when it moves up after a certain level, it will be open if it reaches the top level so, it will close the inlet flow. This is a flow entry that will be closed, but when it is at the bottom or near the bottom so, it will open the inlet flow. So, it will be controlling the inlet flow when it is closed when to close when to open. So, same mechanism is used for your surface production operation also.

How? You have one separator, you create one floating device and you name it as level controller toilet those mechanics are using already this system. When the water level will be moving or the oil level will be moving up beyond a certain limit. That time your valve will be opening, your fluid will go out it will maintain a minimum level then again exhaust port will be closed. Again you allow water to move up and open it water level will go down again. So, the water level will go up and down so, within that range only it will allow to control the level.

So, it will have interface this will be interface controller another kind of level controller will be there for the oil level controller. So, this way ah level control work controller working fine. Oil treating is first you got two-phase separator, you got gas I am not drawing all this controller whatever I taught just I am making simplified thing. So, you are getting liquid. Now, this liquid you put in a phase separator.

So, a phase separator is what you are getting water, oil, gas. So, oil you got. Now, the oil will have what it will contain still water, it will have gas because gradually you are reducing pressure. So, when you are reducing pressure gradually, some dissolved gas will come out every time every separator gap will have certain dissolved gas coming out from the liquid. So, you got oil and three phases in a three-phase separator you got oil, water, gas this oil

whatever you are getting steel will contain a certain amount of water and a certain amount of gas.



Now, there from oil again you try to remove water and gas. Now, here emulsion treating theories, emulsion treating theory will come with a heater, a teeter come electrostatic precipitator or an emulsion breaker will be there. So, that mechanism will come. We will discuss later when we will be specifically we will discuss on the oil separating system. So, there is how the emulsion treating system will be put in place, how the heater, and teeter will work, and how this electrostatic system will be there.

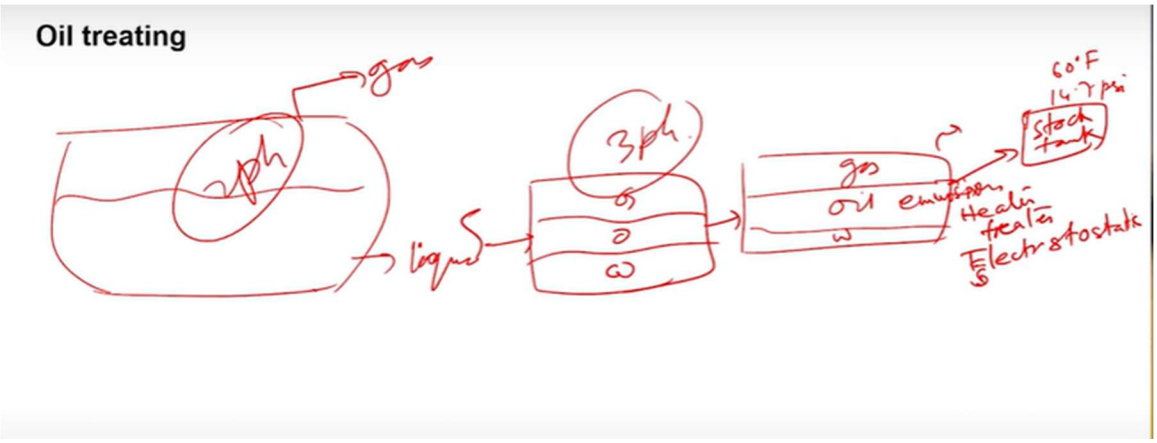
So, all these things we will discuss. Then once the oil removes the gas and water part you put this one into the stock tank. So, stack tank and we know the stock tank pressure will be like 14.7 psi or normal temperature and pressure ah 60 degrees ideally, but if atmospheric pressure and temperature is is different. So, within that condition, you are storing.

Water treating system. In every stage 2 phase 3 phase you are getting water, water, water, and water is not giving you money. You have to dispose properly. I already told this environmental agency are there they will stop your work if you are not treating water properly and you are disposing. So, hydrocarbon must be removed actually or you have to reinject in well bore certain good bore you have to create you have reinjected.

That surface aquifer zone will not be affected by your water. So, water let us say you are getting from wellhead this fluid you are getting into your separator system maybe free water knockout or any type of separator you can use then you are getting water out here you are using one level controller right and here you see one pump is there you are getting oil you are using one pump. So, there also a level of control is there. If you have gas you can take it out, but again gas you will have controllers such that I will drop the controller also. So, like this, this is not a level controller this is a pressure controller actually in gas you are not controlling the level, but in liquid case, you are controlling the level.

This is a free water knockout or flotation chamber here again you are using an LC level controller you are using a pump and again you are treating you are sending to another system. So, flotation chamber there will be skimmer water is there. If you keep the water for a certain time in a certain cool environment without any turbulence. So, that oil will be trying to settle on the top of the water layer which is called a skimmer vessel. So, there skimmer vessel will slowly remove the top layer of crude oil.

Again you will put water continuously slowly when what oil particles get together they will create bigger particles, and the settlement rate will be quicker. So, I will discuss later how this settlement rate can be higher, and water that skimmer will be removing this oil particle as much as possible after that you are injecting or you have to handle this properly fine. Later we will discuss in detail about water treatment systems many ways are there to remove the water particles from oil or oil particles from water. Here more water you are getting and you are removing oil particles, but in the previous case, in the oil case, you are removing water from oil because oil will be giving money. So, you have to remove water, but here you have to dispose of water.



So, you have to remove oil particles and you are not disposing of the oil rather you are using it. Gas dehydration now from all the separators you are getting gas right like this gas you are getting. The gas you have to inject here is called the contactor column normally called the contactor column. The gas will have H 2 S maybe it will have water it may have some other impurities also CO 2 also maybe there H 2 S is corrosive gas. H 2 S it can give sulphuric H 2 SO 3.

So, it can create acid, acid is dangerous. So, H 2 S if it is there in your gas then you have to remove it. H 2 S is your enemy actually in the oil and gas industry if you are getting a very high amount of H 2 S then you have to handle it properly. Otherwise, it will create a very destructive thing because it will corrode all the metal equipment leaking will be there and hazardous to health also. So, you have to handle H 2 S properly.

Now H 2 S you have to remove the next thing is that you have to remove water also why water is not giving any heating value? If you can remember your higher and lower calorific value HCV, LCV higher calorific value lower calorific value. If you burn any certain amount of fuel let us say take XYZ amount of fuel and do a chemical reaction I mean give oxygen react it then you check how much energy it is producing, how much heat you are getting heat how will you measure it. You know the volume you will measure the temperature and how much temperature increases based on that you can calculate heat. Heat mass into specific heat into temperature rise. So, that is your measurement of heat.

So, how much heat you are getting from a fuel let us say I have one fuel with no water

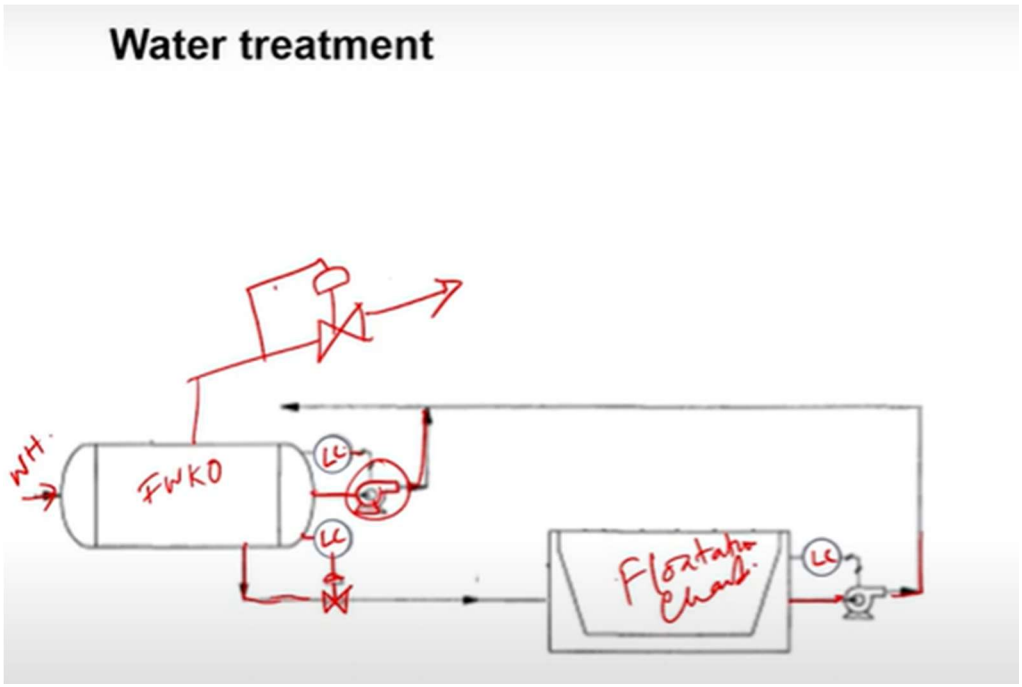
content. I got let us say 100 calorie energy or heat. Now I got another fuel same fuel I took and a small amount of water particle water is there. What will happen water will be at a lower temperature water will be liquid when you are increasing the temperature more than 100 degrees centigrade water will be evaporating or it will create steam when it is creating steam because of phase change it will take latent heat. When it is taking latent heat that latent heat it is using, but you cannot use that heat for your heating purpose your cooking, or anything whatever your CNG vehicles you cannot use.

So, that means, there is a loss. If a certain amount of water is there in your gas you have to remove it otherwise that is a loss actually that will create corrosion also it can create hydrate which can create a blockage, but it does not give heating value. So, whenever you are getting any fluid you have to calculate a lower calorific value if you have a certain amount of water already. It will give a higher calorific value higher value, but that you cannot use. So, a certain amount of energy will go to heat water to create steam.

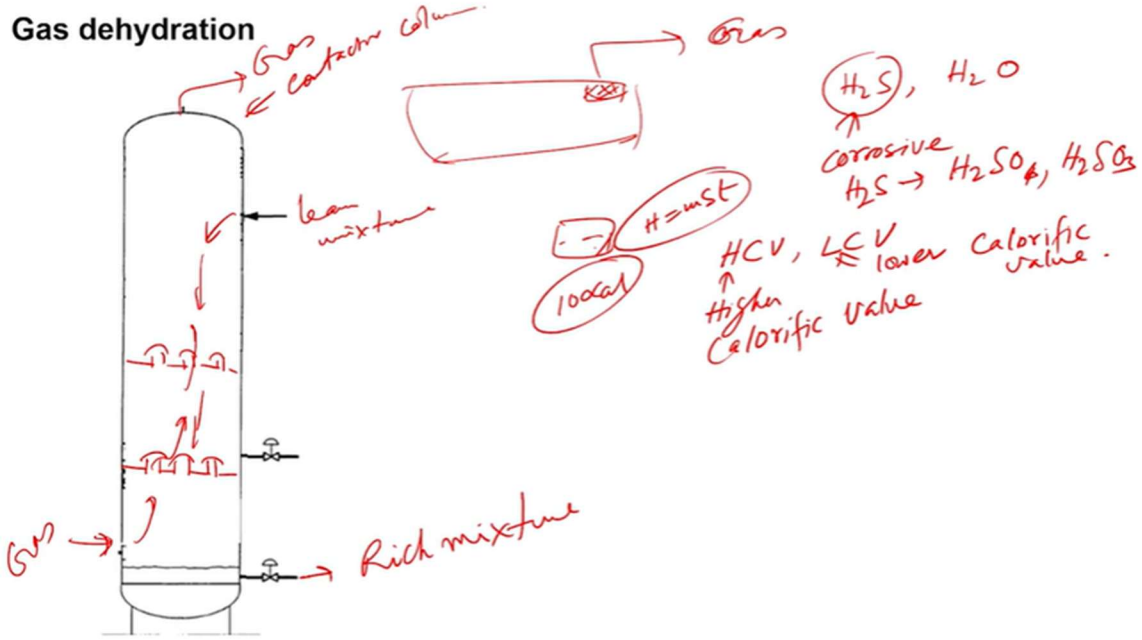
So, that is not usable. So, total heat you are getting minus water taking the heat that is lower calorific value fine. So, for your cooking purpose, you will be using lower calorific value and upper calorific value you are not using what is taking a certain amount of it is not usable. So, whatever oil and gas you get from the wellbore is mixed with water, right? Lots of moisture content will be there. If moisture content is there means some amount of H 2 O particle will be there in your gas already although you are reducing temperature.

For example, in the air also moisture is there in atmospheric air, but you cannot see it in a superheated condition. Similarly, some moisture will be there in your gas also. So, you cannot use that energy whatever moisture will be used. So, you have to remove that moisture but how to remove it? So, you will have some glycol and other techniques.

So, later we will teach in detail. That technique will be removing the gas fine and H 2 S if or sour gas in oil gas they say sour gas. If sour gas is there H 2 S carbon dioxide will plus H 2 it will create carbonic acid. So, if sour gas is there you have to remove that one also if any other gas is there you have to use a certain mechanism and you have to remove that part then you have to send it to the customer. Here this is called the contactor column. So, the contactor column or bubble column they will say will have a design like this.



So, this gas will go from the bottom and many trays will be there these are called trays. These many trays will be there when gas is going through this and from the top you may have an amine mixture. Amine mixture will be removing H 2 S or sour gas or you will be injecting your glycol desiccant. That will reduce your water content and it will move down. Here rich mixture rich mixture means like an amine solution you took and it absorbs already your H 2 S other things.



So, that becomes a rich mixture. So, that rich mixture will be going out, and your dry gas or removed or sweet gas when sour gas you are injecting. So, the sweeter component is the one you are getting from the top. So, that gas you are getting from top to bottom you are injecting gas with water and H 2 S and you are injecting a lean mixture of say glycol mixture or maybe your amine mixture. So, I am showing only one contactor column there will be other contactor columns also ok. So, in the same contactor column you are not using glycol and amine you will have an amine separate contactor column glycol separate contactor column.

So, we will discuss in detail when we will discuss about your gas separation system.