Surface Facilities for Oil and Gas Handling

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Desalting of Crude Oil-02

So, actual picture is here. So, you can see this you can draw this one, this one, this will be 14 ok. In previous problem actual picture is here. In many cases single stage desaltation unit will be there, in many cases there will be two stage three stage desaltation system also there. So, one stage will be removing some salt another stage will be removing some more salt. So, that way if you have higher amount of salt then there will be two stage three stage also possible ok.

Salinity of water produced with oil more than 20,000 ppm, salinity of water produced with oil, produced with oil will be initially it will be like more than 20,000 ppm ok. Formation water has a concentration 50000 to 250000 milligram per liter 50000 to 250000 milligram per liter. I have need two stage system dehydration and desaltation stage is used. In two stage system two stage dehydration and desaltation.

Dehydration means amount of water you are removing, desaltation means you are removing higher amount of salt, dehydration and desaltation ok. So, I will draw one picture figure here how this dehydration desaltation will work. So, dehydration and desaltation dehydration or desaltation saltation ok. So, this fluid is coming from mixing chamber ok, mixing valve you can say mixing valve it is coming from injector ok, nozzle injector I have shown you in picture. So, produced here produced oil stream, produced oil stream is coming from other separator high pressure separator is coming and you now you are these the location where you have higher salt concentration you have already removed other particles ok.

So, now injector section you have to inject your water. So, water means you need one

pump ok. So, pump water is coming like this diluent water, dilution water or diluent water, dilution water is coming. So, this is mixing valve ok. So, water to disposal to disposal and clean oil ok.

So, this is single stage desalting desalting system, single stage desalting system ok. Now, I will go for two stage desalting system. So, two stage means I have one vessel here ok. So, this is degassing system, degassing, heating then coalescing ok. Now, feed fluid is coming here, feed fluid is coming here and then discharge, then this fluid from first stage this stage 1 dehydration, you are removing amount of water then you are putting to mixing chamber ok.

So, there you are adding diluent water ok. So, pump so, dilution water ok. So, dilution water you are going to another vessel degassing again, then heating, heating also you are doing then you are coalescing again ok. So, desalted oil or clean oil, clean oil and water will be coming out from here water discharge. So, it can be recycled again ok, you are recycling again and diluent water here, discharge here ok.

So, from second stage whatever fluid is you are getting because first stage you remove already certain amount of salt, in second stage you are giving some water diluent water. So, that water will be increasing little bit of salt, but not so high. So, that discharge from second stage this is stage 2 ok, stage 2 this is desalting actually ok. First stage you are adding lots of water, diluting you are getting some discharge, but that discharge you may not use, but second stage when you are going you are adding some diluted water again that diluted water when it is coming out you are feeding in the first stage. So, that first stage water requirement you are fulfilling from your second stage actually ok.

So, this is two stage, a two stage desalting system, a two stage desalting system, desalting system ok. This is single stage system, this is two stage system. So, water was also called dilution water ok, mixed with crude oil coming from dehydration stage, wash water, low salinity. Wash water means the water you are supplying diluent water wash water that must be low salinity water, fresh water mixes with remnant water, dilute salt, mixing causes water oil emulsion again dehydration will be requiring ok. The separative water disposed through field produced water treatment and dispose of system ok.

So, there is already water dispose system there you are giving this water whatever water you what as a discharge that one you can dispose the same way ok. Two stage system dilute water recycle and it is put in first stage for dilution, second stage used to minimize wash water requirement. This two stage is to reduce water wash water requirement. So, mixing step will be like this mixing step ok. Mix with pump crude.

So, if pump crude then water wash, then usually mixing device is a throttle valve already we told that nozzle or throttle valve. Mixing device a throttle valve ok. And or if useful device is multiple orifice plate, multiple orifice plate or globe valve ok. Globe valve is also used for the mixing purpose ok. So, how this orifice plate work? Ok.

So, here perforated orifice will be there ok orifice multiple orifice plate. So, when multiple orifice plates are there when fluid is passing from through thisholes. So, fluid will have more mixing up more turbulence will be created. So, it will be mixing more ok. So, crude oil in this is fresh water in.

So, fresh water means dilute and water or low salt content must be there. So, this is the first criteria low salt content. So, low salt content. So, highly emulsified crude. So, highly emulsified crude means you mix crude oil and water.

So, it will create lots of emulsion particle water particle oil particle will be broken it will be creating small small water particles. So, that will create actually emulsion oil and water emulsion ok. So, electrostatic desalting. So, in electrostatic system you need electrode actually ok. So, if AC is there then there will be no positive electric rather it will be changing pole constantly and normally AC frequency like 50 60 hertz will be there you can change frequency to higher hertz also based on your salinity in liquid or fluid.

And for DC one will be positive one will be negative electrode and whenever any water particle is there they will be getting ionized and they will be try to move towards positive or negativeelectrodes. AC field dry device is for water rich emulsions. So, AC field AC where water rich emulsion is there water cut is high ok. And DC where particles are

sparsed sparsely distributed particles water particles actually water particlesare sparsely distributed ok. AC DC net goes I have shown already one figure.

So, dualdevice is there where AC field and DC field both are getting both are getting created inside separate system and separation efficiency in increased. Variable gradient field also can be used this field gradient is increased beyond a certain limit this will be shattering the drops. It is expressed in terms of EC less than equals K gamma dm per half ok. Gamma is interfacial tension interfacial tension and dm is the particle size droplet size droplet size ok. K is dielectric constant dielectric constant ok.

The electric field can be used for both mix and mixing and separating droplets. So, it will be assisting mixing coalescing and settling ok. So, the E is means electric EC means electricfield. Now, if we have chemical also we are adding chemical in the system. So, how the whole separator system will look like chemical desalting ok.

So, chemical desalting system will be looking like this chemical is coming and it will be pumped chemical pump. And it will go to crude oil it will be mixing up then there will be one pump. So, pump will be delivering and it will go to one heating section heating section to your mixing chamber again there will be heating section then you are getting going to settler settling chamber or coalescing chamber ok. So, treated crude crude clean crude ok water drain water disposal or drain ok. This is pump this is crude oil this is mixing valve this is heater this is also heater settling chamber mixing chamber heater this is charge pump they are saying charge pump or only pump ok charge pump.

So, this is called chemical desalting system will look like this. Now, if we have now if we have chemielectric. So, chemielectric approach is this. So, chemical injection and treating crude crude is coming here.

So, treating the fresh water. So, three thing you need. So, chemical will be deactivating your surface active agents and fresh water will be diluting then you will be applying heat. So, how this whole flow diagram will be looking like this ok. What coming there also will be pump for crude oil pump crude oil pump then it will go to heater section it will go to

heater from heater it will be mixing device mixing device and fresh water again it will have one its own pump. A pump is drawn like this then it will have also one heater then this will be going to mixing device from mixing device it will go to electric electrostatic or electrical desalter electrostatic static desalter or desalting device then storage tank ok.

And something coming from here so, effluent water drain water ok. This is heater this is pump. So, all are pumps and this will be connected to here this is also pump ok. So, this is chemielectric. So, chemical electric fresh water all and heat also you are applying.

So, they have given the name chemielectric approach or chemielectric separator system effect of operating parameters ok. Water oil interface water oil interface ok. So, interface level should be constant any change interface level will be creating problem in your electrodes because electrodes must be submerged in liquid and if you are changing the parameter then your performance will be going down. Then desalting temperature desalting temperature. So, in desalting temperature a heavier oil is there.

So, in that case temperature must be higher. So, you have to give more heat actually because high viscosity fluid they will not allow water particle to settle down. So, you have to force that high viscosity fluid release water please. So, in that case you have to give more heat you have to force them release. So, viscosity it will the heat will change viscosity automatically water particle moving down and it will be settling at the bottom.

Wash water properties wash water ratio water wash water ratio heavy crude requires higher wash water ok. Heavy crude needs needs higher water. So, heavy crude again here at this desalting temperature heavy crude higher temperature ok. Heavy crude higher wash water ratio increase electrical conductance because to increase for desalting temperature heavy crude needs higher temperature. So, that electrical conductivity will be higher up.

So, that conductivity can be increased ok. Pressure drop pressure drop in the mixing valve very high pressure drop of it will create very small small particles ok. In the formation of fine stable emulsion will be creating, but better washing. So, however, if del P is excessive

the emulsion might be difficult to break ok. If it is excessive pressure emulsion breaking will be difficult emulsion breaking will be difficult.

So, del P equals 1.5 bar for light crude mixing chamber pressure drop and del P equals 0.5 for heavy crude ok bar for heavy crude this much of pressure drop will be required. Type of demulsifier type of demulsifiers are added to complete the electrostatic coalescence in desalting because demulsifier would be changing the surface active property of surfactant active agent. So, in that case the two particle will be colliding easily.

So, it will be helping in separation ok. And type of water washing water type of wash water ok. In wash water case you should not have higher salt concentration because you are already trying to remove salt using this water. So, this water should not have higher salt concentration. So, you should not have H 2 S NH 3 also must not have otherwise it will be creating corrosion ok. So, low salt concentration plus this H 2 S NH 3 also should be lower ammonia and hydrogen sulfide.

So, that corrosion rate also will be down. So, some crude oil gravity and desalting temperature like 40 degree temperature 100 40 degree crude oil desalting temperature 100 110 degree centigrade. And minimum water ratio volume ratio 2 to 4 percentage. So, crude oil gravity coming less than 30. So, your desalting temperature also going up you can see the temperature going up although the crude oil API changing and water ratio also increasing for higher gravity crude oils. So, here one table I have taken from the book petroleum gas field processing Abdel Al.

So, high salt content if high salt content is there the cause is that feed salt content high wash water injection is low crude oil flow rate exceeds the design flow rate in sufficient mixing of crude oil and wash water. So, the solution increase the wash water rate reduce the crude oil flow rate increase the mix value of pressure drop oil in the desalting effluent interface level is too low wide emulsion band at the interface excessive crude wash mixing poor wash water quality crude temperature is too low increase. So, what is the solution? Solution is that increase interface level inject chemical or dump the emulsion reduce mix valve pressure check for any waste in the wash water source and if you have high water carry over and the desalting crude then wash water flow rate may be too high excessive formation water in the crude oil interface level is too high disturbance in the desalter reduce the solution is the reduce water wash for flow rate and common and comments or increase

chemical injection reduce interface level check the effluent water check the excessive cause of and allow the unit to settle down. So, thank you very much for today lecture.