Surface Facilities for Oil and Gas Handling

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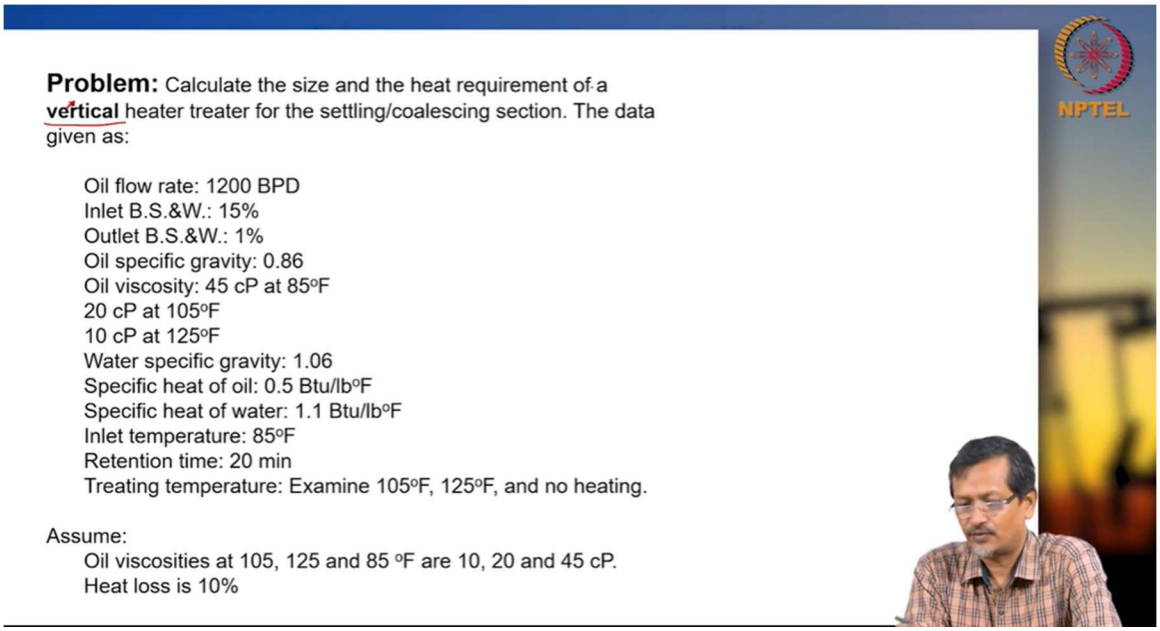
Heater Treater and Gunbarrel: Numerical Part 2

Now, this problem is for vertical separator, now that is dots. So, we can calculate size and heat requirement of a vertical heated heater settling coalescing section ok, this section you have to calculate. So, vertical separator means you will have settling section h also right. So, oil flow rate now is changed to 1200 BPD. So, that you can get different calculation inlet BSW same we have kept out at BSW 1 percent, oil specific gravity same, oil viscosity also same parameter we have taken here, water specific gravity is same whatever you have taken for horizontal separator, the specific heat 0.5 specific heat water 1.

1, inlet temperature 85, retention time 20, heating temperature for 105, 125 or no heating, no heating means operating temperature you are using ok, inlet fluid is not heated only 85 degree temperature is maintained ok. So, examine what I should write. Assume oil viscosity like 105, 125 and 85 like 85, 40, ah 125 it should be like 125 ok. So, higher temperature viscosity to be ah lower ok, heat loss 1 percent ah 10 percent we are assuming ok.



The same procedure you have to follow ashorizontal separator or the, but the formula is different ok. So, formula please do not mix up the formula. So, for T equals T equals 185 degree Fahrenheit, d square 6690 Q o mu o S g del S g dm square ok. Now, you put the values 6690 into 12000 mu o for 85 degree is 45 it is given there ok and S g del S g we are we assumed in previous problem that del S g is not changing although we are changing temperature. So, 0.

2 it is fixed and what about your dm, dm value also you see the previous problem actually. So, dm will be coming like 200 mu power 0.25 ok. So, 200 into mu means 45 power 0.25 ok.

So, this will be coming 518 ok micrometer. So, this is a dm this form a 200 ok. So, 518. So, this value is coming 673 1.7 and this is d square.

So, it will be inch square ok. Similarly, you are calculating for 105 degree Fahrenheit you are calculating d this is d square ok. So, d square so, d you get 82.46 inch ok. Now, for 105 degree you are calculating again same thing 6690 1200 into 20 your viscosity changed and your 0.

2 your del S g not changed and dm, dm value how to calculate dm equals 0.25 into 200 your viscosity 20 power 0.25 ok. So, this will give 423. So, total value is coming 4487.

8 this is t square actually. So, d will be coming as 67 inch this is inch square because square term is there and for 125 degree d square equals 6690 1200 again into viscosity again changed to 10 and 44 oh sorry not 44 this is 0.2 into dm value. So, dm equals 210 power 0.

25. So, this will be giving 4 not 4 this is 356 356. So, C 5 ok. So, this is giving 3173 inch square. So, d equals 56.3 sorry 56 inch ok.

For the next slide space and all that you are writing ok. Now, we will go to retention time based calculation. Retention time based calculation you can remember d square h equals formula TRO TRO retention time flow rate divided by 0.12. So, this is 20 flow rate 1200 this 1200 right ok 1200 then 0.

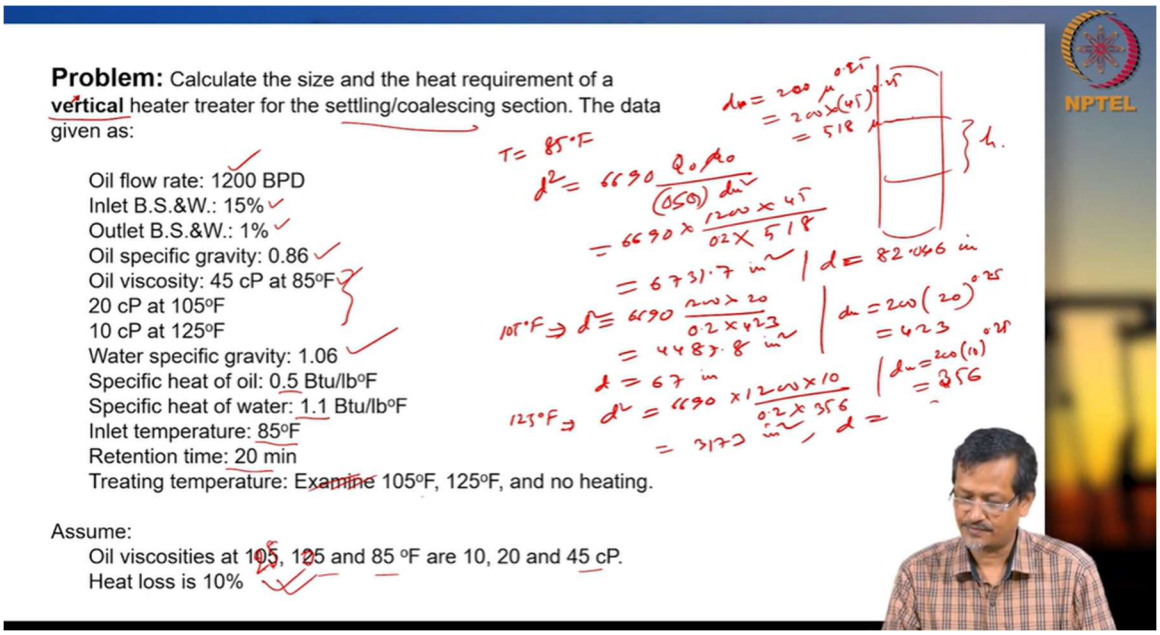
12 ok. So, this will be giving 205800 inch square. Now, again you have to draw the figure h actually this coalescing section height next this one coalescing section this site is h ok. So, this will be coming like this and values are like 20 200 20 200 then 40 60 80 ok. And diameter this is h in inch this is h in inch this is dia or d in inch ok. This values are 20 to 90.

So, 20 30 40 50 90 ok. This is retention time based calculation. So, this formula retention time based means d square h equals 205800 ok. So, this so d or h if you put h value h equals 205800 divided by d square. So, this is your curve from here ok.

And other curves like it will be like this T equals temperature T equals yeah. So, capital T I am using this is temperature small t I am writing for time ok. So, this is temperature. So, temperature 125. So, other temperature also will be like this ok.

Now, this is again infeasible zone ok. This lower portion of your retention time curve is infeasible zone. So, upper portion you can go around the curve also if you take some data that will be ok. Because you have many many DALF calculations. So, you have to take some optimal value and you can say this is optimal it is satisfying all the norms and you are calculating ok.

Now, we will go for heating heat calculation for this one. How much temperature how much heat will be required? So, heat calculation again the some same formula you apply 1 by 1 minus L 15 Q o del T gamma o C o plus water percentage gamma water C water. So, formula will be like this 1 minus 0.1 percent 10 percent.



So, 0.1 percent 10 percent 10 percent 10 percent. So, L 15 Q o Q is 1200 delta T delta Tagain we are assuming 105 degree optimal temperature in for heating 105 minus 85 ok gamma o 0.86 into 0.5 plus omega value I will write here below because my picture will come 0.

5 0.15 this is percentage of water BSW 0.15 then 1.06 and 1.1 1.1 is your specific heat of water and 1.

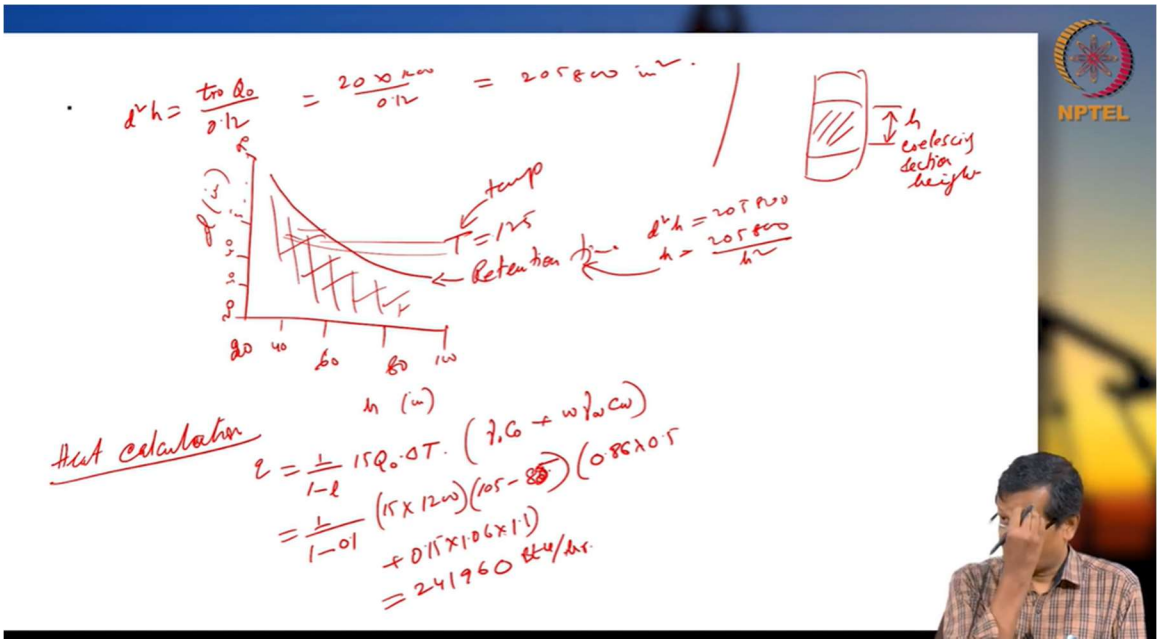
06 is specific gravity of water ok. So, finally, this data is giving 241960 Btu per hour ok. So, this much of heat will be required for heating your system 85 to 105 degree centigrade temperature ok and with 15 percent inlet water is there ok that water will be separated in during the separation process ok. Thank you very much for this horizontal separator calculation ok. I will give one problem I will not solve you we can try to solve ok the problem is like this it is given in your K Arnold book volume 1.

So, oil gravity is given oil gravity is given 30 degree API and 0.875 Sg specific gravity oil flow rate is given 5000 barrel per day BPD inlet temperature temperature inlet equals 80 degree Fahrenheit water specific gravity 81.06 1.04 inlet temperature BS and W 10 percent outlet BS and W 1 percent ok. So, in this case in actually in the booktemperature is not sorry viscosity is not given for differenttemperature.

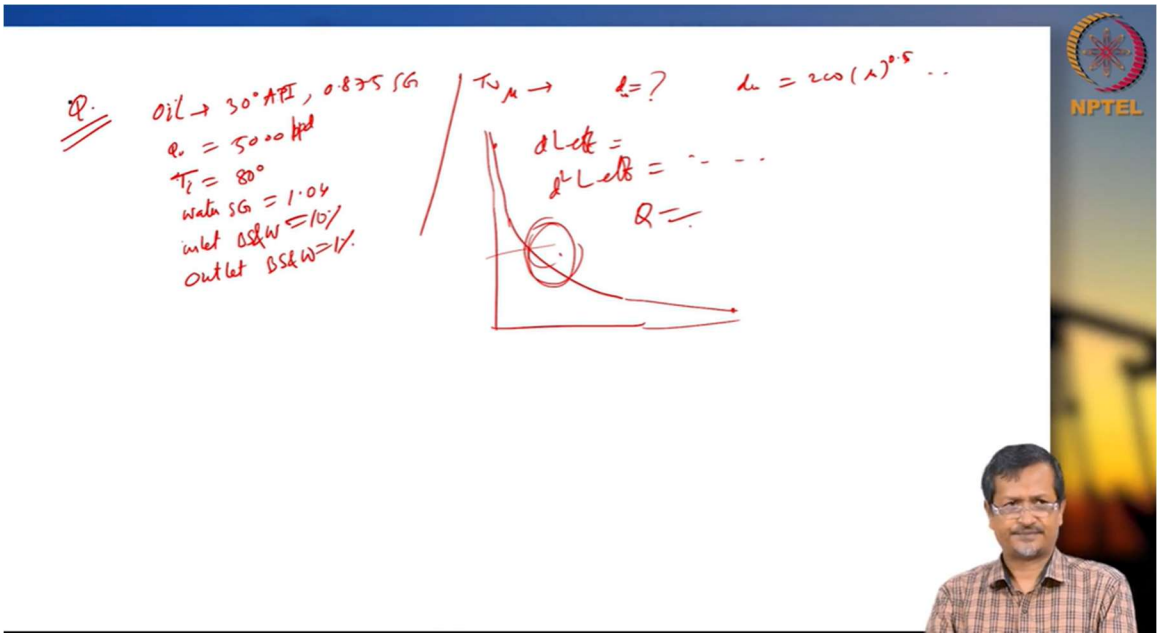
So, in that case you can use the chart I can give use that chart maybe I will give the chart also from that chart you can find the value of viscosity and you can calculate the viscosity. Once you get viscosity once you get viscosity after that onlyyou can calculate D particle size is not given dm ok. Then the steps is that first you get viscosity data from formula you can collect or use chart once viscosity you got then dm formally apply 200 mu power 0.25 within that range. On once dm you get then you can get d L e f f ok d square L e f f ok this parameter you can get.

Once you get you get this parameter then you draw the curve then from that curve you say this is the infeasible region region and my feasible design can be one design you can say this can be one design ok. You cannot say too high or too long L e f f or too long or too large diameter ok. So, you have to take let us say some value within this this range ok. So, if you are taking let us say here so, this may not help it will be too large diameter ok or you can go you are going up upper side.

So, that is also not helpful. So, you should take here where gradient curve gradient is high ok. This will be maybe your optimal zone. So, in that zone your diameter and L e f f will be optimal fine. And accordingly you can calculate heat also heat formula again you can remember that 1 by L by del 15 into Q o that formula you can use and you can calculate the heat. So, for horizontal and vertical for both cases you should practice ok.



And many time I do not give direct formula whatever you are using maybe step by step I will ask. So, in that case actually you have to remember the derivation procedure of the formula ok. If you are not remember you are remembering only final one then maybe some derivation in some step I will give calculate this one ok. So, then in that case you will face difficulty if you remember only the final one. So, better you remember the derivation step by step how the formula came up then you give the calculation result ok.



If you are giving for written exam in a class right in your course exam. So, in that case maybe I can ask give step by step calculation show this one this one this one values ok. But if you are going for NPTEL or online exam mode. So, in that case I will be asking final result, but maybe based on some step not in the final result ok. So, whole thing you have to remember you have to remember final also you have to remember steps also and how to solve the problem step by step we should remember ok. Thank you very much for this one.