Bulk Material Transport and Handling System
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Lecture - 35
Jigs and Thickeners

Welcome back students, we started our discussions on the Froth floatation techniques magnetic separation jigs and thickener. In the last class we talked about the Froth flotation and magnetic separations. To continue in these discussions let us go for talking about jigs and thickener and how this, our mineral processing system these concentrating devices work. Let us starts with jigging today.

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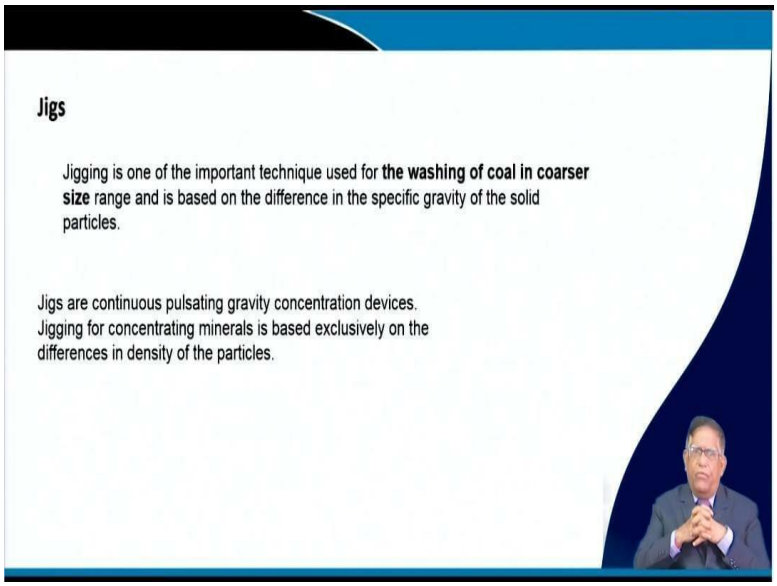

The jigging you will often find in many of the coal washing, you know that in our Indian coal which are having a high percentage of ash. To remove that ash, we need to wash this coal and for washing that coal is nothing but again a gravity separation in which you know the coal particles, they have got a density 0.9 to 1.1, 1.2 like that depending on the type of coal. But the exhaustive with coal you are having often sandstone, shell.

These particles, they have got higher density sandstones may be going density up to 2, 2.4. So, that is why if you can make the systems to you have got this crust to certain extent so that you are liberating those out that crust coal when they are introduced to a device which is named as a

jig. And in that they are washed and then that is a; what is done there washed with a pulsating water that is what is the main in jigging.

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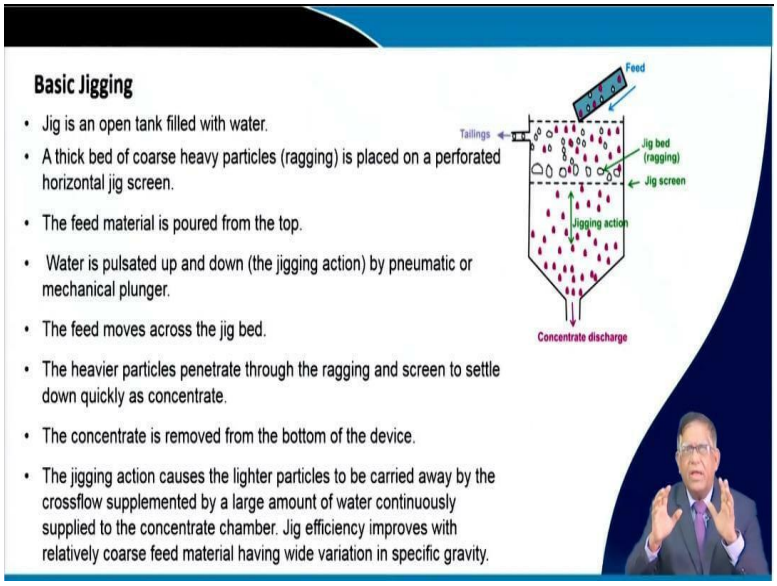

The basic jigging process that your coal and the non-coal material; in a crust for theirs introduced into the jig. And the jig is nothing but a open tank filled with water. Now, here exactly that normally they the water which may be coming there as a pulsating water thing it will be coming over there. And then when that the thick bed of coarse particles is placed on the perforated horizontal screen.

You can see here there is a jig screen on in that screen there are these perforations are there. Now the feed material is placed from the top and water is pulsated up and down and the jigging by pneumatic or mechanical plunger. When you will give it over there the feed move across the bed and then the heavier particles penetrate through this. And then, because it is all the time water is coming you are keeping the perforations clean.

And then the lighter particles, low density particles like coal here, they will be getting at the top and they will be taking it out. Now the concentrate is removed from the bottom, that is a one you can take out those heavier particles from the bottom and the lighter from this. So, this is what is a basic jigging process.

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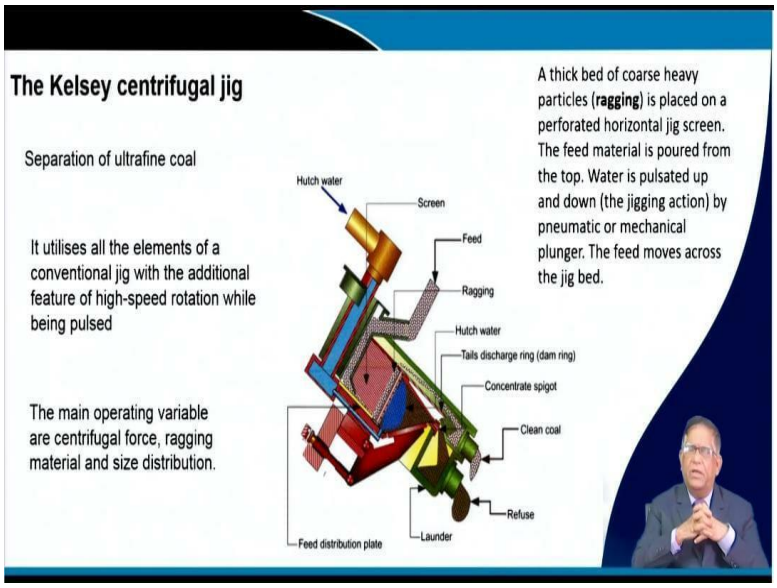

Now, there are different type of jigs say I think in the previous named about the bound jig which is used may be there I think if I am sure in rather peculiarly of our central coal field most probably is having a bound jig there. So, you may find out that exactly in the coal washery and coal handling plant lot of these bulk material handling operations are there. There, you can make a study or case study if you take up for some of the washery you will be knowing much more about it.

Now, this why we go for a jig out of that sometimes when your coal is crushed and then in the tailings all the fines are going you cannot separate it out. There also this jig called Kelsey jig that because they use a centrifuge principle also attached and the jigging with centrifuging is done in this Kelsey jig. And they, the construction is basically what it is here your feed material is coming over here.

Now, this when they will go there will be the ragging part is here, where you have got a thick bed of coarse heavy particles are kept over here. And then the feed material when it will be going over this, they will get concentrated. And then the clean coal will be coming out over here, the dirt that is high density material which gets separated out through this jigging process they are going out over here.

So, that is how your distribution of the feed distribution plates depending on this control you can control if that sizes and all are different. So, the main operating variable is here what is the centrifugal force, how you are rotating that and then what is that ragging, how you are doing it there, how the coarse particles are kept over there and then how the size distributions in the original feed is there depending on this this jig operates.

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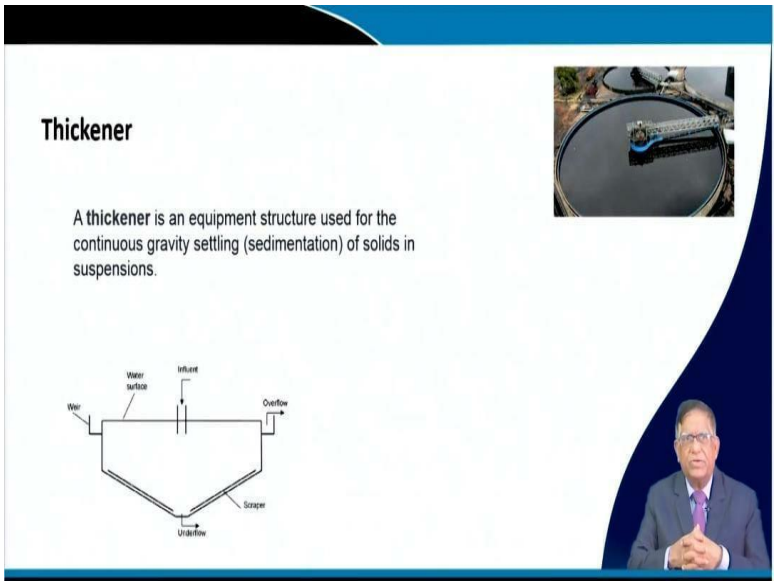

But the basic jigging I told you introduced in the earlier case. Then another thing is the thickener, this also I told you a thickener is an equipment of four structure used for the continuous gravity settling. That fine particles they need to be now separated. Because when it is in the after it is coming as a slurry in that; lot of your fines and the solids are there. So, they are used by decantation they are kept in a tank like that and by that you can exactly that your material the fines with water it is introduced over here.

And then they will be getting; so there can be scrapers for the whatever the material will get deposited over there that can be strapped down and there will be the underflow. After settling it out this your the water or that which will be coming free of particles they can go over there. In that you can use some time coagulator so that you can get the fine particles, get joined together to make a heavier and to settle things can be done in a thickener.

So, thickener is nothing but mainly those very fine particles to be made them to they cannot and then come and then as a sludge they will be taken out from the thickener.

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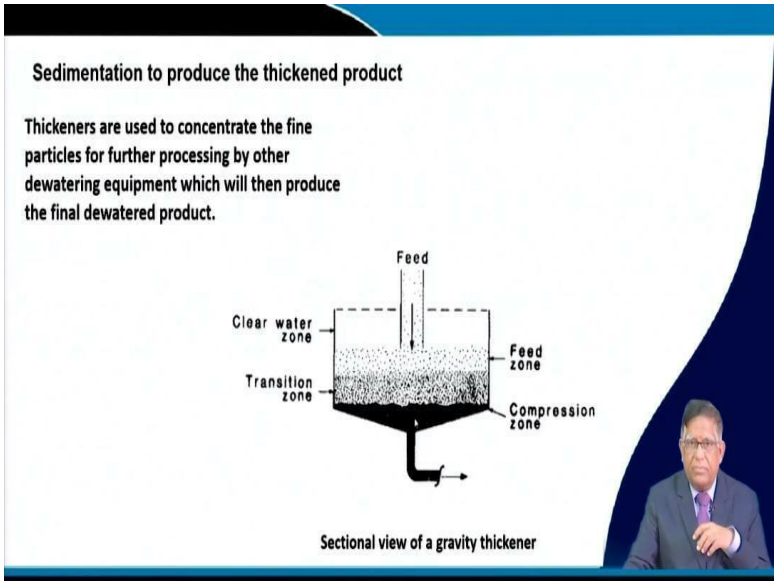

So, this I told you earlier that is your feed is coming that you can get the things collected at the bottom as a thick particle and you can take it out.

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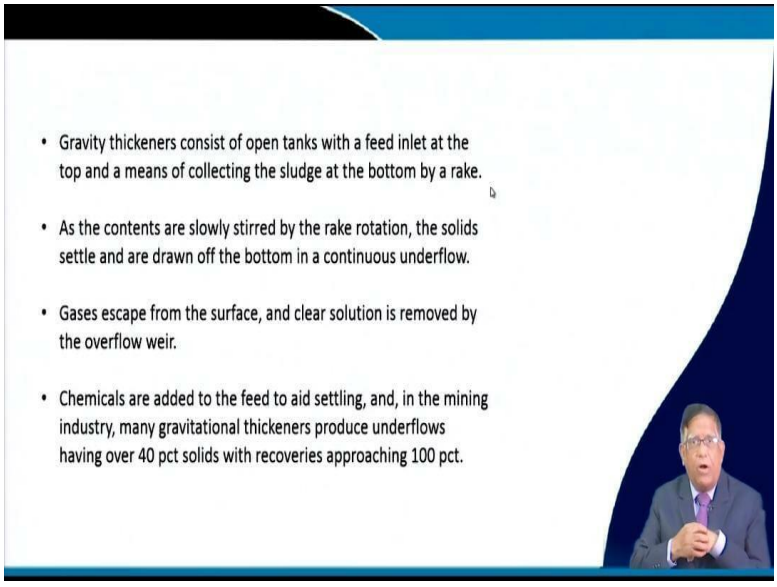

So, gravity thickeners consist of that open tanks which feed inlet at the top and a means of collecting of sludge at the bottom. So, you will be keeping a gate there at the bottom so that it is closed you are allowing a time for settling it down and then how the settling takes place.

Sometimes you add the settler that is your you as a coagulator so that they can be taken up quickly.

That is the efficiency of a thickener will be how much less time it will take for separating them out for the counting. Now, there could be the gasses that may be associated with for making them to escape will have to make give some provisions. There could be sometimes that you may need to take steering also and then if it is a very heavy a lot of sludge have come over there that your the evacuations may not take properly.

So, there you can use some scraper another so that you can scrape down the slabs and put it over there. So, lot of other engineering arrangements can be done over there.

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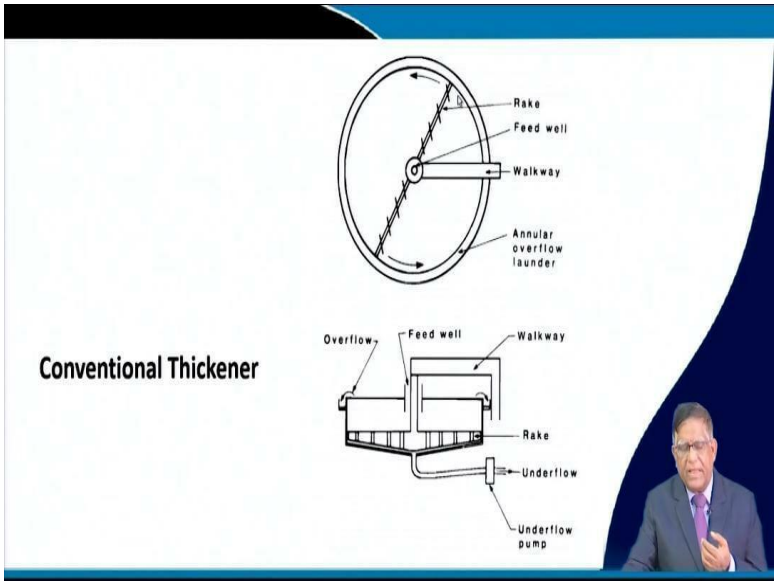

Now that as a conventional thickener you will see that the top people can go for inspection walking and all that thing a rack will be there, the walkway will be there and this there will be continuously will be making it to very slowly moving. Because, that particles they should settle that coagulation could take place that is why a very slow motions is given so that the properly thickening takes place.

And then, from there as you say in the underflow that will have to be pumped it out by doing this. So, that is a conventional thickener.

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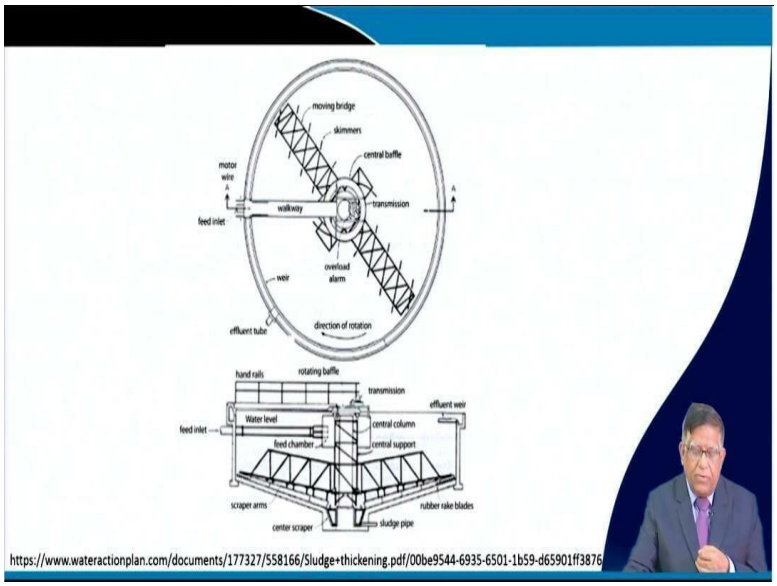

You can see this in a if you go to any beneficiation plant you can see these things. Now what are the various control there in this if this gate filled it up then, if it touches this your rake that is not expected so there you can have an alarm. So, that there will be overload alarm will be there you will be controlling the inlet that the feed coming will be getting. You can stop it then; you can see that maintain the water level you can check that is your when you are giving a feed inlet.

And then there will be that way you will need to monitoring whether this effluent where it is properly functioning or not. They whether how you are scrapping it out from the bottom that material which may just should not get stick to the that hopper portion of there. So, that is why a structure is a scraper it scrap it down and the material it brings to the your that (()) (10:58) phenomena it is there.

So, the whole design there you can have a lot of innovative way of putting it over there. Now whatever is available in the field in the market in the industry as a case study, you can see that those are mainly decided depending on that what type of sludge will be coming. Sometimes in some processing because of the oil and other things you have added over there they make a such a sludge that in that hopper they may get very sticky it does not flow.

At that time, we will have to make this scraping and things like that. So, that the end of the day you will find the whole bulk material handling is to be solved at the site depending on their problem. You will have to have a basic understanding of what are the methods being used, when you take a specific problem at that time you will have to take with your pen and paper and start doing sketches and designing.

Make the basic sketch that this will be there then you go for the designing principle whether it will withstand the strength, whether it will be easy to drive how much energy will be required, what type of problem may come like that you go on investigating and get a new system for these purposes.

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So, for references a lot of materials are there, some of the websites is there but, thing is that already I asked you to go through the text books by mineral processing by wheels that will help. And also make a habit of looking into the manufacturers leaflet. Though, manufacturer leaflet will give you only superficial informations about it. Once you find out then you need to explore that as the basic question, how the energy is provided over there?

How the capacity has been determined over there? And then how the separation is taking places? What are the principle if it is a centrifugal separations? That how much centrifugal force is coming up? Then, in that force whatever particles it can be picking up, what are the flow is a

coming continuously intermittently or if that is there, what type of if your evaporations and that your feed their relationship is how much.

Try to find out those variables and there if when you make the relationship between different variables then we say that we have developed a model. Once you are getting a model you can simulate that okay whatever that system is taking place in the industry can I make it to operate in the simulate by controlling the things can we see the things so, there comes the simulation. So, those are for your when you go for master degree or when you want to do any projects or you want to do research.

At that time, you will have to do those modelling and simulations and then the design control and all. But, for time being now you must know as a general the knowledge of about all these things.

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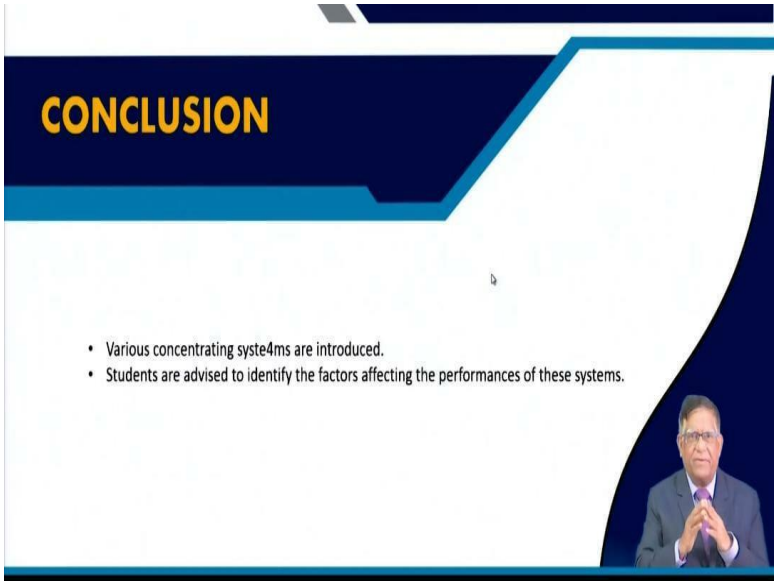

So, I request you kindly start describing what this is and what are the main components and what are their advantages and disadvantages. Like that for each of the system if you make a note for your learning activity preparing that is your writing the name or make a column and then you write for each of these what are the advantages, disadvantages, special construction fissures and the basic principle meaning these four.

Advantages, disadvantages you can put it there the first is the constructional special features of their constructions, special that is your basic principles then their advantage and disadvantage. And this once you are doing it for say thickener for the jigging for this your in jigging again you can go either for the bomb jig or Kelsey. So, like that if you do it for at least there will be eight or ten different systems will be there.

If you can master one is very good but, if you cannot master one that is you know the general knowledge about all of them under these four category make it as a learning point. And with this we conclude about this discussion on the mineral processing particularly for this concentrating and all. And we look forward to our next discussions slowly will be moving into the transportation sites, thank you very much.