Dairy and Food Process & Products Technology
Prof. Tridib Kumar Goswami
Department of Agricultural and Food Engineering
Indian Institute of Technology, Khargpur

Lecture – 56
Over Run and Calculation for Preparing Ice Cream Mix

So, we will do that both we have prepared ice cream cups and of course, cones are also like that from the curve like the cups, cones are also being built like that physically. And in this Dairy and Food Process and Products Technology, today's 56 lecture; we will discuss about Overrun and how the ice cream mix are being prepared right.

So, there is a proof sheet that is they call it to be proof sheet because you are an engineer you know, but the workers who are working they do not have that much of thing. What they need? They want a proof sheet from you, you being the boss. He would they will ask from you, that give me that proof sheet and that will give him that how much work has to be added for the mixed to be prepared right.

So, this is what, but before that as we said in the ice cream preparation, that incorporation of air right. So, if incorporation of air and I gave this example also that that drink that drink in the sense, soft drinks which are being sold in the market; that is basically water and some other constituents. Here, it is basically air and other constituents.

So, that is why the controls body they must have put some mechanism. So, that the minimum things are there such that the consumer is not getting be fooled right.

So, here also assume that if you have out of 50 ml or 100 ml say, out of 100 ml ice cream, if you have only around 30 ml of material and rest of the thing is only air. In such a way that only here 6 70 percent air is there, 30 percent your material then of course, you will be fooled right?

Simultaneously, if the manufacturer has to put say 70 percent your material and 30 percent only air, then that will not be ice cream. So, and unnecessarily that will shorten the profit of the manufacturer. Nobody will come forward to make the ice cream and also the quality and the taste will be different. So, that is why there is some guideline some regulations by which, how much material and how much air you can put in one ice cream

that has definition. And this is done by the term called Overrun right. This overrun is associated only with the incorporation of air right.

So, overrun means you are running one thing, and how much extra you are putting in it in terms of air. How much air you are putting into it that is dictated by the term overrun right. Now you; obviously, this we know that air density is very, very low right. So, density is very low means air volume will be very high, but the mass will be very, very low right. For a since it is density is very low right whereas, ice cream mix which is a mix of fat, protein, carbohydrate, vitamins, minerals.

So, whatever there all put together. So, their solid content is very high right and the density is also very high. Since the density is very high there for given mass volume also will be very low right.

So, to balance it this definition of overrun is made, either with respect to volume or with respect to mass right. So, if because it is not may not be possible all the time you will define only by volume. Sometimes you may need to define in terms of mass which you can measure. Volume of course also you can measure right. So, both the possibilities are kept so overrun is defined accordingly right. So, let us look into how overrun is defined.

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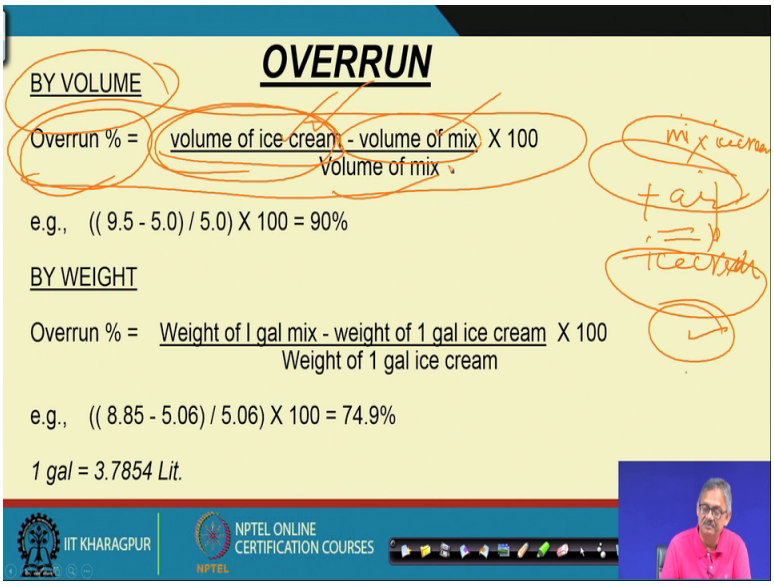

Overrun is defined like this; that by volume percent overrun, this is called percent overrun is volume of ice cream mix sorry, volume of ice cream ice cream means; your

mix plus air, that is the ice cream right so ice this ice cream. So, mix up what mix of ice cream and plus air this put together makes the ice cream right.

So, your volume of ice cream where air has been incorporated is less. Another volume is more right, volume is more and volume of mix whose density is right that will be less. So, volume of ice cream minus less volume of mix over volume of the mix times 100 is the percent overrun right by volume.

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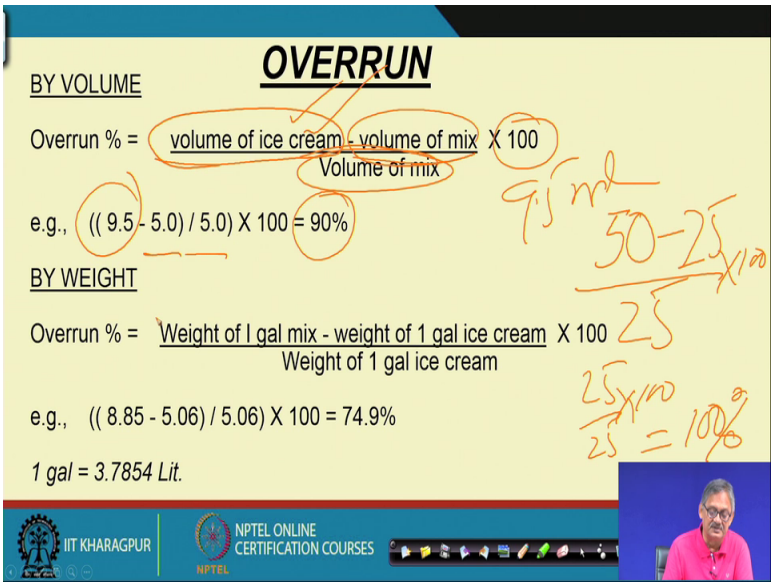

So, percent overrun by volume by definition is volume of ice cream mix minus sorry, volume of ice cream all the time I am mistaken.

Volume of ice cream minus volume of ice cream mix over volume of mix times 100 is the percent overrun right. So, we have example also in front of us. Suppose we have volume of ice cream mix 9.5 say 9.5 ml right. 9.5 ml of ice cream mix you what ice cream you have right, or here we have given that is already there.

So, we take 50 ml of ice cream we have taken right and the ice cream mix we have volume say 25 ml right; ao, 50 minus 25 by 25 in to 100. So, that becomes this is 25 by 25 this is one into 100. So, you are overrun in 100 percent right.

Here we have taken 9.5 minus 5 over 5 this is 4 by 5 into 100, that is 90 percent. 9.5 minus 5 that is 4.5 over 5 is 0.9 into 100 is 90 percent right. Here we have shown it to be 100 percent by volume right, because ice cream has more volume than the ice cream

mix. The reason being ice cream contains the mix that is the solid and liquid and air so volume is more.

Ice cream mix does not have any air so ice cream minus ice cream mix, that is whose volume is less over the ice cream mix volume times 100 gives us the overrun in terms of volume right.

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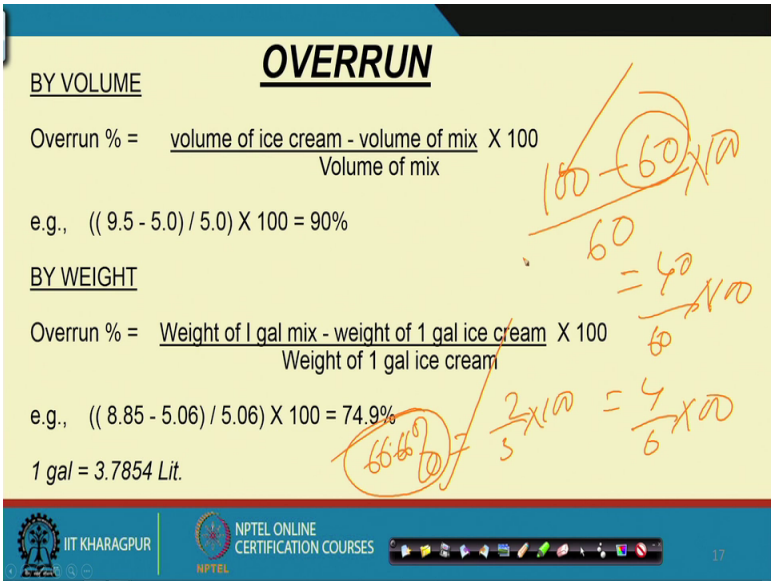

So, all the time this way may not be possible another example if we take that if we have 60 ml no 60 is not to commonly, say 100 ml. We have 100 ml of ice cream and out of which we have 60 ml of mix right; out of which 60 ml of mix over 60 ml of mix times 100 this becomes 40 by 60 into 100.

So that means, it is 4 by 6 into 100 that is 2 by 3 into 100. So, that is equals to 2 by 3 means 0.66 or 66.66 percent you have overrun right.

So; that means, your overrun is much less right you can have. So, 100 ml ice cream in which with 60 ml mix you have given and you have an overrun of point 66 66.66 percent. You will think that I am getting more quantity so, but again the ice cream itself for that, the palatability they test for that, there has to be some quantity of air minimum otherwise you will not enjoy.

There is a difference between ice cream and kulfi right. Kulfi is also made from the similar ice cream mix, but kulfi does not have overrun it is almost negligible around 4.10

percent overrun right. As minimum it is getting incorporated 4.10 percent. So, there it is majority is the solid; obviously, the taste of kulfi and the taste of ice cream are or palatability are not identical or same right.

So, it is not that if I want if I want to give my customers more quantity that may not be possible, because that will not be the ice cream that will be a solid mass which may not be. So, palatable so 66.6 percent which we have come for this 100 ml of ice cream with 60 ml of mix, ice cream mix right.

And this is not your ice cream mix means this is not only solid, but also the liquid. The mix is the entire thing solid liquid all put together before it goes to the freezer that is called the ice cream mix right.

So, this ice cream mix it is not I can give more or you can give more or you can give less. This is one example of getting the overrun very low. Another one I have not calculated I am doing it on the floor itself.

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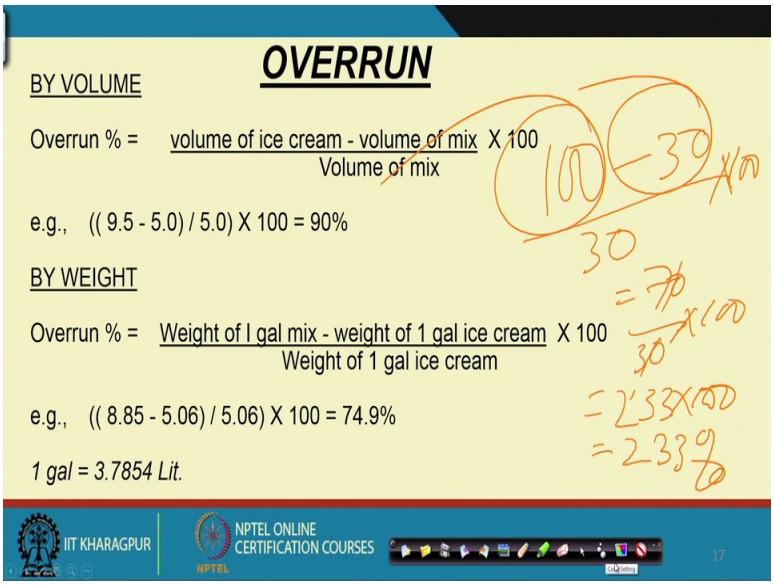

That another one again if we take 100 ml cup and out of which if 30 ml is the mix and if 30 ml is the mix volume then into 100 that becomes 70 by 30 into 100. So, that is equal to 2.33, right. So that means, it is into 100 it is almost 233 percent your overrun right.

So, in 100 ml ice cream you have given only 30 ml mix. And rest of the thing is your right so; that means, the consumer is getting only air or majority is air so he will be

deprived. So, you will buy for 10 rupees, 20 rupees whatever be the value 50 rupees I do not know; that depends on the variety etcetera. Whatever be the price out of which he is getting a very small quantity of the material as a mix. And large quantity of air so that is he is getting deprived.

So, you cannot and here of course, by that your profit is very high, because you are given here which has no value virtually, no value right. Only the air which goes into the ice cream preserve it is supposed to be clean. And aesthetically not only aesthetically microbiologically it should be should be cleaned. So, that he does not incorporate any infection to the system. Because after when you were mixing it is all getting cold you are not getting any chance of heating or cooling.

So, air has to be under very, very clean condition without any having any source of infection or any contamination with the microbial load that must be there right. So, this we have to keep in mind, and not only this we have to keep in mind that; the air which you are giving the air this air will go and mix with the ice cream mix and then make the ice cream.

And when you are consuming that time if that air is already contaminated. So, that will be already inside so you have consumed and there is a chance of you getting infected if, the air is containing some airborne organisms right.

So, that is why air it has though it is we are saying that air is free, but your cost involvement is only there; that when you are passing this air you must disinfect this air before it is going into your system right. This is a must this is a compulsory otherwise it will be infected.

However, it is making 233 percent in under this situation. So, that is not desirable you are fooling your customer consumer is getting deprived not possible right. So, there must be some process, there must be some mechanism by which neither consumer will be deprived nor the manufacturer also will run with the loss, because he is manufacturing for profit to gain his bread and butter. So, that will come from the profit and that will we given to the also the people who are working the workers etcetera.

So, a minimum profit has to be there because ice cream mix that will also cost it is not that entirely are like air everything is free.

So, air is also become costly because you have to disinfected. This in disinfection will also cost you a little; may not be very high, but a little disinfection cost has to be involved. So, there must be some provision, there must be some guideline by which neither you make it to 33 percent nor you make it 66 percent right.

So, if it is 233 percent then you are gaining a lot that is the manufacturer is getting a lot, but if it is 66 percent then manufacturing is manufacturer is giving much more. And you as a consumer is gaining very much. So, that is also a lost to the manufacturer.

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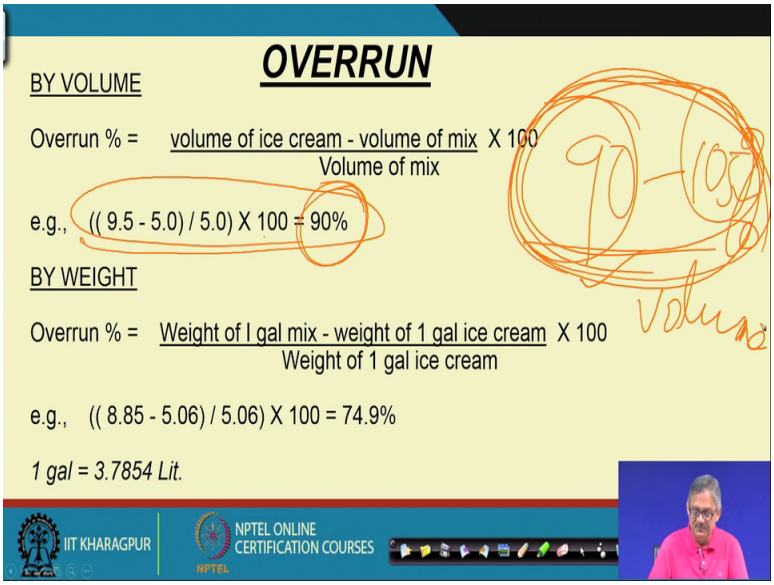

So neither he should be a lost to the manufacturer nor it should be depriving the consumer, such thing has to be given. And the controlling authority as kept this thing in mind and that is why made that any ice cream cannot have less than 90 percent overrun or more than 105 percent overrun. So, overrun should vary between 90 to 105 if it is less than 90 then that will be a loss to the to the manufacturer. If it is more than 105 that will be again depriving the consumer.

So, neither the consumer is deprived nor the nor the manufacturer is getting a getting a loss, for that there is this binding that the 105 to 90 within this the overrun has to be there right. 90 to 105 there has to be there so like that here we got it 90. So, this is the typical example that it is 90 9.5 minus 5 by 5 over 100 into 100 is 90 percent right.

So, it is likewise it can be up to 105 percent right so this is by volume.

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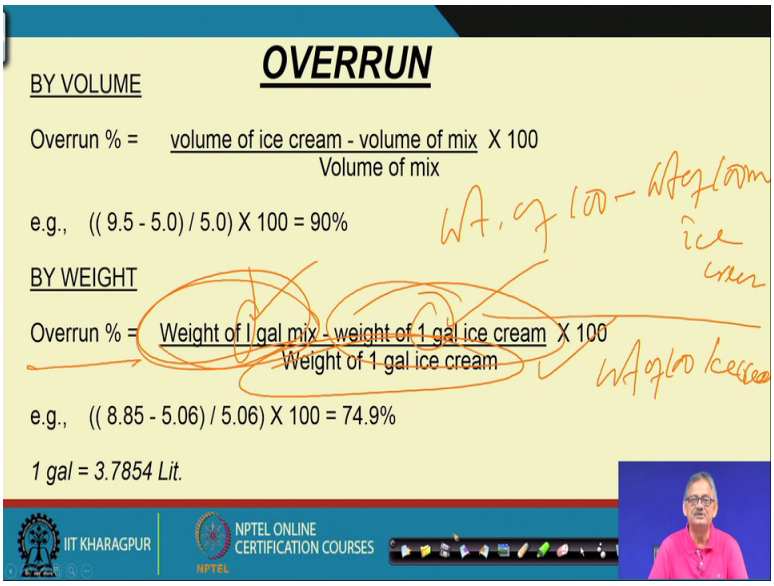

Similarly, if we look into by weight then we get by weight it is like this, percent overrun is weight of the mix in earlier we have said mix as high density. So, less low volume more weight so weight of the mix of 1 gallon minus weight of the ice cream of 1 gallon. This is gallon is a gallon is a volume.

So, you can make it that weight of ice cream mix of say 100 ml right, minus weight of 100 ml ice cream right or divided by weight of 100 ml ice cream because ice cream will have less weight than ice cream mix right.

So, 1 gallon or 100 ml that is a definite volume for a definite volume of the both mix and the ice cream. If your weight difference is known divided by the smallest way, that is the ice cream weighting this case times 100 that will give us the percent overrun in terms of weight.

Generally, commercially this percent overrun in terms of volume is very much popular because that you are making that ice cream not by weight. You are selling ice cream not by weight, you are going to the parlor or ideal ice cream shop where your ice cream is available your going and asking.

That give me a 50 ml cup or 100 ml cup or maybe 1 liter or maybe 4 liters gallon that you were telling all in terms of volume right. All you are telling in terms of volume, but not in terms of the weight. That is why the percent overrun by weight is less popular than

not only less normally, commercially in the in the in the soft floor; it is not there it is all by the percent overrun by the volume.

However, to have the idea we have given this that percent overrun by breath you say 8.85 is the weight of the 1 gallon of mix right, or one known volume of mix. Minus weight of the same volume of ice cream that is say 5.06 over the weight of the same value of ice cream that despite 0.06 times 100, this gives 24.9 percent overrun right. And generally 1 gallon is 3.7854 liter, but in our country in all ice cream industry they make 1 gallon.

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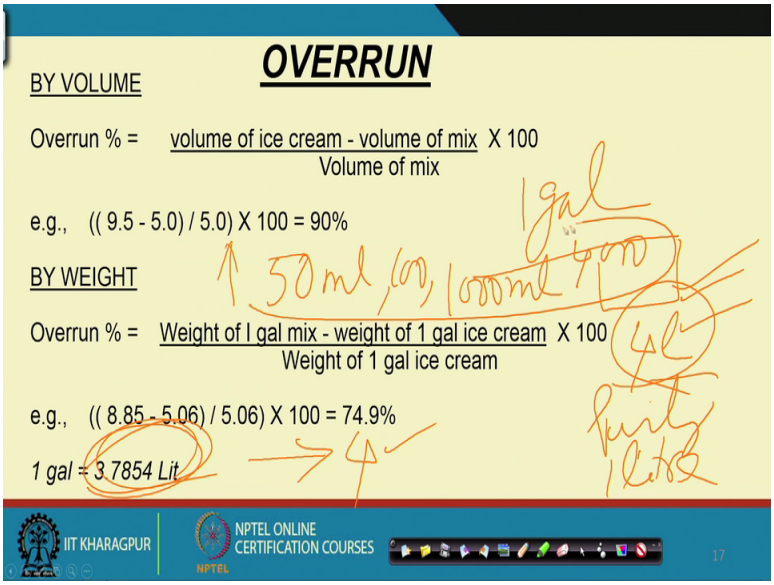

It is still it is said gallon container gallon ice cream, that is still being said, but the quantity put is 4 liter not 3.784 this is the 4 liter.

Accordingly, price is also or whatever would have been a with 3.784 that is converted into 4 liter correspondingly. And the price is held for that 4 liter right. So, when you call it to be gallon pack then it is a 4-liter pack. If it is a party pack then it is a one-liter pack.

So, generally they have these volumes your lollies, your lollies that is different than 50 ml, then 100 ml, then 1000 ml, then 4000 ml. These are the generally 4 types of volumes they are used right.

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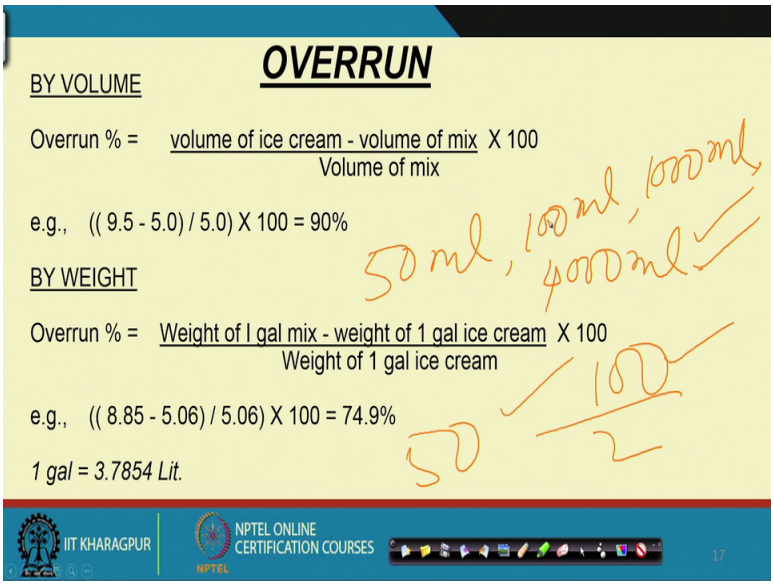

I repeat 50 ml, then 100 ml then sorry, 50 ml, then 100 ml, 50 ml then 100 ml and, then 1000 ml 1 liter the 1000 ml or 4000 ml.

These 4 volumes are normally with the ice cream industry right. So, you will not get in between 2 liters you will not get 5 liters like that. So, these 4 are the volume quantities you will get in the market 50 ml, 100 ml. 50 ml was not there maybe couple of decades back it was introduced in the ice cream industry because when the price was going up, then this thought that 100 ml may be too costly to buy.

So, let us make it half of that. So, 50 ml came in right and in the price became almost close to up and that is right, people could buy those who are not so rich they can buy.

So, that is why to make it more popular to distribute it amongst many people so 50 ml was also introduced right. And the ice cream lollies if they are having the fixed more or less volume more or less yes, if there is will be this side that side some more some less, depending on the how many numbers of years are there right.

So, you will see that there are on Choco bars and many others. They are one type multi layers another type that is again there are depending on the manufacturer whether it is made from Amul made from, Vadilal made from quality or made from any other. So, they will have a slight variation, but not much, but these cups and party packs are gallon volumes they are fixed or everywhere right and accordingly this is met ok.

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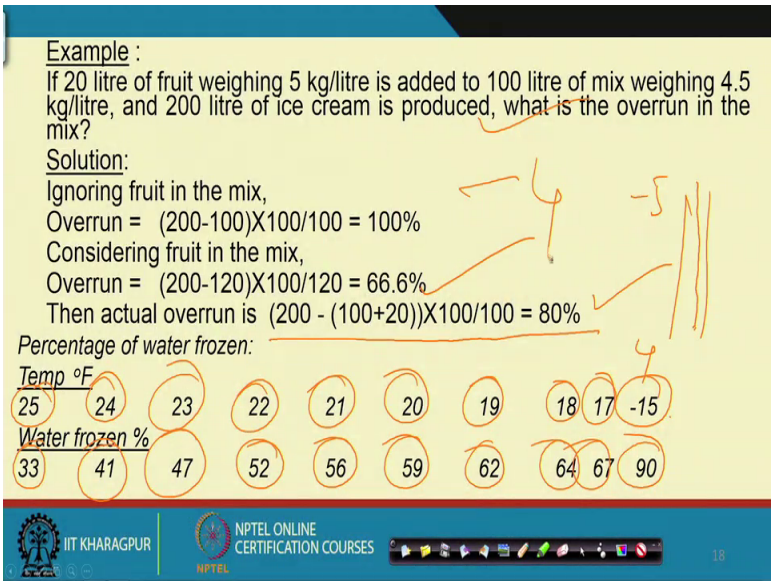

Then we have we have spent a lot in it, let us go into a quickly an example right. Say if 20 liter of fruit weighing 5 kg per liter is added to 100 liter of mix weighing 4.5 kg per liter, and 200 liter of ice cream is produced what is the overrun in the mix? So, we get sorry, we get the overrun to be around here we have seen that from this calculation 66.6 percent right.

Then actual overrun is 200 minus 100 plus 2 into 100 by 100 is 80 percent because this was by weight right.

Now, as I said earlier that when I it was I was saying about the vertical and both horizontal, when it is going another from 4 degree to minus 5 degree. So, you see I have given it in Fahrenheit because these are the whole numbers.

So, when 25 you just convert into centigrade 25 Fahrenheit 33 percent of the water is frozen, 24 Fahrenheit 41 percent of water is frozen, 23 Fahrenheit 47 percent, 22 52 percent, 21 56 percent, 20 59 percent, 19 62 percent, 18 64 percent, 17 67 percent minus 15 90 percent.

I hope you know that there is one temperature where both Fahrenheit any centigrade are same. And I hope you know that that is minus 40. So, minus 40 Fahrenheit and 40 centigrade are same; however, we are not going to that.

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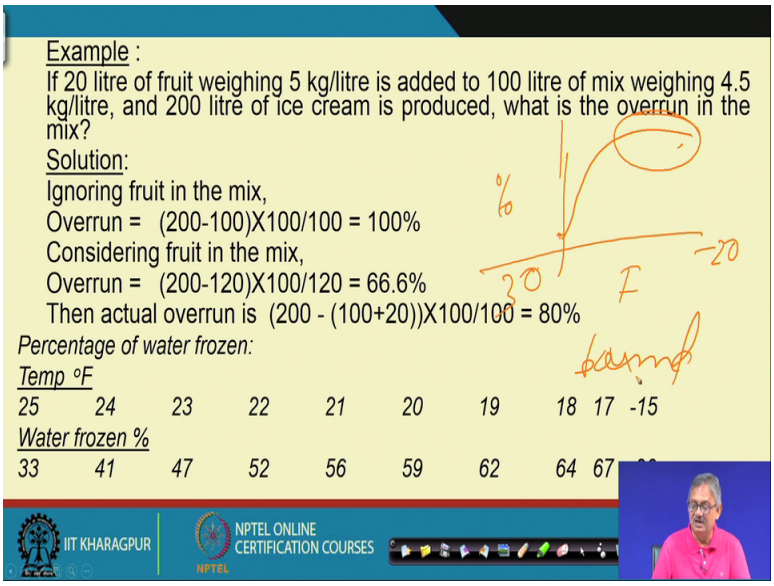

So, it shows that if you have a plot of say temperature versus percent to water frozen. Percent to water frozen is dependent on temperature right, so this is percent water frozen.

So, if we plot that so as if this is 25 24 so minus 15. So, if this is 0 and minus 15 is here right. So, if our plot is minus 20 to down below there then; obviously, you will have one asymptotic thing like this right.

So, one asymptotic can this sorry; so this is 0 or something and minus is this way right. No then that will be the so we have Fahrenheit here and we have percent here and we have minus 20 here, and we have plus say 0 or 20 you have 30 Fahrenheit here right if that be.

So, 30 Fahrenheit is 33 percent, 30 Fahrenheit is 33 percent and 95 minus 15. So, here is 90 percent so; that means, your thing is going like this asymptotic right. So, percent water frozen become and this is telling about the bound water right, this is telling about the bound water ok. I hope we have cross the time today, so let us stop today here.

Thank you.