Dairy and Food Process & Products Technology

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Lecture - 49
Types of Available Milk in the Market

So, we are continuing on the different milk available in the market, in this Dairy and Food Process and Products Technology is the 49 class and again continuation of the types of milk which are available in the market right. So, let us look into some more like evaporated milk right.

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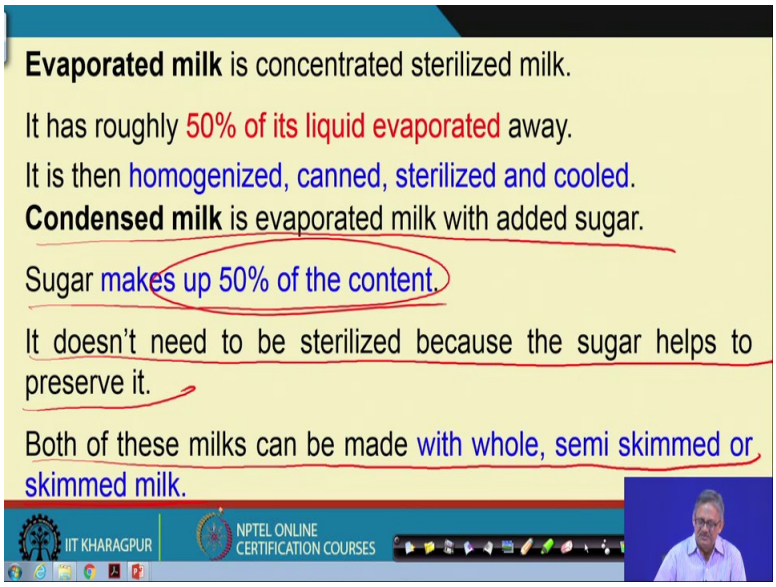

So, evaporated milk is concentrated sterilized milk, it has 50% liquid evaporated. It 50% of its liquid is evaporated and it is homogenized then canned, sterilized and cooled right. So, this we have said earlier also, that 50% of the of the water is evaporated right so, but that was sweet that was sweetened right.

Now non sweetened evaporated milk is also available and to the tune of 50% water is removed and that is called condensed milk and earlier we had said. but that was sweetened condensed, but in this case it could be also a non sweetened. But generally condensed milks are sweetened then the reason being that if sugar is added to that, then that serves both sweetening as well as the preservatives. So, for that reason sweetening is

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1required and preservative is not externally added, then like here it has come that 2condensed milk right.

3So, condensed milk is evaporated milk with added sugar, sugar makes up to 50% of the 4content and it does not need to be sterilized because the sugar helps to preserve it. Both 5of this milk can be made with whole semi skimmed or skimmed milk right do you 6remember earlier we had said for 2% that is the semi skimmed right or whole milk which 7we also said earlier 3.25% or even more 3.5% standard milk.

8So, depending on the locality depending on the controlling agency, this fat content varies 9widely all over the world right. But the basic thing that skimmed means you have 10removed the fat whole nothing as being removed partially skimmed; that means, whether 11you how much you have removed whether it is 2%, 1.5% like that depending on you that 12you call it to be semi skimmed right.

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15Then process technology for the manufacturing of the dried milk another very important 16one. Because dried milk you have seen from your childhood that you are apart from the 17adult people are taking liquid milk, you have seen people are also feeding young this 18dried milk. Red milk powder or baby milk baby food all these are made from the basic 19milk these are all milk products.

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So, dried milk is one of the very important milk product which is not only locality dependent, it is not locality dependent it is available all over the world because primarily this is as dried milk is associated with baby food or baby I mean milk dried milk right. So, meant for the meant for the young babies right.

In that case raw milk on arrival at the factory is tested rapidly for number one what is the temperature, this are primary factors because if the temperature goes up during bringing, then there maybe chances of milk getting spoil or some organisms may get developed. So, that is why the temperature measurement is one of the criteria. Then the hygiene. How good it was hygiene content that is because maybe the container is shrubby that it may it may induce some infection into the milk and that is not desirable right.

Then antibiotic level that is also required. Because in many cases nowadays this cow is injected with antibiotics so, that either the yield is more or the milk is stayed for a longer time. So, that is also not desirable. Then what are addition? Because in most of the cases this adulteration in major cases adulteration could be by adding water of course, by adding water means your fat content will go down right. So, these are when all the things are tested right and adulteration is also tested if there is any adulterant if that is also identified and revoked then only you have the whole milk available for making your dried milk.

Remember this dried milk vis a vis baby food is synonym, because I do not know how many of you have seen that of course, now it is given for making tea that dried milk powders are available. But hopefully it is not so much popular or so, much wide as the liquid milk right. But the dried milk in the form of baby food is not only popular it is essential because when after couple of months when the milk availability is going down that time this external milk helps the baby to sustain or to make the required growth right.

So, on acceptance of all these when the milk has come from outside, these temperature these quality in terms of antibiotics hygiene water content or your adulterants if all these check is over if the milk is found suitable, then you bring the milk when it is accepted and pump in into a silo. Because when you are we are talking dried milk, you need to dry huge quantity of milk otherwise it will not be economically viable. So, the before it goes to the drier. So, lot of milk you are keeping in one place right and that is in silo right big

containers they are called silo right. So, this milk pumped into the silo or that is called for storage tank right.

And at before the processing plant it goes to the processing plant, this can be held at 7°C or a minimum of 5°C. 5 degree the lower the temperature better it is we have said earlier also. So, 5 degree is better than 7 degree. So, if possible 4-5°C, this silo temperature is maintained because you do not know when this milk will be going for the processing. Like so many big silos are there, which are getting filled by the incoming milk and this milk go for getting dried right.

So, that drying process before it takes place you are storing the milk which is accepted right that milk which has been accepted by the quality control people and then this milk is kept at low temperature for 4-5°C, till it is going for the processing right.

Then milk is standardized, because it is not that one batch earlier also we said one batch we will have one fat content, another batch we will have another fat content or solid not fat content, that is not desirable. So, you have to standardize and this standardization is based on what you want whether you want skimmed milk powder or whole milk powder depending on that you have standardized your milk right. So, this contains now you know so, much fat so, much solid not fat. So, this fat to solid not fat ratio, that you have already decided and accordingly you have standardized right.

Then the microbial quality of the milk because that way you can do with the with the with the microbial analysis that; what is the microbial load or the milk powder right the microbial quality of the milk powder is very important and it is possible at this early stage of processing to take out 99.9 percent of the microbial load. That is possible not by heating right if you want because heating is a very costly process, heating is a costly process.

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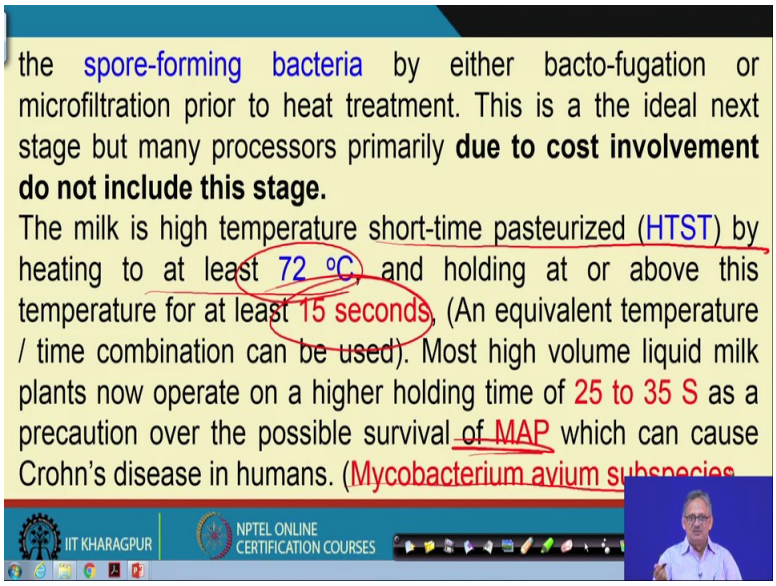

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3So, by now this 99.9 percent spore formers or bacteria that can be taken off either by 4bacto fugation or maybe by microfiltration prior to the heat treatment and this 5microfiltration is done by the molecular sieve or by the filtration right by microfiltration. 6So, that is done with the help of the smaller membrane having small holes and through 7that the microbes can be filtered right. So, this microfiltration can be done and can be 8removed can removed rather most of the majority of the spore forming organism.

9Then the dryer will not have that much load in terms of microbial content right. So, this 10is one of the vital step, but because of the price constraint many of the processors do not 11follow such kind of thing right. So, they directly put into the dryer. So, that let it be 12whatever is there, but it is not it should not be it is better if you can remove the major 13microbial load or spore former even by the microfiltration then that helps your next step 14that is drying step much more smoother much more easier right.

15This milk is the milk is high temperature short time pasteurized right milk is pasteurized 16at high temperature short time, HTST by 72°C at holding 15 seconds right holding time 17is 15 seconds, 72°C that is HTST. But in many cases nowadays the people do keep it for 18more than 15 seconds around 20, 25, 30 seconds or even 35 seconds the holding time 19they make it. Because nowadays many heat resistant spore formers are also coming one 20such is called MAP and that is *Mycobacterium avium subspecies* of tuberculum right.

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1So, tuberculosis is formed and that organism is very very heat sensitive heat resistant and 2that is why this pasteurization is done at 72°C, but for more than 15 seconds maybe 25-335 seconds whatever combination you have right that is done.

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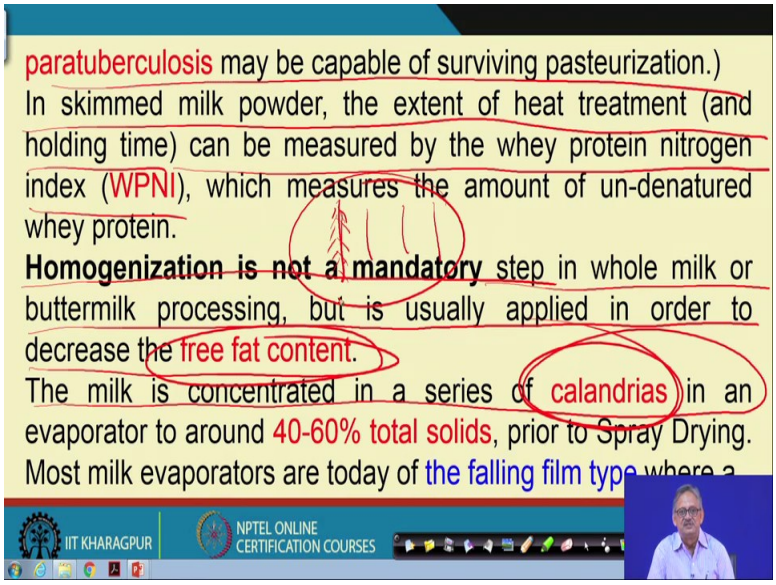

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6Then that microbacterium paratuberculosis that is there and maybe capable of surviving 7the pasteurization temperature or process.

8In skimmed milk powder the extent of heat treatment and holding time that can be 9measured by the whey protein nitrogen index. Now another term we are coming across is 10called whey protein nitrogen index or WPNI right. This whey protein nitrogen index is 11associated with the skim milk powder right. How much you have heated that time 12temperature combination that can be predicted by the WPNI number Whey Protein 13Nitrogen Index.

14This is a number right which measures the amount of un denatured whey protein. 15Because if you have undenatured whey protein more that means, your heat treatment was 16less and if you have undenatured whey protein less that means, heat treatment was very 17high. So, this WPNI is a measure of that un denatured whey protein and this is very very 18useful parameter for judging that how the quality of the dried product is right.

19Homogenization is not mandatory in this case because whole milk or butter milk 20processing, but is usually applied in order to decrease the free fat content. In this case

when you are making it then homogenization may not be required the reason being that you are making it dried right. So, homogenization why we make? Because the fat comes out from the milk but when is dried water is not there. So, that is not getting separated. So, that is why it is not essential. but in many cases it is done, because this remove the chance of the free fat content that chance is reduced.

The milk is concentrated in a series of calandrias. Now calandrias in earlier perhaps I also referred earlier that, there are many vertical tubes like this in the calandria maybe in a drum right in a drum like that there are many vertical tubes through which in one surface this liquid drops like this, and in another surface the steam is passed at high temperature right this is called evaporator calandria and this type of evaporator is available for concentrating right.

So, in this you are concentrating up to 40 to 60% of the solids right up to 40 to 60% solid content you are concentrating prior to the spray drying, because this is reducing the load on the spray drier right. Most milk evaporators are today of the following film type right this is called this calandrias, most of the evaporators are like that that film forms on this and for and heating is done on the other side by the by the steam right. So, most of the evaporators are nowadays falling film type, where fine film or milk concentrate is passed down the tubes wetting the surface whilst steam is on the other side of the tube and the vapours extracted from the centre by vacuum right.

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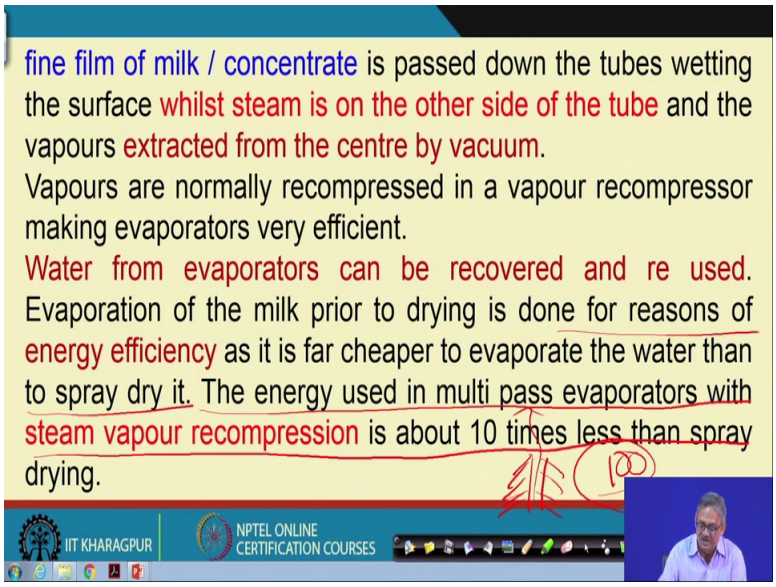

Vapours are normally recompressed in a vapour recompressor, making evaporators very efficient. Now you imagine that we said that you have this kind of calandrias say this is the tube and in this you have in one side milk film and in the other side your steam. So, vapour is coming out and this vapour is what had very high temperature, maybe depending on the pressure, maybe closer to 100 degree right.

So, if you can utilize these vapour, then your pressure on evaporator goes down. So, this vapour is reutilized and that is why it is called re compressor right. So, this is why the vapour recompressor that makes the evaporator very much efficient.

So, water from the evaporators can be recovered and reused evaporation of the milk prior to drying is done for reasons of energy efficiency, as it is far cheaper to evaporate the water when the spray with respect to the spray dry right you compare to spray drying that evaporation is much cheaper. The energy used in multi pass evaporators with steam vapour recompression is about 10 times less than the spray drying right.

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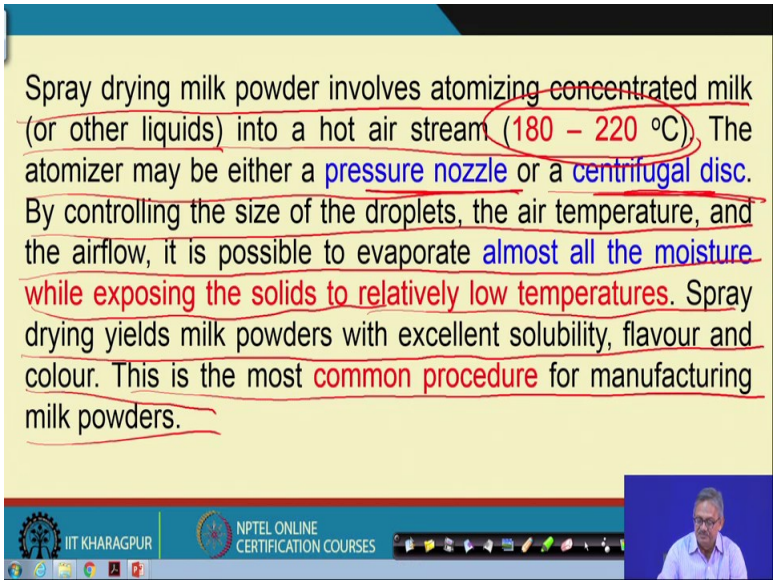

So, spray drying is highly costly see if that with vapour recompression system if you can concentrate first, and then if you can send it for the drying, then your drying efficiency goes up and the spray drying can be much better, so right.

So, this is to be done, but again as I said in majority of the cases, this type of typical good processes are not being followed the reason was known to them, but it is advisable

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1that it should be. Spray drying of milk spray drying of milk powder involves atomizing 2concentrated milk or other liquids into a hot air stream of around 180 to 220°C. This 3atomizer may be either a pressure nozzle or maybe a centrifugal disc either of this either 4a small pressure nozzle through which it moves, maybe a centrifugal disc right. By 5controlling the size of the droplets the air temperature and the airflow, it is possible to 6you operate almost all the moisture right while exposing the solids to relatively low 7temperatures, spray drying yields milk powders with excellent solubility flavour colour 8etcetera this is the most common procedure for manufacturing milk powders right.

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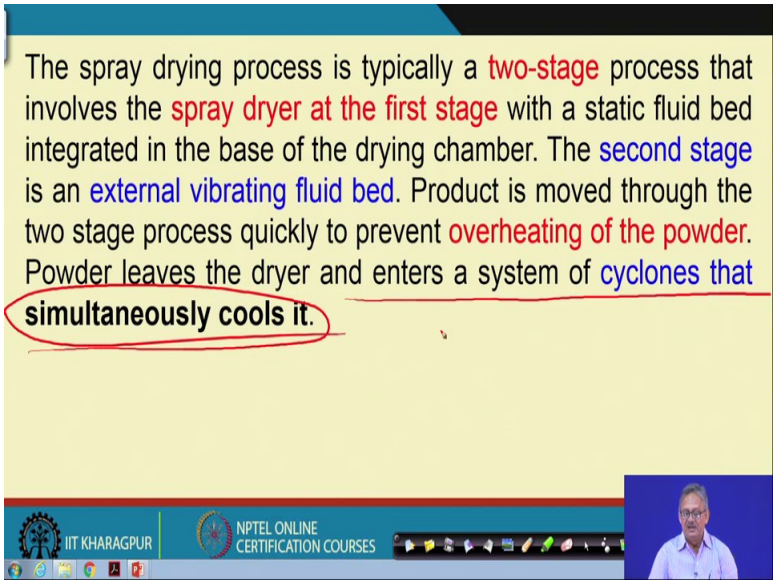

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11Then the spray drying process is typically this spray drying process is typically a 2 stage 12process that involves number 1 the spray dryer at the first stage with a static fluid bed 13integrated in the base of the drying chamber and the second stage is, an external 14vibrating fluid bed right. This product here product is removed through the 2 stage 15process quickly to prevent overheating of the powder. Overheating if it is done that again 16the WPNI that may go up that is why protein nitrogen index or the product may become 17some colour may develop which is not desirable right. Then it enters a system called it 18enters a system called cyclone that simultaneously cools the powder also right.

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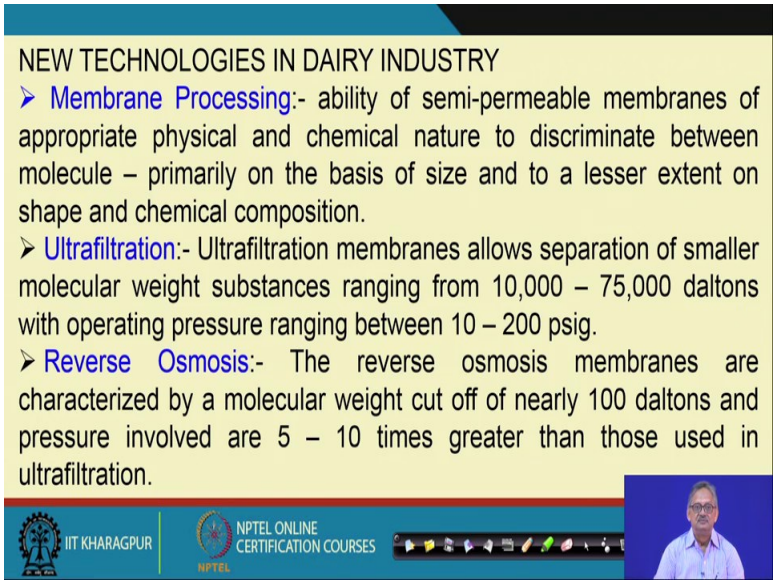

Then some new technologies in dairy industry which are nowadays used ok. But hopefully today in this class we may not be able to continue for a long because our time is also now getting limited, but even then let me let me let be summarize in that that in the sprint right now, in this case you will see that the dried milk in many cases this dried milk the rehydration may not be that good right.

You take some powder put it into water and you will see that it forms lumps. The moment a lamp is formed; that means, the outside of that is with water, but it is not able to penetrate right. So, if the lamp is formed then it will not be that good. So, that is why that spray dried is not made to a very very fine, in some in many times it is being formed as the globules so, that the rehydration becomes very easy.

Because your ultimate purpose is there not the dried milk is to be consumed, whether it is in the form of making tea, whether it is in the form of taking milk or making rehydrating it to milk right or reconstitution, this is called reconstituted milk or any such or may be food whatever it be, in that case the rehydration that is that milk which you are producing that should be very easily done and it is 1 to 1 means if you take 1 kg of powder then corresponding 8 to 10 kgs of liquid milk you should get that is the idea right.

But in many cases if the powder is getting lump, then your product is not getting sold. So, people are taken this into consideration and many cases the small globules very small of course, minute globular forms are made whose this rehydration capacity or capability

is very high. And they do rehydrate and make almost all the milk converted into liquid milk and that is used as the either baby food or any other right.

So, in that case of course, baby food you it is not only the dried milk. but also some other characteristics are also associated. I am not discussing in particular baby food because that becomes very much specific in the there also it contains some fat content, then fat to protein or fat to this nonfat dried that is SNF that has to be solid not fat, that has to be fat to SNF ratio, that for the for the for the baby food is definite and not only that some additional sweetening agent is also given so, that the this becomes accept acceptable to the baby right. However, in all the cases that rehydration of the powders is a backbone or primary because that is to be sold to the market right.

So, with this of different types of milk and milk products, we will finish this class and next we will go to not only in dairy, but also in process industry nowadays many types or many instruments are being used we will discuss some of them.

Thank you.