Dairy and Food Process & Products Technology
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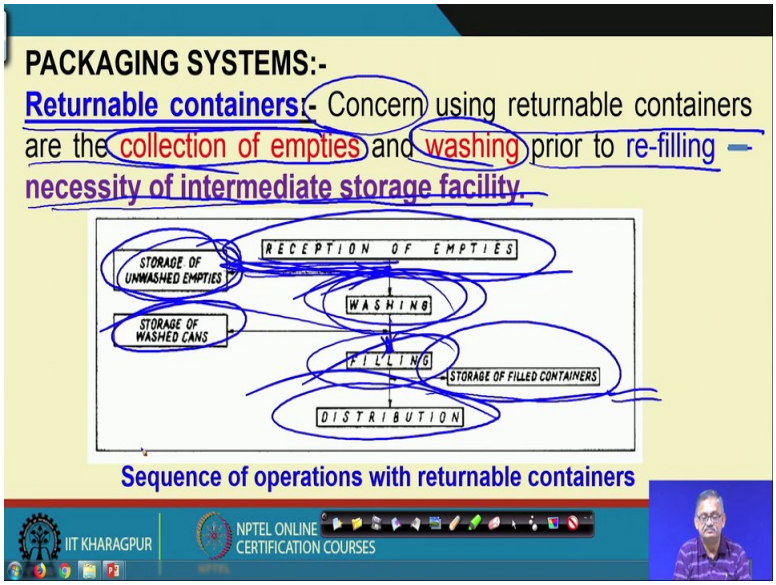
Lecture - 40
Packaging

So, after processing the liquid food it is required to be packaged. There we have seen in the last step that liquid food liquid rather liquid milk is processed and then it is packaged, right. So, in this dairy and food process and product technology in our fortieth class let us do the packaging of the processed milk, right.



So, if we do that packaging of the processed milk let us look into first that packaging system now depending on whether you are packaging system. Obviously, can be of many types depending on what is your product right depending on what is your product that will dictate what type of packaging will be suitable for you, right. So, one of the most convenient thing was in earlier days.

Nowadays, it is again it again not so much in the market, but again gradually it will come up because of the bad use or misuse of the plastic materials and how it is spoiling the other art. So that someday it will become mandatory to come back to these earlier process or old process, right where the packaging units were with the help of returnable packaging material right, returnable or re-usable packaging material.

So, this re-usable packaging material primarily was or is rather is the glass containers, right. So, in I don't know how many of you at your age how many of you have seen glass containers where milk is being supplied, but yes in our early days when we were at your age we have seen lot of such milk used to come. And it was mandatory that without spoiling the glass container you have to return if you are damaging the glass container then you are supposed to pay some fine or the price of the bottle or things like that. So, that there is a mandatory deposition of the price of the money so that if there is any damage that can be taken care of, right.

But, nowadays many others things have come up for which the use of this kind of glass material glass material yes handing is very difficult because all the time you have to take care whether there is number one if gets broken then all the milk is coming down right to the container where through which you were taking or the place where you were the thing has happen or the glass that has to be thrown out. So, all this is the hassel, this is hazard definitely. But, this hazard was counteracted by many subsequent development, but again the cycle is like that again it will summed or the date will comeback because of the use of the plastics in many ways and that is not desirable, right.

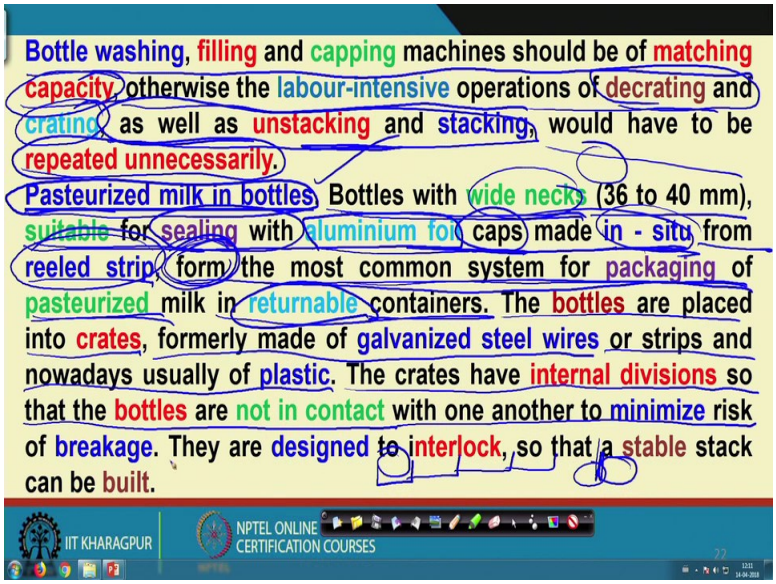
However, since we have taken it to be the packaging right. So, let us take it to the way that first returnable containers right first it is returnable container, right it is concerned and the concerning factor is using returnable containers are that collection of the empty containers washing of the empty containers prior to filling and it which necessitates the intermediate storage facility because it is not that 1 to 10 hundreds number of bottles you are handling, it is several thousands to lakhs number of bottles you are handling.

So, before it is being filled they are to be kept somewhere. So, you need that place and after filling you need somewhere where it has to be kept, right and that too it is not possible that you fill it up now and then you send it to the supplier or send it to the consumer not may not be possible. So, some intermediate space where they are to be kept the field one on field one and also and then they this require lot of space lot of lot of design for the packaging system, right.

So, one such let us handle it here that the reception of the empty bottles you have meant. So, after that it goes to the washing and maybe directly it is or maybe if washing is already filled up you have to store it the unwashed empty bottles, right and these

unwashed empty bottles it is to and fro, that is, if it is not going directly to the washing it may go to the this storage place and when where it is required or possible it will comeback for washing.

So, after washing again it may directly go for filling if it is possible otherwise it will go to the again some storage space where you were that worst cans serve worst bottles or worst container is being stored. Then after filling it may go to the storage of fluid containers the storage of rather fluid containers that could be another space for storage or it can go to the distribution, right. So, this is one way how we can use the returnable containers now it will look into the design of this how the containers are ok before that some more items we let us discuss.



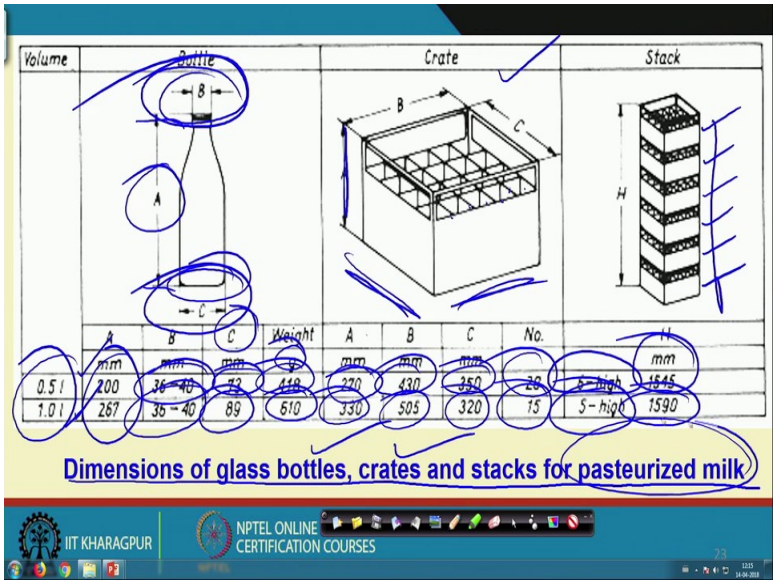
That the bottle washing, filling, capping machines should be of matching capacity because all of them your bottle washing if it is 10000 liters if your filling is 20000 liters and if your capping is 5000 liters then your what is a rate determining's number 5000 because capping maximum you can do. So, that is not desirable. What is desirable? That all these processes that is bottling filling or washing or caping all of them are having the same rate, right.

So, capacity is same that you have to first ensure otherwise it has to be highly labour-intensive and the operation will require decrating or crating means you can you have to fill it in crates or take out from the crates that is also highly labour-intensive and it may take unstacking and stacking requirement also would have to be re repeated

unnecessarily, right. So, these are to be avoided if the capacities are not matching then this additional hazard additional your inputs additional expenses may be required for handling this mismatch by the by the laborer. So, that is not desirable.

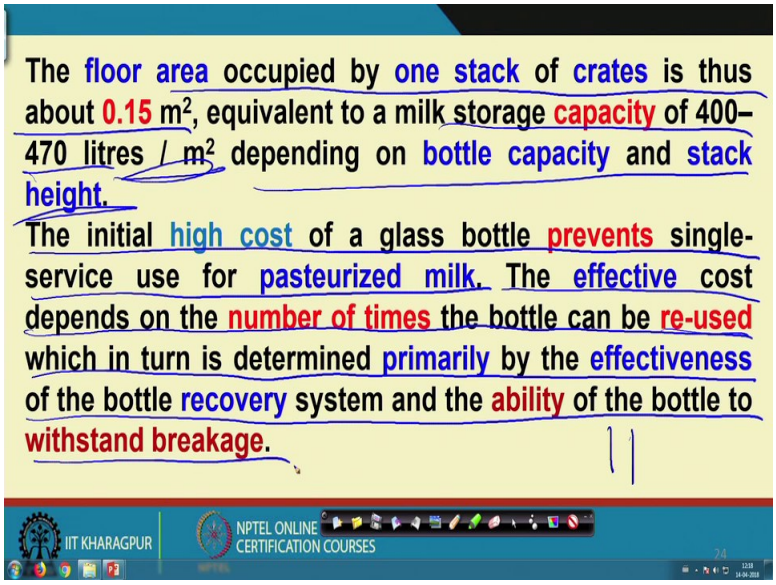
Now, pasteurized milk bottles if we take them then bottles with wide necks; so first reusable one or returnable one is pasteurized milk bottles were bottles with wide neck is around 36 to 40 millimeter in diameter. So, that is used suitable for ceiling with aluminum foil that is also is required foil caps made in-situ this caps are also done in-situ from reeled to strip by aluminium foils from the most common system for packaging of and this formed a most common system for packaging of pasteurized milk, right. So, bottles with wide necks of 36 to 40 millimeter this is suitable for sealing with aluminium caps made in-situ and the this is formed from the reeled strip that is continuous strip is there in real form and all these form the most common system for packaging of pasteurized milk and in this is called returnable containers, right.

The bottles are placed into crates formally made of galvanized steel wires or strips and nowadays usually of plastic. The crates have internal divisions. So, that the bottles are not in contact with one another to minimize risk because if this kind of crates are not there then the bottle which you will keep if they are side by side without any difference then there maybe this bottles will come across and they may they may be damaged because of the presence of the proximity, right. So, they are designed to interlock this crates are made in such a way that minimum risk is there for breakage and this crates are design in such a way that interlocking facility interlocking can be done, so that a stable stack can be built, right. If it is one crate so, next crate may come over it and for another and then like that it is interlocking, right. So, that it just fix on the one over the other, right.



Then we come to this the dimensions of dimensions of glass bottle crates and stacks are pasteurized milk. How? See this is the bottle which is having this is one A is this height, B is this diameter and C is this diameter, right. So, the height could be depending on half liter or 1 liter capacity 200 to 67 or this neck could be 36 to 40 or 36 to 40 both for both half or 1 liter and C that is this is for half liter 73 for 1 liter 89 in diameter in milliliter where weight in gram is 418 for half liter and 610 for 1 liter, right and then these are the crates right, where you are putting your bottles in like this, right.

And, these bottles are crates are here A that is the height and C is this and B is this dimension so, A is 270 that is height for half liter or 330 for 1 liter, B is other two sides is 430 and 350 or 505 and 320 and you can accumulate around 20 numbers for half liter or 15 numbers in 1 liter. Then, you get the stack which could be either 6 side that means, you can put 6 1, 2, 3, 4, 5, 6, 6 such crates 6 side which has a 1545 millimeter height or 5-high which has 1590 millimeter high that is for 1 liter and this is for half liters, right. This is a dimensional distribution for bottles crates in the stacks for pasteurized milk, right.



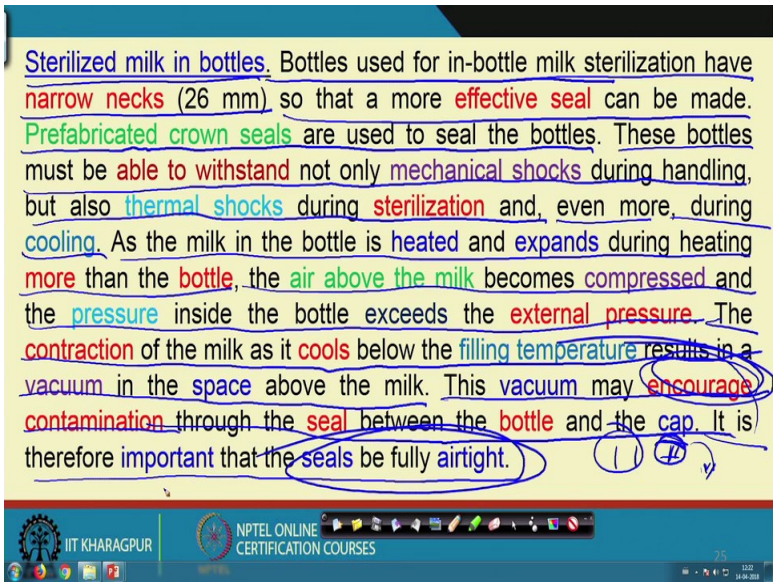
So, after this let us look into that the floor area which is required that we have seen from the previous one the floor area which is seen is that here right floor area from B and C right from B and C this is the stack floor area, right from B and C we sorry we see that that you if you multiply this with this it will come somewhere 0.15 right if you multiply this with that in the area required you will come somewhere that 0.15, right. So, floor area occupied floor area occupied by one stack of crate is around 0.15 and equivalent to a milk storage capacity of around 400 to 470 liters per meter square depending on bottle capacity and the stack height, that is, whether it is 5 high or 6 high depending on that also.

The initial cost of a glass bottle prevents single service use for pasteurized milk because glass bottle containers you have to pay for the glass bottles, right. So, lot of investment. So, if you have hundred thousand liters of milk to be supplied so, lot of bottles you have to initially buy. So, that is highly cost requirement. So, that is a bottle neck for pasteurized milk to serve. The effective cost dependent on the number of times the bottle can be re-used.

Obviously, if you buy today for first time and if you can remove it for 20 times or 10 times how many times you can re use some may get broken by the first supply, some may get broken. So, that part may be 5-10 percent is there to be replenished, but in general on an average if your number of returnable cycles could be 10, 20, 30, 50 depending on how the more you can reuse the more is your profit or less is your chance risk factor, right. So, that you be you give you back or pay you back that investment

which you have made initially. So, initially high quantity high cost is required for buying the both your bottles and the crates, right.

So, these if it is re-used that will dictate whether it will be primarily by the effectiveness of the bottle recovery system and ability of the bottle to withstand breakage. So, all these whether it is re-usable, returnable, returned or reused or if it is how much resistant to break breakage rather. So, depending on all these the performance will also depend on that, right.



Then, let us go into the other sterilized milk in bottles, right. Sterilized milk in bottles so, where milk is in bottles and it is sterilized, right. So, bottles used in use for in bottle milk sterilization have narrow necks around 26 millimeter. Earlier it was a bigger neck, right. So, now, it will be much narrow sorry much narrow such that you were this coverage can be easily made. So, that no pilferage if there is there that is not desirable, right. So, now, so, that a more effective seal can be made and prefabricated crown seals are used to seal the bottles these bottles these bottles must be able to withstand not only mechanical shocks during handling, but also thermal shocks during sterilization, right.

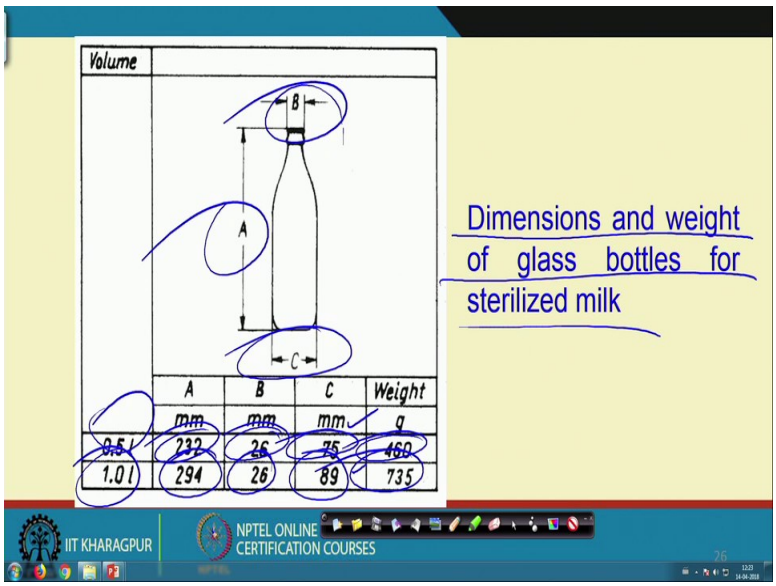
You have taken a bottle. So, it should have good mechanical strength as well as the stability towards a thermal treatment because you are doing in bottle sterilization that means, in the bottle you are putting milk first and then you are sterilizing and you know for sterilization the time and temperature this combination is very high and for that if the

bottles are not either mechanically stable or heat stable then you are loss is again there your problem again started, that's why it is required.

Even more during cooling also that after heating while cooling if there is crack you are done for. So, during cooling both heating and cooling it should be stable, thermally stable. As the milk in the bottle is heated and expands during heating more than the bottle the air above the milk becomes compressed and the pressure inside the bottle exceeds the external pressure the contraction of the milk as it cools below the filling temperature results in a vacuum in the space above the milk. This vacuum may encourage contamination rather may encourage contamination through the seal between the bottle and the cap.

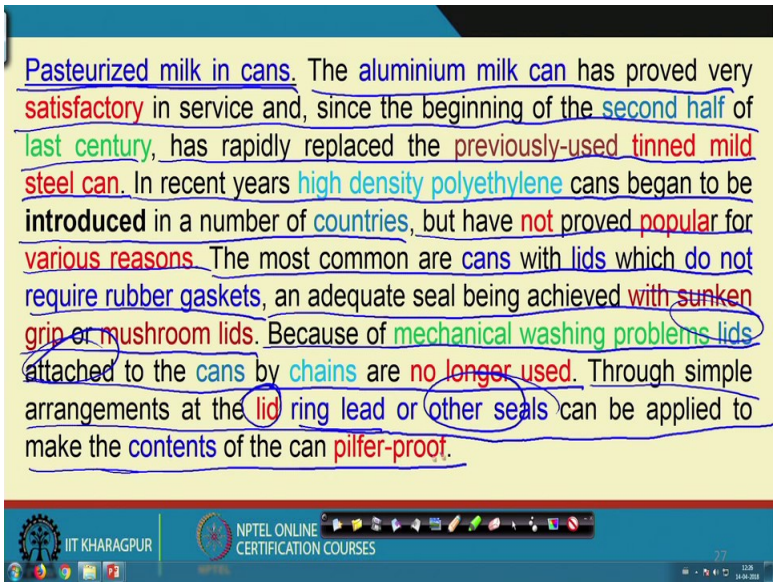
So, that is the danger, that you have already created some vacuum inside your bottle. So, from outside it is always there is a possibility that there will be some invention because your inside pressure is low outside pressure is more. So, there will be always a natural tendency from outside to inside invasion and the moment some pressure here is going in so that will automatically bring some organisms to the bottle, but that is not desirable, right. So, it is always there for important that the seals be fully airtight, right.

So, unless your seal is airtight you cannot do such kind of things.



So, this is a bottle like that dimensions and weight of the glass bottles for sterilized milk that is in bottle sterilization. So, for half and 1 liter bottles so, we have this cap size and we have or neck size this is the height this is the diameter. So, 75 diameter, 26 your cap

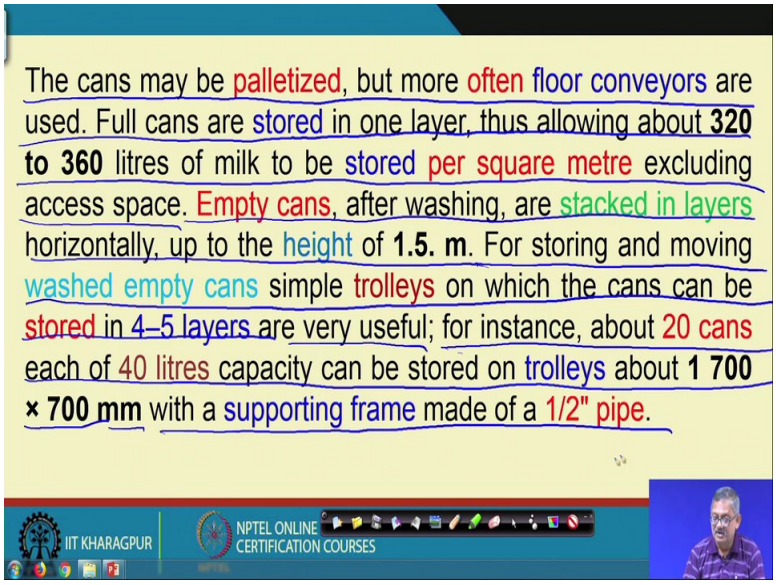
and 232 say in millimeter your height. So, this is for 1 liter 294 millimeter whereas, your B and C are 26, 75 and 26, 89 depending on whether it is half a liter and 1 liter and weight is around 460 to 735, may not be double, but somewhere close to that right.



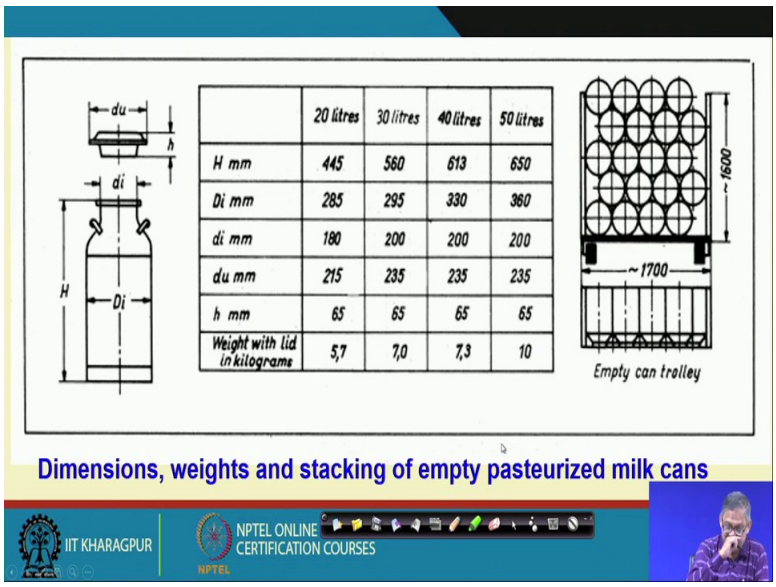
So, if this is there in bottle then we can say the other things are pasteurized milk where the aluminum milk can and aluminum milk can has proved very satisfactory in service and since the beginning of the second half of the last century this has rapidly replaced the previously used tinned mild steel can though in our country even now if you go to dairies you will see those kind of mild steel and tinned containers are still being used, right though it is not advisable. In recent years high density polyethylene cans began to be introduced in a number of countries, but have not proved popular for varies reason may be price may be breakable breakages etcetera.

The most common are cans with lids with which do not require rubber gaskets and adequate seal being achieved with sunken grip or mushroom lids. Because of mechanical washing problems lids attached to the cans by chains are no longer used. So, lids which are attached to the cans they are so that the lost is minimized. So, that is also not desirable because during washing or handling it is very difficult.

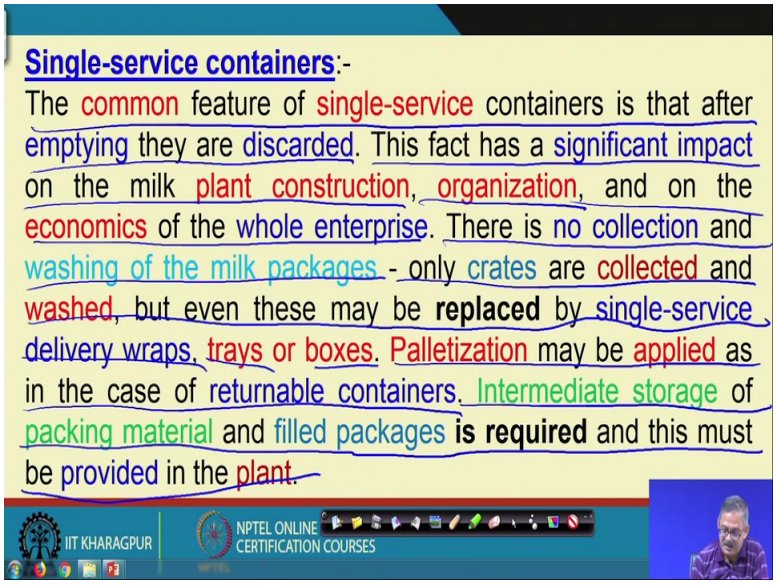
Through simple arrangement at the lid ring lead or other seals can be applied to. So, through simple arrangements at the lead ring lead or other seals can be applied to make the contents of the cap or can pilfer proof, right.



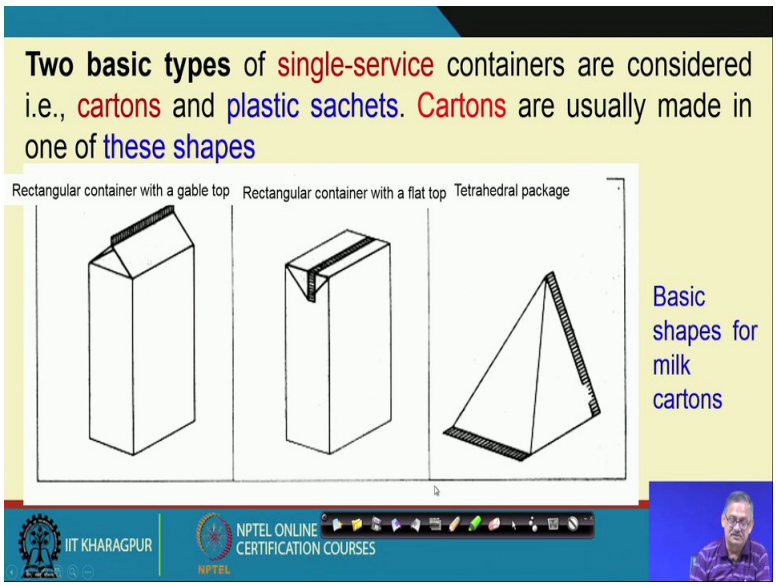
Then, we come to last that is ok, this is let us make it very quickly the cans may be palletized, but more often floor conveyors are used full cans stored in one layer thus allowing about 320 to 360 litres of milk to be stored per square metre ex excluding access space. Empty cans after washing are stacked in layers horizontally up to the height of 1.5 meter for storing and moving washing and washed empty cans simple trolleys on which the cans can be stored in 4 to 5 layers are very useful for instance about 20 cans each of 40 liters capacity can be stored on trolleys about 1700 by 700 millimeter inside with a supporting frame made of a half inch pipe, right.



So, now this is how it looks like these cans, right.

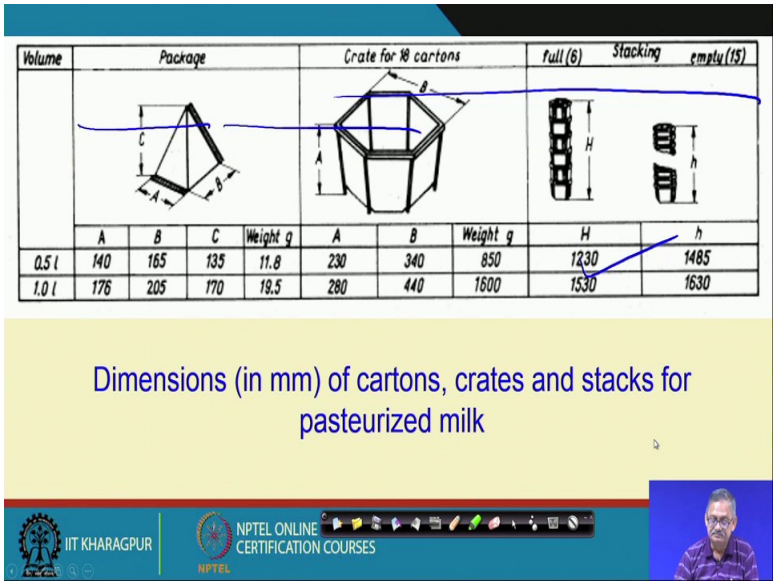


Now, if you look the last one that is single service containers and these single service containers the common features of the single service containers is that after emptying they are discarded this fact has a significant impact on the milk plant construction organization and on the economics of the whole enterprise. There is no collection and washing of the milk package only crates are collected and washed, but even they may be replaced by single service delivery wraps, trays or boxes. Palletization may be applied as in the case of returnable containers intermediate storage of packaging material and filled packages is required and this must be provided in plant, right.

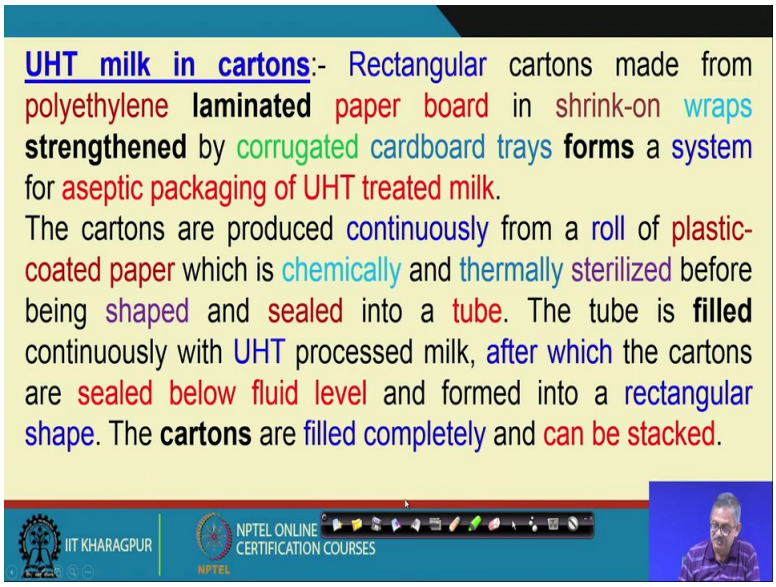


So, if you look at further that single single-service container this looks like that. So, they may have one where gable top is there where the flat top and another tetrahedral packs

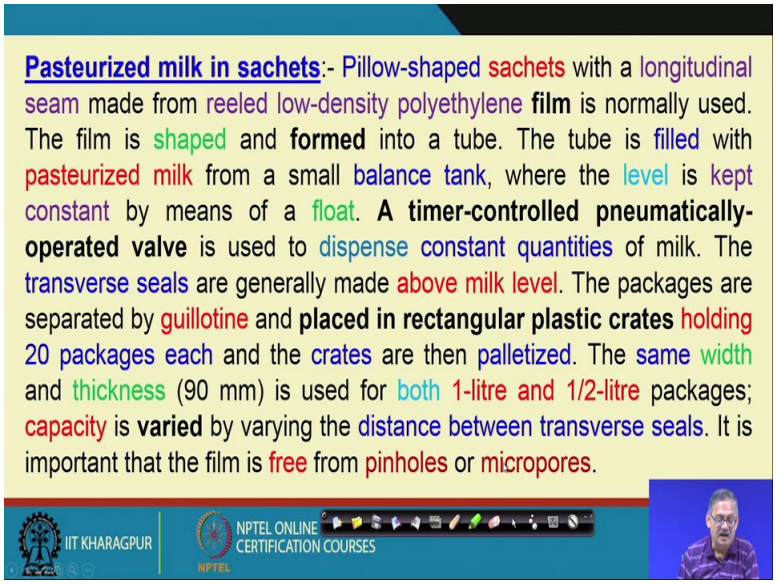
right. So, there are the two basic type single service containers are there one is cartons and other is plastic sachets, cartons look like this.



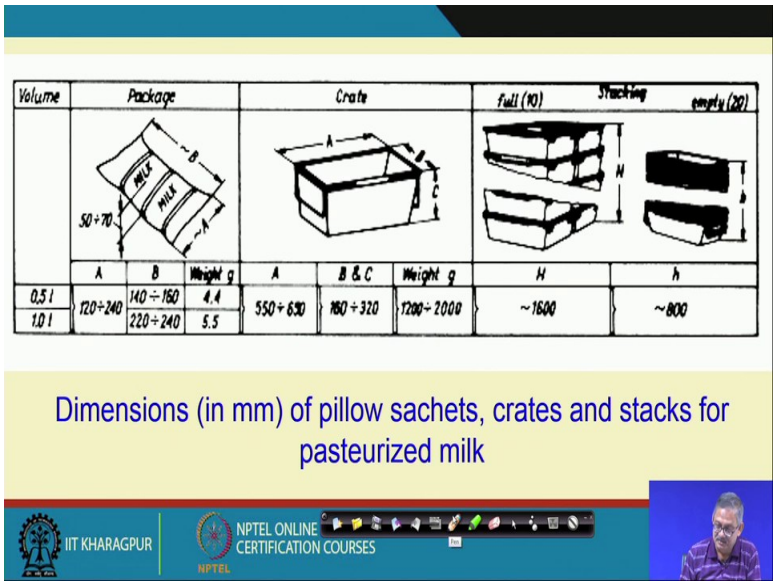
And, let us look into the plastic sachets that look like these dimensions of the cartons crates cartons how they are being how they are being kept. So, this is like that, right; how the dimensions in millimeter of cartons crates and stacks for pasteurized milk like that it is being kept.



And, the other one is the sachet and the UHT cartons, ok, it could be like this.



And, and pasteurized milk in sachet.



That is a pillow shaped that is a pillow shaped one which is a like this pillow shaped one and like this they are put in the crates. So, these are the dimensions right and they look like this and they are kept in the in the in the crates like this. They can be returnable they not required to be returned so, they are through use and through type and this use and through type once are nowadays very popular because you don't have to consider the storage and other things.

So, this is what out time is up. So, up to packaging we have finished after the liquid milk processing we have packaged and then allowed it to dispatch.

Thank you.