Glass Processing Overview
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Lecture - 34
Glass Processing Overview

Hello, warm welcome to Glass Academy. Today I am going to present about Overview of Glass Processing and Sustainability on Glass Processing.

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This is my agenda. So, what is glass processing type of glass processing, benefits of glass processing and sustainability on processing.

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So, let us begin. So, first we are going to discuss about the type of glass processing in a processing plant. So, it is start with glass storage, pre-processing, tempering, heat strengthening, heat soak, laminated glass, ceramic glass, digital printing, basically printing, technology acid etching and sand frosting. So, these are the common typical types of glass processing happening over the world and as well as India.

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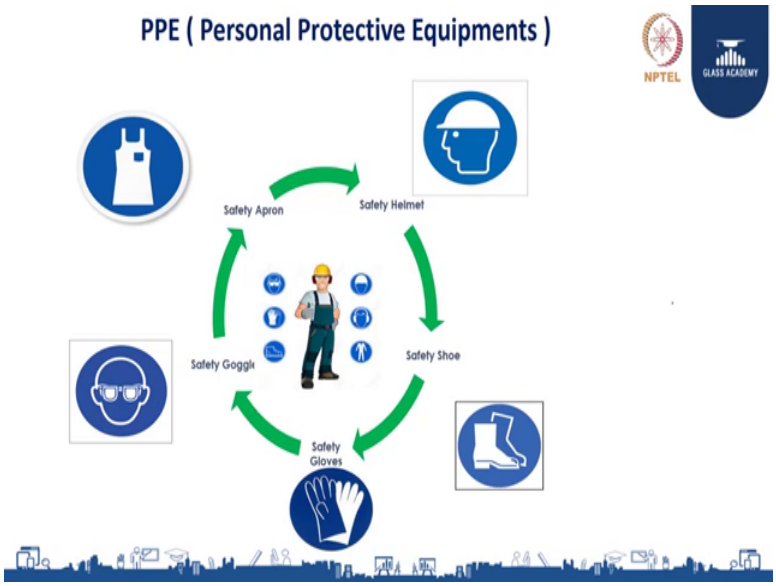

So, PPE is most important tool for glass processing industry. So, let us begin with the PPE. So, it is a Personal Protective Equipments which we all know about it. So, safety helmet, safety shoe, safety gloves, safety goggle, safety apron is most essential in terms of using the glass handling and wherever you are in the floor. So, we will have be very

careful in terms of know usage of PPE. Otherwise, because you are dealing with the glass so, anytime know assorts may happen. So, we will have to protect ourselves. So, first of all the people has to be wear personal protective equipments you know start from process to dispatch of the glass.

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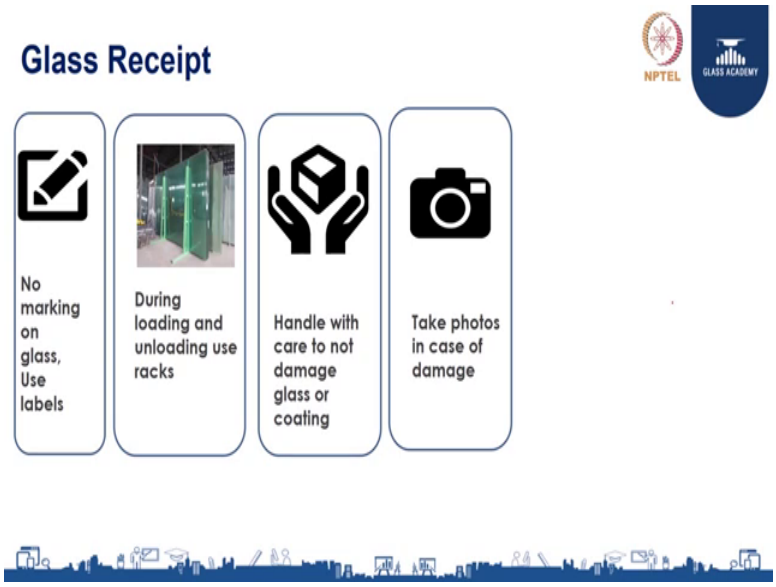

So, let us talk about the glass receipt. Basically, you get the glass from the processor. So, you get the glasses from the manufacturer so, where you are getting the glass and the truck. So, you will have to keep it in a respective places, where you can store either thickness wise or clear glass, coated glass, know different types of glasses we have.

So, accordingly you can store in a respective places. So, that identification will be easier so, upon receipt or the glass receipt. So, we will have to do a first thing is we will have to enter the data when it is received what type of glass it is where you have stored. So, basically it is a first in first out basically. So, we will have to figure out the way, how effectively you can use the systematically handling the glass. So, glass receipt is most important.

So, as soon as reaches so, we will have to enter not on the glass you will have to enter in your documents. So, no marking on the glass use labels for easy identifications during a loading and unloading use a racks. So, these are the rack systems, which you saw the second picture.

So, in we will have to be used extensively on rack system rather than using on the walls. So, most of the processor would stack on the know entire pile on the walls. So, we do not know how much strength a wall has it ok. So, we cannot predict. So, we will have to use in a the proper rack system either a frame or l rack you can use it handle with a glass very care not to damage the glass or coating.

So, you will have to be very careful at the time of shifting one place to other place or you want to store it. And take a photograph in case of any damages at the time of receipt. So, immediately you have to contact respective supplier, basically a float glass manufacturers. We will have to give them the details what has happened either breakage or you know aluminum fall peel of a waters accumulation on the track on the glass and everything. So, basically you will have to identify and we will have to respectively will have to be report to the respective the forth manufacturers.

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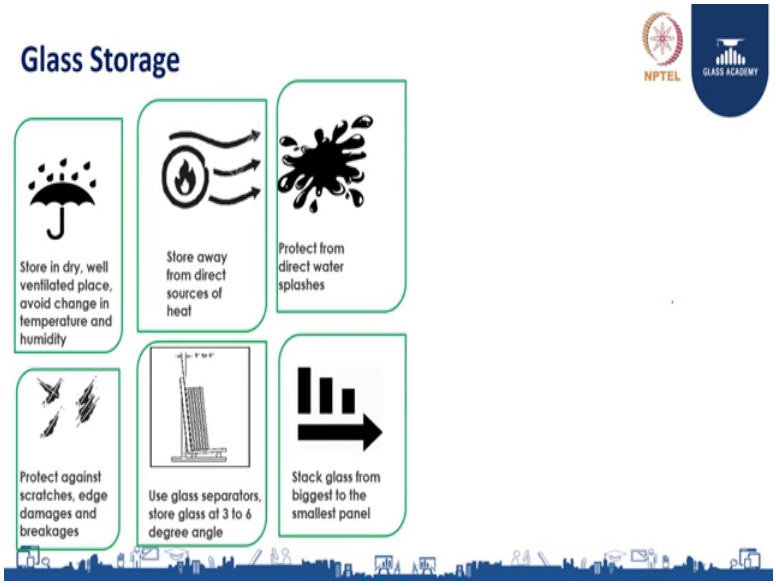

Glass storage store in a dry and well-ventilated area avoid any changes in temperature and humidity. So, this is the most important and next is store away from the direct sources of heat most of the time. So, people are stacking outside of the processor like warehouse where you have respective place for restoring the glass whereas, people not using at the right place to store.

So, we should not allow I mean, everybody should have a good practice to store inside the building where you have a you do not have any direct sun lighting to towards on the

glass. And, protect from the direct waters splashes either rain water or you know piping which is tripping. So, it should be stopped and protect against scratches and edge damages of the breakages because each sometimes you will not able to shift the one pile. So, maybe you will be you have to do a single pane at the time. So, you will have to very careful at the time of shifting one place to other place.

So, not to avoid the scratches between the glasses, use a glass separators store the glass. For example, if it is a big pane it is a parent glass where it not used because already float manufacturer have sent with no Lucite powder, which is a Safrole powder, which can be separated at the time of cutting or if you want to move it in the different places. So, can you use one rack system with separators? So, (Refer Time: 05:37) you can use it for stacking purpose and stack the glass from the biggest to smaller do not know mix it a smaller medium bigger so, that we cannot take in a proper manner. So, you take appropriate action towards staking as well.

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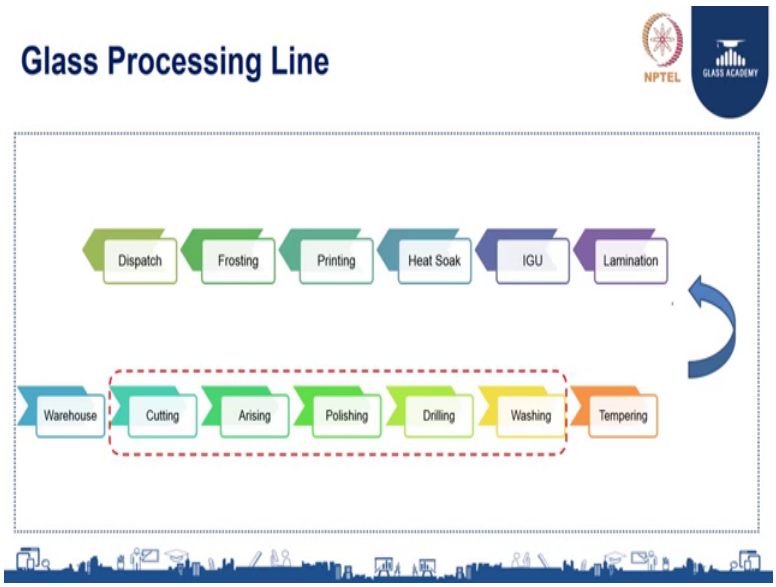

Let us move on to glass processing a line, what is typical glass process line look like? So, this a most common processing line involve white. So, you can see here warehouse, cutting, arising, polishing, drilling, washing. So, this is a which I indicated red color which is call to pre-processing department or zone and next is tempering. So, in a basically it is U shape it is a one shape you have seen that, the next after completion of tempering.

So, either we will have to go to I G U or laminations depends upon either first may be I G U tabbing there or lamination should have be there, it is depends upon the processor how they want to place their machines? So, accordingly they can place. So, this is schematic diagrams to understand effectively on processing line how typically look likes.

After lamination I G U the heats of machines and printing, either it is a digital printing or it is a ceramic printing can be done or frosting again it is a frosting is a 2 types on acid frosting and sand frosting, after that is a dispatch. So, this is the typical processing line for processor.

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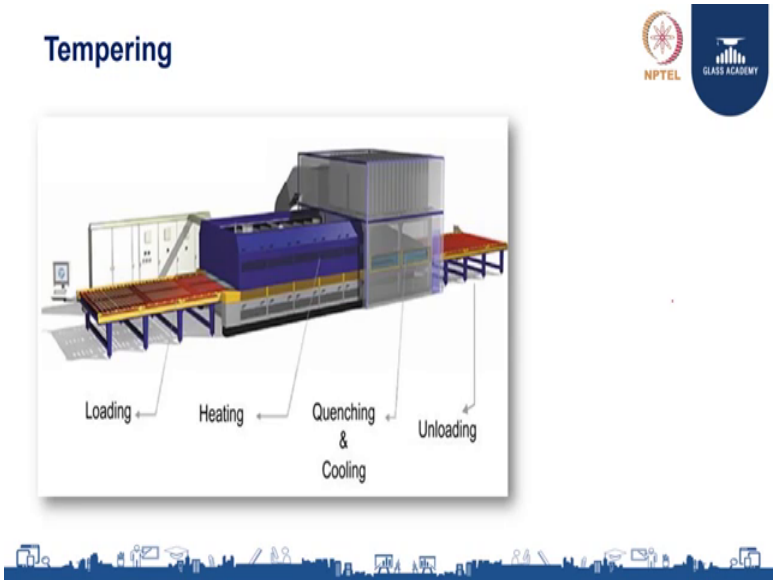

So, let us move on to the tempering. So, before going to the tempering; so, I would like to give more few more details about pre- processing. So, because the pre-processing is a the prime processing of any with respect to any glass processing. So, cutting and arising, polishing, drilling, washing.

If, you are not very careful about handling on pre-processing so, whatever your mistake you have done you are allowed make you know a scratches whatever it may be. So, will be replicated during the process course of action like tempering I G U lamination, if you not preprocess is not done properly, you have to expect some of the defects going to you know appeared, after tempering post tempering or I G U or lamination or respective the process.

So, preprocessing is a most important and play vital role in processing. So, even not only the preprocessing at all the states we will have to be very careful in terms of handling the glass. So, let us move on tempering. So, what is mean by tempering? First of all you would have known about it. So, this is this the schematic diagram for the tempering machines ok. So, loading, heating, quenching, cooling, unloading, there are 4 section of process in tempering line.

So, tempering is nothing, but the glasses have been heated up to like 650 or 690 or 700 degree centigrade, heated up to certain period with respect to the thickness ok. And, after that how fast you are cooling the glass will be getting the stress induced on the surface of the glass. So, thereby you are increasing the mechanical strength of the glass. So, that is a called the tempering process.

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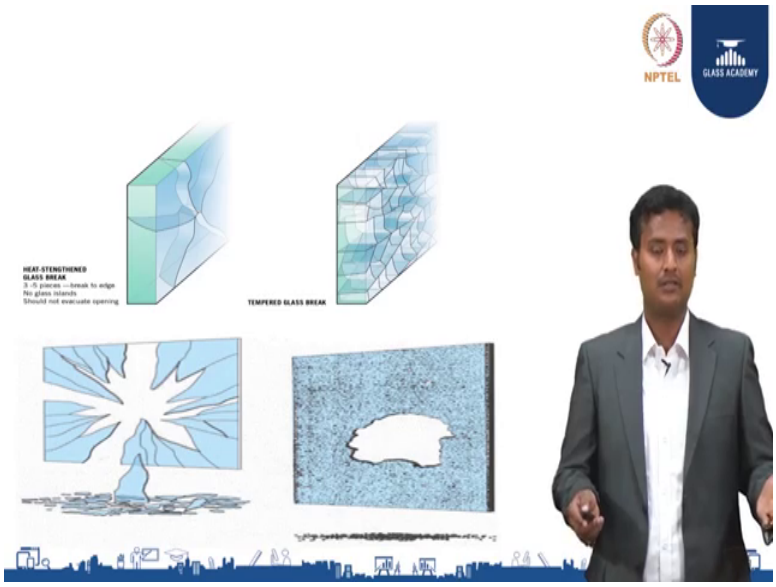

So, this is schematic diagram. And, you can see this difference between the heat strengthened glass and tempered glass fragmentations. If somebody wants to check the fragmentation portions thereby you can understand, what is happened on the glass?

Basically, whether it is tempered H S or a need, you can go through you can easily identifiable through this fragmentation pattern. So, you can see the right most which has a small dull edges a which is called tampering fragmentations, you can see the left most side which is very sharp edges as good as (Refer Time: 09:38) the glass ok. So, you can see that. So, this is a differentiate between the h s and tempered glass.

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So, in tempering visual distortion is most important. You would have check that these are the you know pictures you would have saw in tempering line when the glass coming out of the quenching line. So, you will have to be go through this process, which is called visual distortion you will have to see this the Zebra line at 3 3 meter distance and 30 degree angle.

Which, you see that if the glass perfectly tempered or you can say distortion less or you cannot eliminate completely, you can play a you know tempering process to may be modified the distortion level, tempered glass would always has distortions, but it can be the good processing machine, we can probably you know increase the less distortion. So, that is what tempering process, you can see that below picture has a problem of distortion. So, the all the glasses has a problem, because at the time of tempering there were not taken care about this distortions. So, which will be after installing the glass, you will able to see the distortion effect. So, in order to avoid this so, we will have to be very careful at the time of tempering.

So, in the common defect in tempering is distortion. There are other defects like coating burn for the solar controller (Refer Time: 11:16) glasses the scratches oxidization you know lot of things are there. So, let us move on the heat strengthening. Heat strengthening is nothing, but the same similar process of tempering process, where the glass fed with the furnace. Subject to heat and pressure is applied which means 690 to

700 degree centigrade in the particular period of time, with respect to the thickness. A, how slow when it comes to the quenching session, cooling session, we will have to a cool the glass very slow pace at not like tempering process, where you are apply the amount of air in a sudden which is you know very know rapid manner. So, you will get a tempered process.

Whereas, heat strengthening the same process typical tempering process, except cooling the rate of cooling is differs. The how slow you are cooling the glass will be getting a heat strengthening glass.

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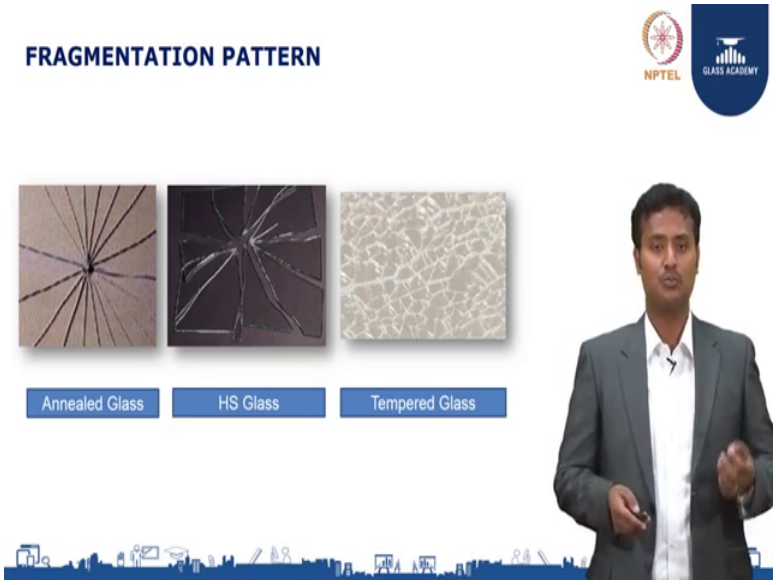

So, I would like to give you small brief about this. You see this left hand side the annealed glass breakages, you see there is lot of you know cracks when it annealed glass breaks, it is very sharp it can harm anybody and see the middle picture. So, it is a HS glass. So, typical same as good as annealed glass, but it has a strength glass with that twice than the annealed glass strength.

Basically mechanical strength you are increasing and safety aspect of the glass we are doing the heat strengthening and tempering. And, the last one which is third one you can see that the small fragmentations, that is look like you know small crystals, you know you can see that that is the fragmentation of tempered glasses.

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Let us move on this application of tempering. So, application of tempering, which means widely used you know the facades or interior application, you can see that you know the glass either any color depends upon the what color of glass you are going to select or if you going to do a lami clear glass with a color may be you can get a colored glass as well. So, the tempering process is similar that to the other process, which is additionally involved to give a aesthetic effect.

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You see that this is the clear glass facade.

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And, interior partitions these are tempered it has to be tempered glass cannot use any handed glass over there.

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And automobile glasses also. These are the automobile glasses, basically sandwich glass, which is laminated glass, in the event of breakages and the glass would not hurt to the driver the or this seat who is occupied the inside they lot get hurt. So, basically that P E B layer which is protecting them the breakages, which is though it is glass breaks, but the any stone or any whatever obstacle which is not facing to or passing through the glass. So, basically this is wind shield application car manufacture widely used on glass.

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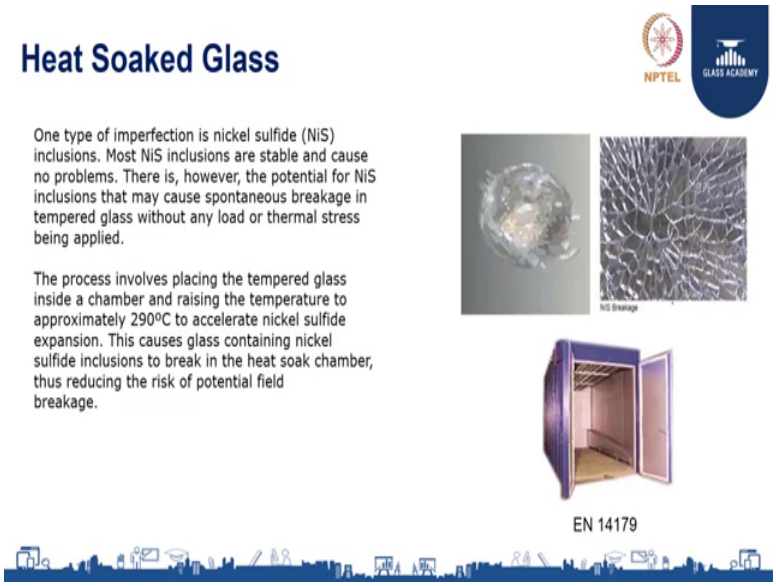

Next move on to heat soaked glass. So, people always call about self-suicide glass ok. What is mean by heat soak glass? Heat soak glass is nothing, but it is a process of after tempering people have to use this process to avoid or you can eliminate this nickel sulfide inclusions. So, one of type of imperfection of nickel sulfide inclusion in the raw glass processing I mean raw glass manufacturing at the tempering. So, that impurities would not burnt perfectly or it will not release stress at the time of tempering.

So, some of the inclusions are very stable which is not causing any problems spontaneous problems at the time of tempering. So, we cannot identify whether this glass is having nickel sulfide or not. So, as; however, the potential nickel sulfide inclusions that may cause spontaneous breakages in tempered glass, without any load or thermal stress being applied. So, how to overcome this issue? So, we will have to use a particular chamber where the glass being fed into the chamber, which 2 ninety degree centigrade we will have to accelerate the nickel sulfide expansion process.

If the glass has a nickel sulfide the glass would you know get break at the chamber itself that can be recycled if it passed from the heat soaked test. So, basically it will help for the occupant for avoiding these spontaneous breakages any point of time. So, thus reducing the risk of potential and field breakage at the various places, you can see this the first picture, where this is a microscopic picture of nickel sulfide inclusion on the raw glass.

If it is if the nickel sulfide inclusion the centre. So, the probable the possibility of breakages at the earliest for example, if it is in tensile portions yes it is going to be a anyone point of time it is going to break we will have a we can expect the spontaneous breakages on the tempered glass. This is only on tempered glass it cannot be on the heat strengthened glasses, why? Because, the tempered glass has a strength like annealed glass than the 4 to 5 times than the annealed glass strength so, stress completely induced, there will not be no longer arrange residual stress upon.

So, this a particle when is 290 degree in a particular period you keep it at the chamber know you are allow the expansion of nickel sulfide will alpha to beta stage, it will the changes the faces of a nickel sulfide, it happened only on the tempered glass, heats in the glasses has a less compressive strength compared to the tempered glass. Whereas, it is compared to annealed glass it is twice than the annealed glass.

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