Plastic Waste Management
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Lecture – 04
Plastics – Uses and Global Statistics

Hello, welcome back. So, this is the 4th module of 1st week. So, as you know in this particular week, we were trying to talk about plastic, what are the different types of plastics, and how much how they are made we discussed that in the first three videos. And now this video, which is will be the module number 4 or lecture 4 as you may like to call it. And then the second video after this which will be like the fifth one, we will talk about the Uses and Global Statistics.

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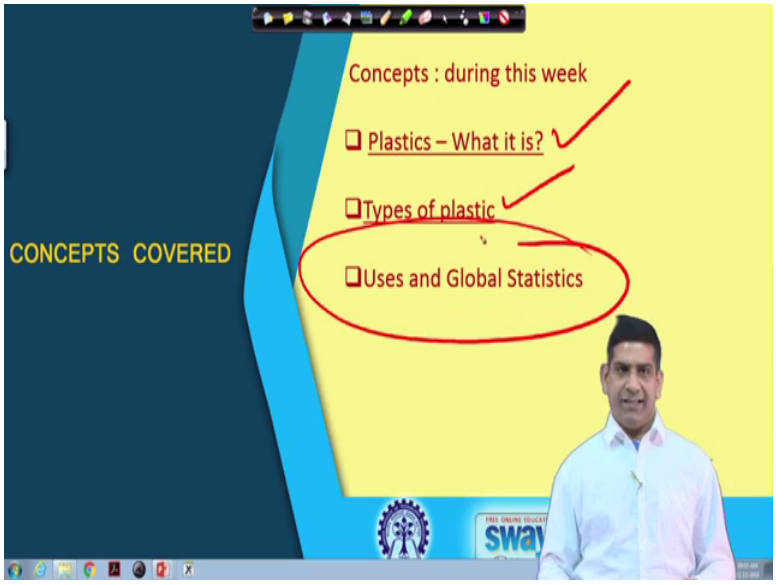

So, what that does mean? We will be talking about how much plastic is being made, and where it is being used, made in India as well as abroad that is why, it is a global statistics. As you know plastic waste does travel a lot, we will talk about later on in great pacific garbage patch, and plastic getting the ocean, different rivers contributing to those plastic pollution, so we will see that plastic actually travels quite a bit.

So, concept that just to recap the concept, that we are trying to cover in this particular week; the first two bullets, which has been underlined. This topic we have already taken care of, so we already talked about what is plastic, where you also looked at what is the

type of plastic. Today, like in this video, and the video after this will focus on uses and global statistics, so that is what our focus will be in terms of this video, and the video after this.

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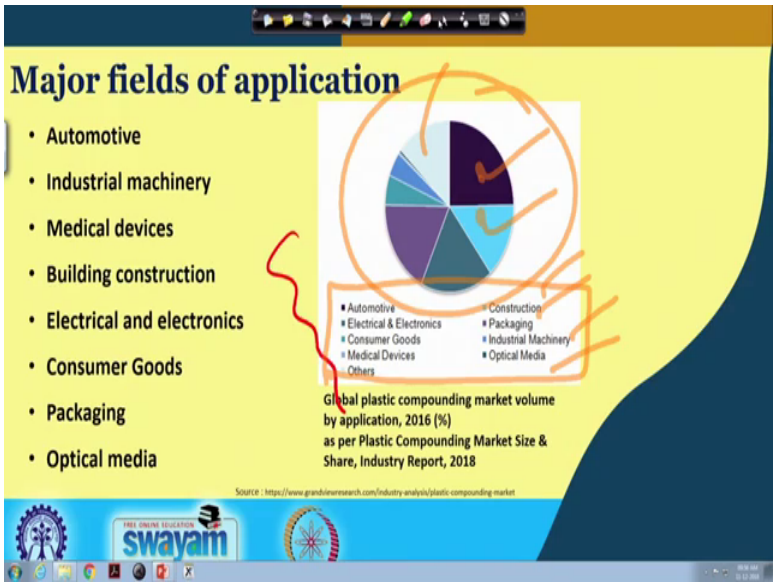

So, now in terms of if you look at in terms of its use, so in terms of so we will get started and look at the use and global statistics. So, what are the major fields, where the plastic is used? And I have been telling you in last three videos, the plastic basically where use everywhere, but where are the maximum quantity of plastic that is being use, so automotive sector. So, this particular pie chart over here kind of shows you in terms of different like if you look at automotive sector, electrical, so that is your automotive sector, then we have electrical and electronics, consumer goods, this is consumer goods, and medical devices, we have some in terms of the medical device, these are others. So, this is our the others category.

Then we use in construction, we use in packaging, we use in industrial machinery, we use in optical media. So, as you can see majority, so these are the major areas where the auto we are using the plastic, it is being used in these different applications, where it is plastic is being used for automotive, plastic is being used for electrical electronics, consumer goods, when we say consumer goods, all sorts of different items that you and I buy.

Medical devices, you go to any hospital today, you see lot of plastic related stuff over there. Construction industry uses a lot of plastic, in construction and also in the tools aiding in construction activities; packaging material lots and lots of plastic being used. If you buy anything from online shopping or if you go to any mall and any like if you buy lab equipment or any sorts of stuff, you see lots of packaging and lots of plastics being used in there. Industrial machineries, that is where we use lot of plastic parts these days, because they are convenient to make. Optical media, optical media is your from pen drive to like a CD ROM or floppy disk, we do not use anymore, but and like a different types of media that is used.

So, global it is around this is this pie chart is kind of telling us in terms of the distribution as per 2016 market, which was report came out just this year as for the plastic compounding market size and report. And one thing you may have you may have noticed that for most of these pictures like a almost all of this picture unless it is our own data own diagram, we are putting a link here.

So, the reason for putting this link is twofold. And this is and those of the students who are here, you should definitely do it, because this is not my data, I have taken it from somewhere. So, I have to indicate the source that is a standard practice in terms of presentation. For lectures, sometimes we can get a way without providing this source, because I am just using this information to teach an audience. And it might be unless it is also not I would not say it is like a it is not advisable it do it, but if you forget at some point of time, it can be condoned. But, at this but if you are using it for your any project, any presentation, any seminar, it is a standard practice global is standard practice that you should list the source, so that is one aspect of putting the source here.

The other aspect is I want you guys to go and look at these sources, because what I am presenting what we are presenting in this course, in the slides or in this video is only a snapshot of that particular report. If you have interest to look at more in this particular topic, please go and visit this particular website. So, you can all these slides will be available to you as part of the lecture material, so as part of the reading material go and look at those slides, look at those particular websites. And, you can learn more information from there, because not everything can be taught in a course, it is especially these kind of courses, which is it is you will you will have to do lot of self-learning, you have to get out there and find lot of information by yourself.

So, coming back to what our topic, there are these are the major fields of applications of plastic again automotive, industrial machinery, medical device, building construction, electrical electronics, consumer goods, packaging, optical media, and there could be other applications out there as well.

So, consumer goods kind of include all this stuff that we use it for as I as I keep on keep on saying from toothbrush to toothpaste to evening even like the bulb or like the electrical fixtures, wires every lot of things we use plastic at our home, TV even microwave or most of the appliances now have plastic components. You think about mixer grinder, you think about even many of you like handles to the cooking pats, cooking and microwavable microwaveable containers, so tiffin containers, so quite a bit.

So, if you go and look at your house, and even wherever you are sitting right now, if you just keep around you take a 360 degree look, and you will find lots of plastic products. So, we are using lots and lots of plastic in our day-to-day application. And that is the reason why, we have been we have been trying to find out that how to take care of how to manage properly these plastics.

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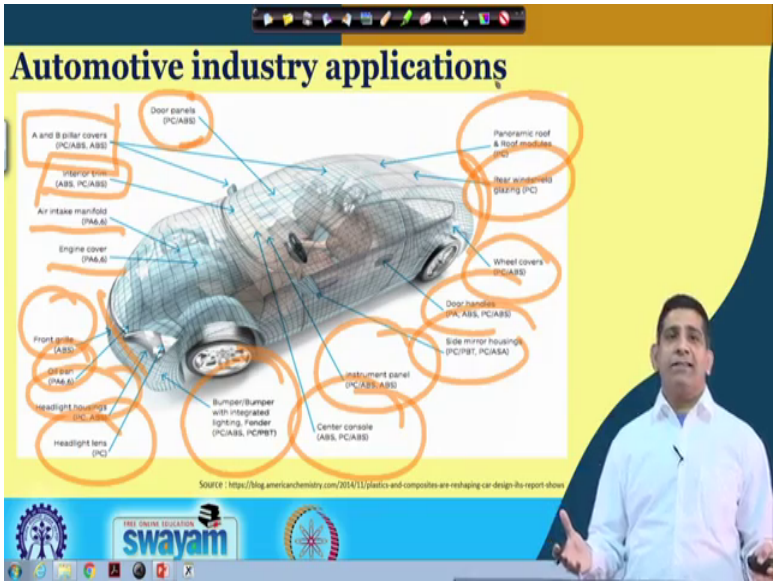

So, in automotive sector, next time when you when you are in a car or when you are looking at any vehicle, when you are inside a vehicle just see the vehicle around and you will find different plastic components. Now, this particular picture, I will just kind of go over this different components, which is there like a starting from if you look at the top,

we have door panels the door panels which you will have different, and then here we have also tried to put below that what that what is the type of plastic. So, it is a polycarbonate, ABS type.

Then A and B pillar covers, where you will have covers on top as well as covers for the mirror. So, interior trim a interior the trim that is used the again ABS lots of ABS are used, air intake manifold, plastics engine cover, front grill, oil pan, headlight housing, headlight lens, bumpers. These days entire bumper is actually plastic that is why, when you go and got forbid if you get into some accident or just in if you just while backing up you hit something, you see that the whole bumper just gets you have a very big dent even with a slight hit with each other with some other objects, you get a like a quite a bit of dent.

Because, most of the body of the car is a plastic that is why, the cars are becoming very lighter. So, and the so it is being used and as you can see, the different components of a car, you see the plastic is pretty much everywhere from bump, we call it from bumper to bumper. Say from the front bumper to the back bumper, this area is our front bumper, then this is our back bumper, and you can see the plastic is basically everywhere in the car.

So, you have in the instrument panel, central console, where you have all those music, and other stuff that is over there side mirror, door handle, wheel covers, rear windshield, panoramic roof, and roof module. So, think about your car, you have plastic wherever you touch the car, there is plastic, so that is why plastic we use lots and lots of plastic. And plastic has done a wonderful job in terms of this automotive industry.

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We have a plastic is being used in automotive, plastic has made the automotive the vehicles very lighter. And lighter means better fuel mileage, because if it is a light car, less weight, better fuel mileage, so it helps save the mileage in that way if you think about it helps save into the fossil fuel consumption. So, it is actually doing good for the environment that way. So, all uses of plastic is not bad.

So, when we talk about that how plastic is a big pollution plastic is basically we are getting drowned in plastics and all that yes, there is plastic mismanagement of plastic waste is a problem. Plastic itself is not a problem, plastic when it was invented, and the way it is being used today if the reason for that it is a wonderful material, it has multiple application as you saw in last three videos. It is made in a variety of way for widespread applications on our day-to-day basis, we use this plastic in lots and lots of industries, and our daily usage, consumer products as you just saw.

So, plastic has really make our life improve helped and improve our life, we can we can say that. But, at the same time yes, it is a new it is a when it is discarded, it is a waste. When it gets into the waste stream, the problem that we are having is we are mismanaging the plastic waste. We are not managing the plastic waste properly that is the issue. Issue is not just the plastic.

And one and there are certain types of plastic, which creates more nuisance. Those are call single use plastic, very thin. It gets disintegrates into the environment flies through

with the wind. So, yes those are say single use plastic, pill plastic, they are the problematic. But, most of the plastic applications that we have in terms of the automotive cars and all also if as you can see in this particular slide, you see like a beautiful pictures of several industrial machinery and so in industry you walk into any industry today, and you will find lots of plastic parts there as well.

Lots of plastic based construction lot of plastic based material used in construction of these industrial machines. So, it is needed over there, it has made life much very simple, so it is not that. So, as I say there is no you cannot paint all plastic products as bad, yes there are certain types of plastic especially those pill plastic, and plastic which has less than size like thin it is a very very thin less than 40 microns, which government is looking at banning.

So, when they ban the plastic, it is the single use plastic mind it. So, it is a single use plastic, which is government is looking is trying to ban, it is not the entire plastic. The single use plastic is the nuisance and we have to kind of we have to come up with a better material for that or manage that single use plastic in a much better way.

So, looking at this picture again here this is only to give you a like a variety of applications for plastic in industries, there is nothing like this a collage is just to put together to give you an impression that plastic is used quite extensively in industrial applications. As you can see in a variety of settings from whether it is a different kind of industries, as you can walk in you will see plastic pretty much everywhere, so that is what we are trying to illustrate using this particular image.

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So, I talked about the other area is medical application, you are go a medical is starting from you go to a hospital like a I do not wish that you need to get hospitalized. But, just in case if you have, you visit somebody in a hospital, you just look around the hospital bed, the bed in which the patient is taking rest is recovering from illness or surgery or whatever and you just see all those different gadgets, which is attached to the patient. You all those tubing's that that IV fluids, those glucose or whatever is being given to the patient. Different types of medical liquid medication, which is injected into the patient's body, even the injection syringe or the containers, you have different types of like a where containers for medicines, as you can see on this two pictures over here.

You see over all these different kinds of medication. This is just some example medication not only these medications, in fact all the medication. As you go home today you just look at your medical cabinet, most of most of us has some medicine at home. And you will see most of the packaging is plastic only or it will be mixture of plastic, and some other material or if you have a containers you use different types of containers, again you have variety of plastics being used. So, we use lot of plastics in medical like a as applications.

So, if you can have a quick look at the list here, we use it for IV and respiratory fitting that is what I was trying to tell you, you can use it for IV respiratory fitting. Filters of the laboratories and filter casing that is where also it is used. Diagnosis device, blood

collection tubes. Whenever you go to give your blood or urine sample, the container in which it is taken is plastic, and the syringe it is used to take out the blood from our or a hand is again a plastic. So, separation equipment and dialysis components, catheters, plastic pill casing, surgical examination gloves; which is again plastic. Inflatable splints, inhalation mask, disposable gowns wipes, droppers, urine continence and ostomy products every like you see that lots of applications of plastic is being done in medical applications.

So, think about that if the plastic was not there, see we get so much one thing, I always try to a stress upon is we are environmental engineer and environmental scientist. There is a difference between environmental engineer environmental scientist versus environmentalists. Environmentalist is when they kind of out I do not want to use that word, but most of the time they have some sort of agenda or some sort of they will go after a certain topic, but the topic that they will be pursuing the cause that they will be pursuing, they may not have that much scientific and engineering understanding.

They go buy some evidence of see as something has happened, and then let us go and ban the entire plastic industry for example or let us ban all the diesel vehicle, but that is not the solution. We have to live on this planet, we have to do our day-to-day activity, we have to go to hospital, we have to get cure, and all the tools and appliances that is used in hospital and those nursing homes contains lots of plastic. And there is why this contains lot of plastic, because there is no other alternative.

As of today whatever alternative is there, it is very expensive or there are for certain applications probably you may not find a practical alternative. Theoretically many things are possible, but you have to look at from a practical point of view. And that is why, we have always have to do a cost benefit analysis have to do a environmental risk assessment on a brig on a holistic view have a life cycle thinking, have a systems perspective just do not, we should not make a decision based on emotions.

Decisions should be on based on based on science, facts, engineering, technology, options, so that is very very important. So, yes plastic is a problem, when it is a problem, when you do not manage the plastic waste properly. So, what is the problem? Problem is the mismanagement of plastic waste, it is not the plastic, it is the mismanagement of plastic waste, which is a problem.

So, let us focus on that. Let us manage the plastic waste properly. And yes there are certain types of plastic, which needs to be gradually phased out those single use plastic, those thin plastic, the pill plastic that you and I get when you go to the grocery store, when you buy your coconut sorry buy your potato or onions or some vegetables, they give you that very thin plastic the see through white color or the black plastic that you get in meat shops. Those are actually nasty stuff.

We should stop using try to stop using them rather than banning the entire plastic, which is not really going to work anyway, because unless there is a material, which is equally good as plastic, which is equally cheapest plastic, and which can do most of the funds in that plastic does today, so that is very very important. It is the mismanagement of plastic that should be the focus of the discussion not banning plastic entire is (Refer Time: 19:20) we are not most of the places, we are not actually talking about banning plastic. We are just talking about banning single use plastic, so that is also very very important to remember.

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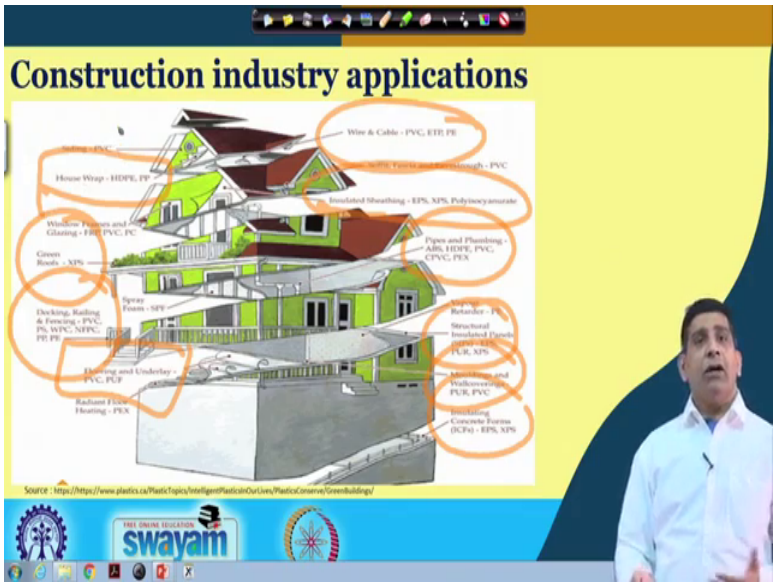

So, and when construction and industry application; so, as I said will look at the different applications. Here is again if you look at these you have the wire and cable, this picture is from a North American building or like a Australian, Canadian those kind of places, where they use their they have a slanted roof.

As you can see in this picture, it is a slanted roof and so in this particular roof what they do is they try to have their why they were scented roof, because more most of the places there is a snow, so the snow will actually will not accumulate on the top, otherwise it will be too much heavy. So, let the snow go down. And these are mostly single housing single housing or duplex buildings or like that.

But, for in so in those kind of applications in the construction as you can see, there are wire, wire cables even in Indian contest we use that. And insulated sheathing in insulation is done using plastic. Pipes plumbing, pipes plumbing is done lot of a plastic in fact if you look at the plumbing in India right now for housing, I would say probably if not close to 100 percent, 90, 90 plus percent will be plastic only. We are using lots of plastic even the taps everything is becoming plastic.

Now, in terms of the like a some of the other stuff they have like vapor retarder, we do not use that much in Indian context is structural insulation, moldings insulation from the bottom, and you have a flooring, flooring use some PVC, and other stuffs daking, sometimes green roofs again you use some types of plastic their, windows frames, house wraps, HDPE PP sidings. So, lots of plastics is being used in construction industry as well, so that is that is what we try to highlight using this particular picture.

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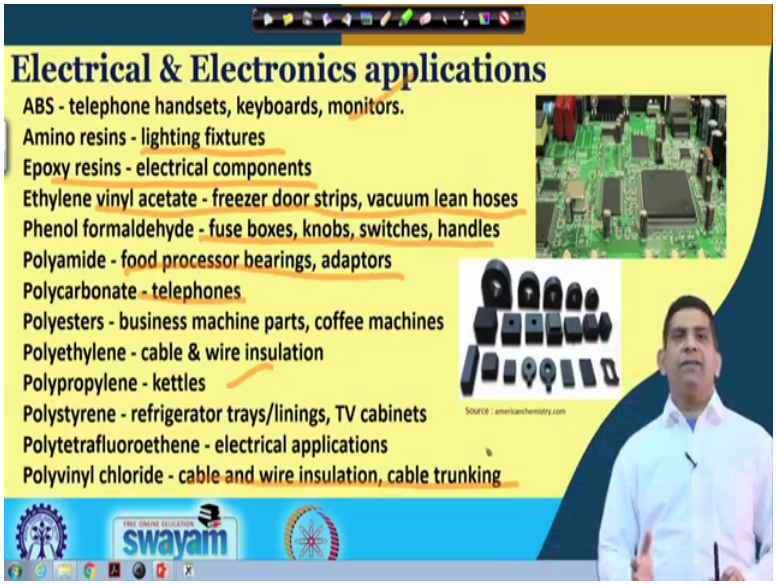

Then electrical and electronic applications; you are watching this video either on your mobile phone or on your iPad or maybe on a laptop or a desktop and all of that contains

plastic. So, it is you have different types of plastic. So, your mobile is becoming lighter. You have a big mobile phone, but it is if the weight is not that high. Laptops, we are replacing metals with plastic, laptops are getting lighter. And same thing with the desktop, remember the desktop of earlier days when you will have to actually one person carrying the CPU, one person carrying the monitor. Now, the entire unit one person just carry by itself, because it became lighter because the metals have metals were heavier, it was replaced by lightweight plastic, so that is the reason why you have plastic being used pretty much in most of almost all the electronic products the plastic is there.

As you can see, we have some examples over a listed over here. ABS- telephone, and keyboard, monitors that is what amino resins, where the lightening fixtures, epoxy resin is used, ethylene vinyl acetate for freezer door strips, vacuum lean hoses. Phenol formaldehyde for fuse box, knobs, switches. Polyamide-food processor bearings, adaptors. Polycarbonate, we use in telephones, those telephones that we have you polycarbonate. Polyesters-business machine parts, coffee machine, polythene and cable and wire insulation, polypropylene in kettles, polystyrene in refrigerator trays, lining, TV cabinets, polytetrafluoroethene in electrical applications. Polyvinyl chloride in cable and wire insulations, and cable trucking and this is not the total exhaustive list. This is just some example to illustrate that variety of plastic is used in our electrical and electronic applications. And this list will actually keeps on increasing and increasing as we try to come up with different types of plastic.

Many of these are also blended plastic. Blended plastic is when you have, two or three different types of plastics are mixed together. Especially, if you have looked at your remote if you have looked at the remote, that we use it is a very smooth, signing like a I am not signing, but its smooth plastic, very it feel is very different. Most of the remote has a similar kind of plastic material, and they are actually blended plastic. They are two three different types of plastics, so they blended together, so that is what you see that. And same thing with the telephone sets, they also have similar plastic sorry.

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Then consumer goods, the variety of goods are made using plastic, as you can see on this picture on the left as well as on the right. It is self-explanatory, I do not have to really explain that. So, let's plastic is used in variety of consumer goods, where we use it for different kind of applications as you can see on this particular image both like for whether it is for your toiletries, whether it is for food containers, whether even you have sometimes you like a you like a milk containers, cleaning, supplies or you have drinking water bottle, shampoos whatever and as you can see variety of things, where you have plastics are being used.

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Then packaging industry; packaging as well as a storage industry, whether it is a Coca-Cola, when Pepsi, a sprite or you have even for soaps or different kind of packaging, whether you see plastics per being used. Then also for the containers that we used in our houses or even for packaging say if you have go for a for example, if you go for these like a Horlicks, Bournvita, Maltova and all those different I do not know whether Maltova is a still available.

And you goes for those brands and anything that is just one example even for ghee all those different you go a peanut butter, mayonnaise you go to any market you see all these different plastic containers, and different shapes, different sizes and all these is used in the packaging industry. So, packaging industry is actually a huge area, where the plastics are used different types of plastics are used as well in terms of its application.

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Optical media, where you use it for different whether you use for the cables, you use it in your different speakers, you use for CD's, you use for a USB for pen drive, and you can the list can be a long-long over in this area as well. So, as you can see different applications in there in optical media as well.

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So, if you look at the, so for all making all these products the plastic has to be made is not it? So, it is plastic has to be produced, because we are using it in a such a variety of way. So, plastic needs to be produced to make those make those material, make those products. So, if you look at in terms of the plastic production, it is it not 18 percent China is the largest producing of plastic material, I followed by Europe and NAFTA; NAFTA is the North America like a For Trade Agreement, which is includes us Canada as well as the Mexico.

So, China 29 percent, so 29 percent of the plastic is actually made in China. So, nearly slightly less than one-third of the plastic of the world; then Japan has around 4 percent, 17 percent in the rest of Asia. So, if you look at total Asian countries total, they produce 50 percent of plastic is being made in Asia itself.

So, because again if you look at: why you see this because most of the manufacturing is happening in the Asian countries today. The Manufacturing industry is actually moved from Europe and North America to Asian countries almost, I would say mid 80's around that particular time. And that is and gradually it has it has picked up in India, China. China is of course, the leading manufacturer even today India is catching up, but in India, we do not have that much manufacturing, we are getting more into the service industry rather than manufacturing industry.

So, but that is why you see that China is still producing a lot of plastic, they also recycle they used to recycle lot of plastic from around the world, before they did this China short policy recently, which they banned the import of plastic waste coming from abroad. They have not really banned, but I would they have put a very high standard. They want clean plastic in terms of the recyclable plastic getting into China.

So, this is 50 percent from Asia, then next is Europe and NAFTA is almost the same 19 percent from Europe, 18 percent from NAFTA, which includes US, Canada, and new Mexico sorry US, Canada and Mexico those three countries. Then 4 percent in Latin America, 7 percent in Middle-East in Africa, 2 percent in that in the Middle-East and those countries; so, this is based on plastic again this is based on the data from plastic Europe report when 2017.

And so if you go and look maybe in 2018, now if the newer report is out there, when we made these slides almost I would say in the December of 2018 when we were preparing this slide, this was the late this was the figure. Now, if the newer report is out there, the figure will maybe have changed that is what I want you to do, because as I said earlier in the last video as well.

We will learn this topic together. There is no textbook on this topic, we are collating information from variety of sources from India as well as abroad. And trying to put a trying to present to you the plastic waste management is status of as of today, what are the issues, what are the potential solutions, and we are as a person who works in the waste management field, I am putting I am I am putting my perspective on these as well as a instructor of this course and potential solution to this plastic waste management problem we will talk about.

But, since it is a very dynamic, it is a very new topic dynamic topic, any new information out there, because it is not possible for me and my two tiers to kind of get the entire information from the clock, we may miss some information as well. So, I encourage you to go you look at that you also do some Google searches, you also look at some of these reports, if there is new data available, let us know it will be really nice, and it will help us we can include that in our discussion forum and all that and discuss those kind of material.

So, again use the discussion forum for make it lively, I promise you that your query will be you will get very quick response in most of the time it would be within 24 hours. And at the same time if you have any questions, any comments, any feedback, feel free to put it on the discussion forum. And thank you, and we will continue this discussion, we will carry on in terms of the global statistics now. So, in this particular video, we talked about what are the different uses. Now, the last topic for this particular week is on global protection data, which we kind of got into with this particular slide, and then we will continue our discussion further in the next video.

Thank you and see you again.