Plastic Waste Management
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Lecture - 38
Plastics and Circular Economy

So, welcome back this is the 3rd video for week 8 and we will continue our discussion the theme, the topic for this particular video is looking at Plastics and Circular Economy. So, in the first video for this week we were looking at the plastic resource recovery questions; like what are the cont issues and concerns and how to go about resource recovery, what are the issues associated with plastic resource recovery. In the second video we focused on trying to introduce the concept of circular economy.

So, the whole, as you as you know this course is on plastic waste management. So, initially we talked about plastic resource recovery, second week we talked about circular economy. I introduced you to the concept of circular economy; we looked at the two small videos on a circular economy in general and circular economy for plastic waste. So, with the similar kind of theme in this particular video in the next 30 minutes or so, we will be looking at is issues of plastics and circular economy. So, we are bringing whatever we learned in first video and second video. So, we will combine it together now in this third video, so how plastic and circular, which you saw some of those examples earlier as well so, but now this will be directly focused on a plastics and the whole concept of circular economy.

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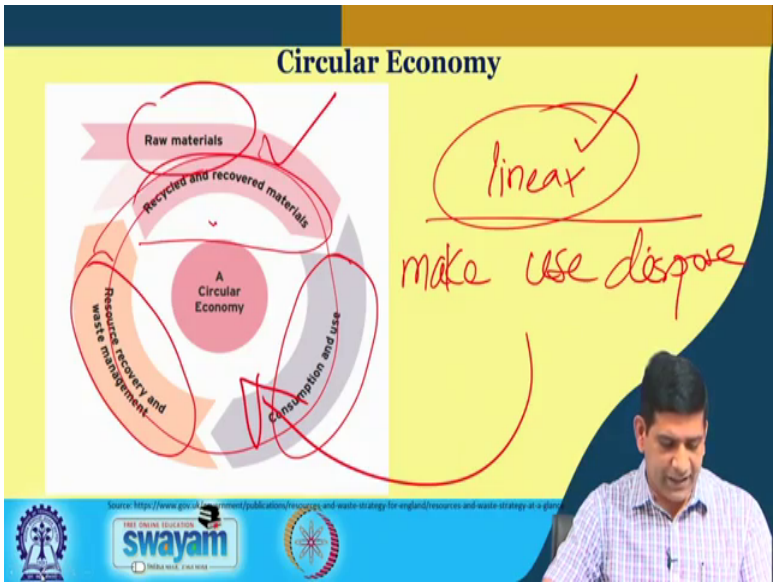

So, just to recap what is circular economy? We looked at it earlier, but just for a quick recap. Circular economy means where you take the raw material as you can see over here you start with the raw material and you make product, you try to consumption and use. And then you after usage your resource recovery in terms of the waste management you recycle or recovered material, then the whole thing kind of coming back. So, this is all the concept of circular economy.

Linear economy was as you saw in the earlier video as well make use and dispose. Here we are not trying to dispose anything. Here we are trying to bring it back into the economy. So, this is the, this is the linear economy linear and this is circular. So, this is the circular part, this is the linear economy part, so that is the difference. Right now presently most of our economy is based on the linear economy, but we want to move from linear economy to circular economy. So, that is the whole goal of in what we are talking about when we say circular economy that is our whole focus to move from the linear economy part to the circular economy part.

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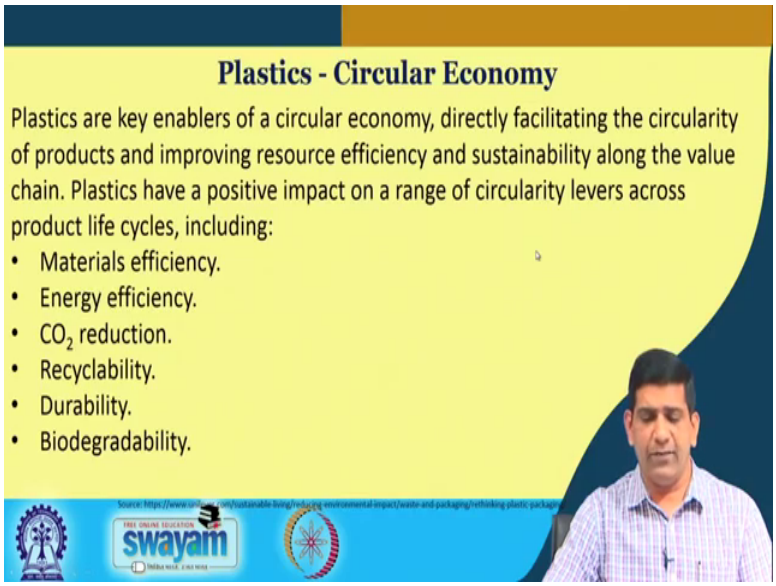

So, that is what we will see in this particular video for next 30 minutes or so that how that is possible in terms of plastic. So, when we talk about plastic circular economy, its plastic is actually a key enabler of circular economy, because it can directly facilitate the circularity of product, improve resource efficiency and sustainability which is along the value chain. Plastic can have a positive impact in the range of circularity lever across product life cycle.

So, what are those different aspect, they are materials efficiency, energy efficiency, carbon dioxide reduction. Reduction in the carbon dioxide in coming out, because we are trying to reuse it rather than just putting it into the dump site or into the landfill. We increase the recyclability, we design the product in a such a way, so that recycling becomes easier, we improve the durability of the product, so the product can last for a longer period of time.

So, that is the durability of the product and we are also moving from non-biodegradable plastic to the biodegradable plastic. As you saw in that I think two weeks ago when we are looking at the alternative materials, you saw that different materials are coming up which are replacing traditional plastic and products with biodegradable plastic products and most of it was for the single use, signal use items like cutleries, plates and other stuff and bags, and those kind of stuff which is a single use which was creating lot of nuisance

into the environment with all those great pacific garbage patch and other ocean impacts that we are looked into.

And recently in, we saw a news article as well where a whale was found with nearly 40 kg of plastic in its stomach. So, a whale died and there was 40 kg of plastic in its stomach and that news came in the month of like a mid-March of this year march of 2019. So, its so that is the problem, that is the problem why this courses needed, that is the problem why this the whole concept of why to introduce this course and try to have some discussion on plastic waste management, although with an absence of a like a traditional textbook, it was it was never easy.

So, we tried our best, I hope you liked it, we are already in the last week and I hope many of you are still with us out of those 900 600 people who have registered for this course.

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So, in terms of circular economy that continued that discussion, it we can, we are looking at producing plastic from alternative feedstock. So, we are trying to become more greener, use plastic waste as resource. You saw that example as well in terms of plastic waste being used in a road construction. Plastic waste being used in making bricks, plastic people are using plastic waste to make different products.

If you go on YouTube or Google you will find several examples as well. We gave some example in this particular class, in this particular like in the in the videos, but there are lot of other examples out there which I mentioned earlier too. So, we are also looking at redesigning or plastic manufacturing products to improve the longevity, reusability and waste prevention. Increase collaboration between business and command consumers, to increase awareness on plastic recycling, and reusing and abandoning the throwaway culture.

So, that is what that throwaway culture which has come into the society, it is becoming a nuisance in terms of a more and more waste being produced. As a waste management engineer, as a garbologist as I call myself, it is a job security for me or anybody who is working on waste management. More waste produced better for us, but it is as we say that in any profession with the best thing that we can do is, make the make our we like. I would be really happy the day we do not really need a waste management engineer where because although I myself is a make myself jobless.

But its, that is what say the doctors the best, the day for the where doctors can come up with system in which people do not have to go to hospital and we have the like a preventive medicine, we have a preventive healthcare, where if our air is clean, if our water is clean, if our soil is clean half of the disease will go away anyway, so and that is where we need to work on. So, as a environmental engineer our job or as a waste management engineer, I would like to see a day when I do not have any waste to manage that would be wonderful.

Although I would like our job profile will change, but that that would be the ultimate goal, where we do not really have to manage waste my waste. There is no waste, we are designing things in a such a way, we are designing products whether it is a plastic or any product in such a way, so the things that we easily recycle. Of course, recycling is part of waste management as well.

But again not no landfill, no waste to energy plants need it that would be wonderful I hope that day will come in my lifetime in India. So, in terms of, so we will try to bring the business and the consumers together where we can raise awareness on plastic recycling and reuse and abandoned the throwaway culture, we do not want that throwaway culture and then developed robust information platform.

So, it is a multidisciplinary approach, it is not only it is a material science it is a business approach, it is a way, it is a management part as well. So, it is a business, it is a economics, the economic model and having lot of the data that is collected that data has to be managed properly as well. So, all the data analytics and all those pictures comes in here as too. So, it is a multidisciplinary approach which needs to be adopted in terms of coming up with circular economy solution for the plastic sector.

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So, in terms of the plastic or in terms of objectives of the circular economy, the these are the, these bullet points are the major objectives and we talked about circular economy is that design out waste. So, design out waste we do not want waste to be produced. So, think about what will happen to people like me you will become jobless, but that is what we want, we do not want waste to be produced. We want, because we have a better material efficiency, we do not want pollution to be produced on the system, and that is the whole concept of the circular economy.

So, many many of the environmental engineers might be thinking that we will become jobless, it is not you will actually you will have a job of a preventive engineer rather than you will be looking at what we rather they it is a it is you will look at from a systems perspective, you will not be a end of pipe engineer, that let us people do the contamination then I will come and clean up. You will be a engineer if we will work with

other engineers from the very beginning of the product design and so that you are designed the product in such a way, so that it is easy to recycle.

So, your job actually becomes much bigger you have to understand other things too. You have to understand the process, you have to work with the chemical engineers, you have to work with the mechanical metallurgical engineer to come up with solution, so that it becomes easy to recycle, it is easy to recover. So, your rather than being a reactive engineer you will be a proactive engineer. So, the nature of job will change and those kind of things are not taught in any engineering colleges right now.

Because see we always hear about that future problem will be different, so how can people who are, who were trained earlier can teach to a student for the future problem, so that is always very interesting. So, as a instructor we also have to keep up to date, we have to learn things, we have to think, look at what, how the things are changing over time. We just not the bookish knowledge which is important, it is the skill set, it is the thinking which is important rather than just the route memorization.

So, it is a it is not that you just get my slides and get the reading materials you mug it up and do this NPTEL exam and get a nice certificate and that is it, that is not what should be the motive? The motive should be that yeah I want to, I want you to start thinking and that is what the whole purpose. So, that this whole this that, because we do not know much about how the circular economy things will pan out and how things is going to work in the economy. So, there is a lot of learning, but we have to, somebody has to really be smart and start putting things in perspective.

So, we will try to, the goal here is to design out waste, we do not want a waste, so we have to take the waste out, and also pollution, so we have to take the design and waste pollution from the system. Now and the key products and materials in use; we do not want the products to be discarded, we do not want materials to go, I would like to be put in a landfill, we want them to be back into the economy, we want to regenerate natural system. So, we have to work as mother nature works. In mother nature, there is nothing called waste for most part.

One process waste becomes feed for another process. As if you look at carefully, like one process says waste becomes a feed for other process that is how the mother nature works, there is no really waste being produced in the mother nature. So, that is what we are

trying to recreate. We want to create the natural system in our industrial system, which is not that easy, but that is why we need thinking engineers we do not, we do not just want memorization people which you can just memorize things and just to spit out in the exam and that is it, we want people, who can think, who can innovate, who can come up with the ideas.

So, that is what is needed in future, that is what this, that is what we are going towards in next 10-15 years, the whole economy will become a circular economy concept. We have to go that way, we have no other option, because our resources are limited and this is the future where we need to end up, and people are already started working on it, TU Delft in Netherlands has a huge project going on with several companies funded that project, and that its that is one example which I know of there are several areas where people are working on. Even at IIT Kharagpur we are trying to do some work in terms of circular economy concept, resource recovery from organic fraction or municipal solid waste, where I am like I myself is doing some work with some of the PhD students.

So, this concept is already there and then future engineers has to bear embrace on this concept, we can we cannot get away with that now, it is already its needed, and redefine growth and focus on positive society wide benefit. So, remember that social LCA. So, you have to look at the society wide benefit.

So, you have to redefine growth, because we always, we are so much fascinated about this GDP numbers, and I always think that what that is what is this GDP number is all about we may have high and high GDP being produced, but if there is no jobs, if the water is a still we have, still have to rely on this water filter companies and not, I cannot go to a tap and open the tap and drink that water like they do it in Europe, in many of the western European countries what kind of GDP or even if we have a great GDP numbers what does that mean to me nothing.

So, I should have it is the quality of life that needs to improve, I should have access to clean air, I should have access to clean water, I should have access to clean soil. So, that is what we will, and people should have jobs that is what it is about, what is this would be the focus. And, so that is the way, we have to redefine the way we define our growth what does what we mean by growth. So, that is, and focus should be on the positive society wide benefits, so that is that is important. And gradually decoupling economic

activity from consumption of finite resource, that is very very important; like decoupling of economic activity from consumption of finite resources.

So, we have finite resources, any resource which is there which we are using it most of it, which is there on the periodic table, they are there, some of them we call it abundant, some of them we call it is scarce, but it still even the abundant has a, it has a limited that limited could be a like a bigger number, but it still at some point of time we will be running out of that too. So, we want, so there are resources are finite, we have finite resources. So, we want to decouple, we want to decouple our economic activity which is very very important concept. So, we do not want the economic activity to defend on resources.

So, every time we want to build and then we have to mine. So, thing is that, no we have to we can, whatever is the resource already there in the system we want to recycle, recover, reuse, so that is what the whole concept of decoupling of economic activity from the consumption of finite resource. So, that is the whole concept and that is because, because the mining is becoming costlier and the resources are limited, our population is going up, affordability of the population is going up. So, we need to start thinking in terms of secondary material, secondary material which is as good as the original material, so that is where the focus of research and innovation lies where we can recover.

We have take the material which is already there in our which have already mined from mother earth and let us use it multiple times, and that is what we need to do and that is there and we do not have to go and kind of get more and more of material from the mother earth, so decoupling of economic activity. And moving to the renewable energy sources where we rather than fossil fuel based sources, we have to go to energy based sources.

So, that is we want to go for transition to renewable energy sources, so that is important. And build natural social and economic capital which if you look at earlier which kind of talks about what sustainability was all, the buzzword of sustainability all that is there for quite some time that also talks about social economic and environmental. So, this is natural is your environmental, economics and social. So, you look at all these three aspects and come up with of your the concept of circular economy.

So, circular economy is nothing, but kind of a another version of sustainability, more clarity is there. So, as you can see over here we want to design out the waste and pollution from the system, keep using the products and material, regenerate, try to mimic the natural environment, natural system, try to redefine the growth and look at the society wide benefit, gradually decoupling the economic activity from the consumption of finite resource transition to renewable energy source, build economic natural and social capital. So, all those things are again similar stuff that we talked about in sustainability as well, but here we are right to put more clarity in terms of the whole concept of circular economy and this is what the circular economy is all about.

So, that is what like we need to kind of focus on and that is where the future is. whether we like it we do not like it many times as a human as man as a human race we are lazy people and we do not, we always like to stay in our comfort zone. So, we have to. It is time that we need to go beyond our comfort zone we have to start doing things a bit differently, because that is what the nature demands from us as of now.

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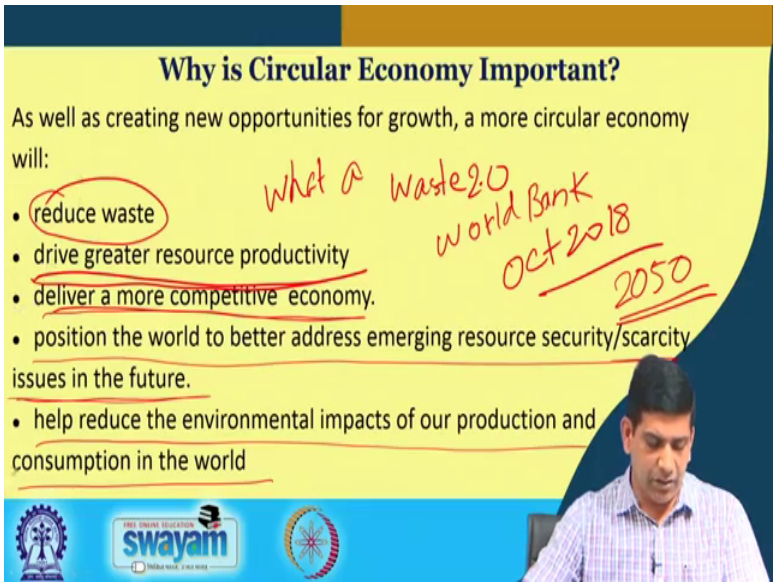

Now, why it is important, it will it is a, it is a new opportunities for growth it will create newer opportunity, newer kind of job and it will also relate to reduction in waste as you can see, reduce waste which is waste we are kind of having a huge problem with waste management issues which we talked about in our other NPTEL course which is offered in July, again it will be offered this year. So, those of you are interested in waste

management can take that course as well which is already I think announced on NPTEL website, have to be offered from July onwards and there we talk great detail about the waste. A newer report has come if you go to Google and you will let us find that report on what a waste 2.0, it is what a waste 2.0.

So, if you if you go and Google this you will find this is a world bank report, and we just came out in October of 2018, it is October 2018, this report came out around Diwali, Durga Puja, those Dussehra time. And this report kind of talks about in, how the waste situation will be in 2050 and which we will be talking about this in that other course in the waste management course, but you can look at this report and there are some videos associated with that you will find on YouTube as well.

So, it is that is the it is, so we have to reduce the waste, we are producing a enormous quantity of waste on this planet right now as with our human activity. So, we need to reduce it; otherwise we will be in. We are already in a lot of trouble, you saw that hole the plastic waste getting into the ocean and all that, plastic waste getting into the rivers. And so, that is why, there is a lot of activity lot of activities are going on in terms of preventing that. So, these are all reactive approach.

So, now the time has come with the circular economy concept is to become proactive. This whole concept of circular economy is to have a proactive approach rather than reactive approach. The waste management system is more like a reactive approach, the concept of circular economy, sustainability, lifecycle analysis as they are green engineering, pollution prevention, different names, but similar concepts they are proactive approach. So, that time has come for us to go for a proactive approach

So, it will reduce the waste, I try to have greater resource productivity. So, we try to for the productivity from the resource deliver a more competitive economy. So, we try to have a economy which is more competitive. We try to position the world to better address, emerging resource, security, scarcity issue in the future. So, we put things and address emerging resource security is scarcity, because we are having resource security in scarcity issue and help involve reduce the environmental impact of our production and consumption in the world. So, that is why this circular economy a concept is important

And plastic waste and plastic being one of the important component of the waste management; 12 percent in India of a municipal solid waste is plastic waste, that is what

the reports are suggesting in recent times. We also have done some sampling in several cities as part of the smart city program, and we did sampling in Vizag, we have done sampling in Guwahati and some other cities as well and we also found it was around similar number, it is around 12 percent of a municipal solid waste is plastic waste; that is a lot of plastic waste

If you think of 12 percent by weight, so by volume it looks much much bigger, because plastic traditionally those plastic which shows up in the dump site are the lighter. And so these they are huge amount which shows up in those in those dump sites. So, we want to reduce that

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Now some examples of how we are trying to reduce this waste and how people, how several companies are going towards circular economy concept. So, let us start with Unilever which is a what. We will go over some of these case studies in terms of different companies out there.

So, in Unilever they are making some steps towards a circular economy and so it is so, there is as it says that no business can create the circular economy in isolation, it has to be, circular economy has to be created. So, there are again they are looking at five broad areas; one is rethinking how they design their products, because lot of plastic is used, so how to design the product. Now, deriving systemic change in circular thinking at industry level and working with governments to create environment that enables the

creation of circular economy including necessary infrastructure to collect and recycle material. So, that is because you have to bring it back into the economy. So, you have to collect those material, so that you can bring it back.

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So, that is some of these steps that company the Unilever has started working on and they are working with consumers in areas such as recycling to ensure they are clear on different disposal method. For example: recycling labels, collection facilities, exploring radical and innovative approaches to circular economy, thinking through new business model. So, it again it is a disruptive model, they its, there has to be some disruption in the traditional economic model and to introduce the circular economy concept and right, but at the same time you need to make it convenient for the people.

So, you have to make it, you have to convey information in a easier way for people to understand. So, they are working with the consumers in area to ensure that the consumers are clear on the disposal method. For example, there are recycling labels; 1 2 3 4 5 6 those labels which is there that should be mentioned very clearly on the products. And, in terms of collection facilities, say an example such as waste bank in Indonesia, where they are helping create waste band. So, people can deposit their waste in there and then they get some incentive in terms of some certain to either monetary incentive or other sorts of incentive which helps them, it encourages them to participate and of

course, they have to every, like radical innovative approach needed in circular economy which we have been talking about in this video and in other contexts as well.

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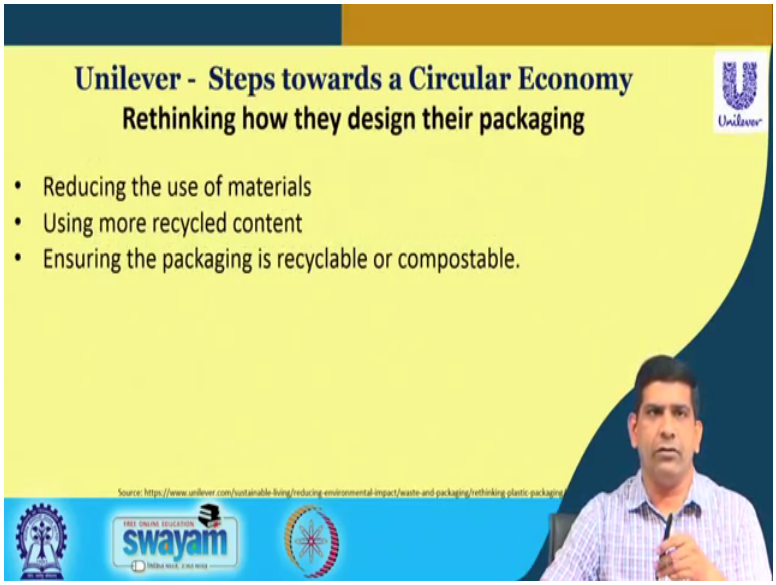

So, what Unilever is trying to do, they are they are rethinking how they design their package, they are trying to reduce the use of material, using more recycling content, ensuring that packages recyclable or compostable. So, these are mostly if you think from a from a just from a common sense perspective as well these are what you would expect you to as to do, like a reduce the use of material which is happening, packaging is getting lighter, more recycle content and more like a recyclable and compostable material.

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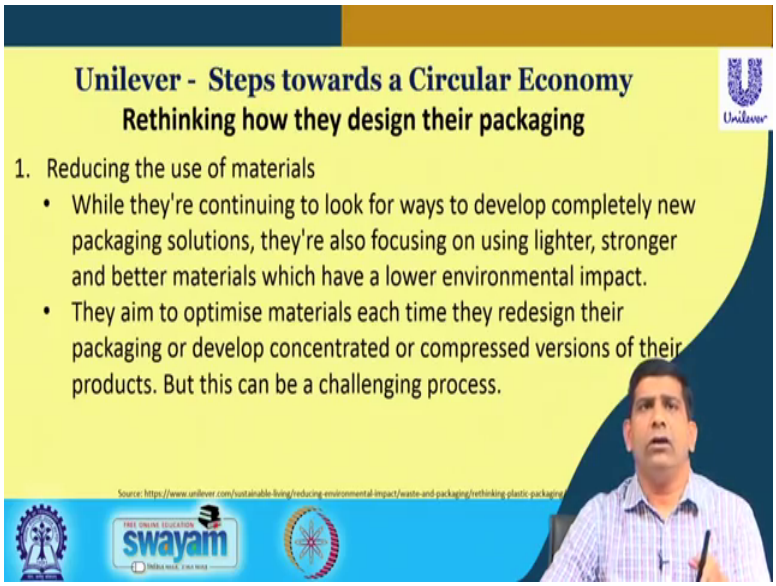

So, in terms of reducing the use of material they, while they are looking at ways for developing completely new packaging solution, they are also focusing on user lighter material, a stronger material which can be reused or recycled easily, better material which have lower environmental footprint. So, when you try to go for these, again the analysis something like LCA becomes important, because when I say lower environmental footprint lower environmental impact I need to quantify that and that can be done using the tool of LCA.

They aim to optimize materials, each time they redesign their packaging or develop concentrated or compressed version of their product, but again that is a challenging process. So, when they have to redesign the product of, take a compressed version of their product, so that, but again this requires some thinking some innovation.

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They also look at significant invest, they are put in significant investment in the amount of material in a pack, and even if you driven or one gram that that, because that leads to cost savings, that also leads to your transportation cost reduction. So, the return on investment is worth it. So, even if you the amount of material in the pack by one gram and when their innovations are certainly reduced the packaging and waste impact in the value chain that increases the material cost saving, and of course, increases the sales as well.

So, they are working with suppliers, academics, start-ups and other organization to develop new technologies, these ensure a constant flow of innovative solution. So, that is where the that academia engineering institute, students like you and people like me becomes very important in terms of whenever we try to going for rethinking of design. And I think the government also has a lot of programs these days going on in terms of Hackathons, recently we had this a smart India Hackathon.

And those all are focused on trying to have innovation with trying to solve tomorrows problem with the newer thinking; we have to think outside the box. Hence, Unilever is also trying to do that in terms of reducing the use of material, to trim up with innovative solution. So, that is where the future is, and where we have to kind of go beyond our traditional thinking. And just a traditional kind of root learning and question and answer and then you memorize the stuff, you take an exam, you get some marks, you get some

degree and you have a nice number on your transcript, but your transcript can take you only a little, you have to really have things on your head to go a little far.

So, with that message let us just stop at this video and then we will continue this discussion in the next video. So, again thank you for taking this course. We have now completed week 8, this was the third video, so another two modules left for you to go through and I hope you have enjoyed this course so far, and there is a lot of activity on discussion forum which is good. We are trying to keep up and trying to answer those within 24 hours and we will continue to do that. And any questions any queries, please do not hesitate to ask and we will be happy to help and take advantage of for the online sessions as well.

Thank you.