Strategies for Sustainable Design
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Lecture 40
Case 2: A Comparative Analysis of Product Design

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Hello everyone, in this lecture we will discuss about comparative analysis of product design. So, some actually messages here how this can be actually dealt with giving information because the measure actually challenges in like a today's time is about the lack of awareness about like several stuff. Mostly when we actually go for like a sustainability related actually issues and solving them then we will realize there is actually immense you know the gap the information gap is there between what needs to be done and what people actually know.

So, how this design actually how this actually the this you know this communication gap can be actually bridged, so there could be like a n number like a solution as you can see in this this image over here. So, how a simple actually cardboard box you know can communicate to its like a user or the handler like that it is not a piece of trash so it should not be thrown into the garbage rather it should be actually sent to the recycling unit.

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So, there is an immense actually need for the people to understand you know like how they can close the cycle. As, we saw in the like a previous slide a simple actually a product or simple actually an item of like a cardboard like a people are not aware and they throw it into the like a garbage bins and they actually get mixed up with the other like organic stuff and other like a material and it gets actually polluted and it becomes like even more like a confusing and like a challenging to segregate these pieces of like the materials the solid waste which are thrown from like any household or any like institution like a campuses, etc. or maybe a neighborhood.

So, that the closing the cycle so how this man this message can be actually given so that a lot of a huge amount of for this trash and this waste which is generating on like a daily basis can actually be taken care of at the unit level, at the house level itself. So, that it does not ends up in the like a wrong place you know creating a huge actually amount of this waste which becomes like a (()) (2:22) to actually handle.

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So, some like what could be the actually objectives and approaches for like industrial ecology like if you are referring from these like a previous like a slide so a development of conceptual structures for the understanding and evaluation of that impacts of industrial systems on the more environment and for the implementation of strategies targeted at (()) (2:47) the impacts of products and processes.

So, this we must actually address because if you want to deal with the closing the cycles and like a handling a product once it is like a life like a one it is like a use is over. Further conversion of the linear structures of like industrial systems where raw materials are like usually transformed, used and dumped you know to a cyclical structure the one we which we spoke of in the previous illustration, where the outgoing flows of resources are used as input by other processes of transformation.

So, that a waste generated from like a one industry or one place can become the raw material of like another actually process. So, this is how we can actually close the cycle you know and prevent actually you know the immense amount of these garbage which is creating like a you know in there actually recent times.

Lastly harmonization between the processes you know making up life cycle of products you know between different interacting life cycles you know between the system of life cycles and

the environment. So, like a continuous movement of materials as the discarded material again using it as a raw material then again processing uses discarded, so this this will actually keep on going you know reducing the actually waste generated from like any of these processes which are adopted.

Thus, like it will save the environment like we have discussed in the chapter in the lecture of this pollution. A pollution is like a condition which was famously said by the Buckminster Fuller, a pollution is a condition where a resource is present at the wrong place you know. So, we must actually prevent the materials and the components and the items you know reaching to their like wrong places we must always keep them at the right places so that they can be used and they should not become actually a polluting identity for like others.

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Further, with these objectives industrial ecology proposes the application of an integrated approach to the management of environmental impacts correlated to the use of all the resources in place such as like energy materials, economy capital, etc. In the context of industrial ecosystems to optimize resource use Fa Frost and M Hara said managers need a better understanding of the metabolism use and transformation of materials and energy in industrial ecosystems, better information about potential waste scarce and uses and improved mechanisms you know markets and sensors and regulatory structures, etc. that encourage systems optimization of material and energy use.

So, this is how actually if we pay attention to the you know the material and it is like energy consumption and the kind of is like a worth in the like an economic actually market we can utilize it in a more efficiently while by closing actually you know the cycle of it.

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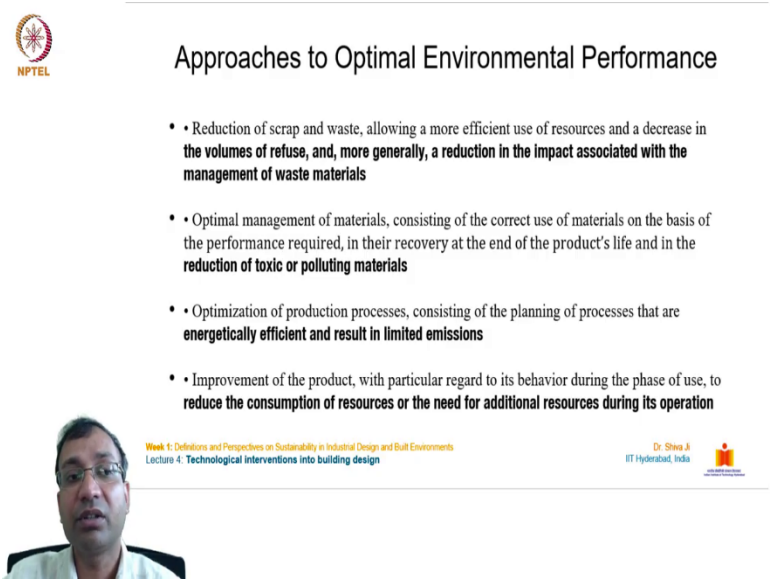

Well, what are the approaches for like optimal environmental performance so reduction of scrap and waste allowing a more efficient use of resources and a decrease in the volumes of refuse and more generally a reduction in the impact associated with the management of based materials. Optimal management of materials consisting of the correct use of the materials on the basis of the performance required in the recovery at the end of the product's life and in the reduction of toxic or polluting materials.

Optimization of production processes consisting of the planning of processes that are energetically efficient and result in limited emissions. Improvement of the product with particular regard to its behavior during the phase of use to reduce the consumption of resources or the need for additional resources during its operation.

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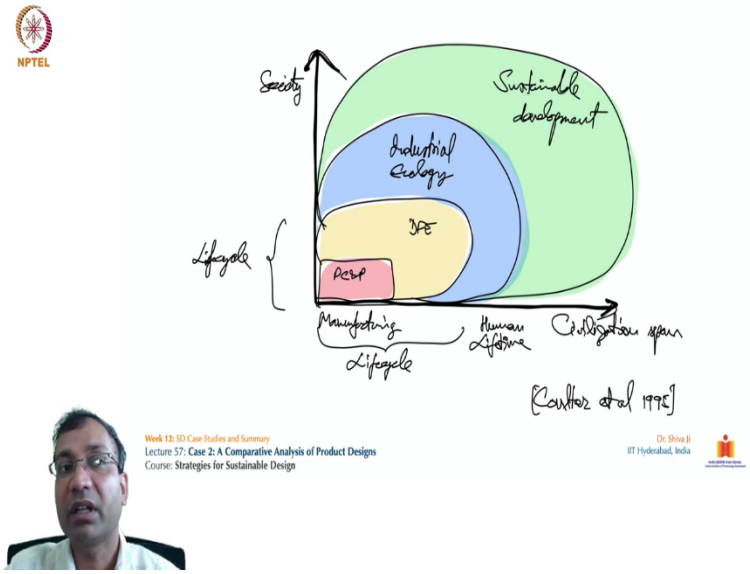

So, here if you see in this like illustration this speaks about overview and relations between concept you know tools approaches to the environmental questions and also you see like around this x-axis we have this manufacturing use you know disposal, etc like upper normal like a product life cycle. Then we have a relatively more than that a longer like a human life cycle you know life actually time like such as like a how a human like how long a human actually lives you know and then on the longer scale of this time, we have this civilizational aspect.

So, we have this civilizational span over here, so this is on the like a temporal extent and on the spatial extent we have a starting from like a short duration like a use you know product life cycle you know the manufacturing use, disposal, etc. Then we have industrial system which they actually produce this like industrial ecology then we have the overall like a society.

So, this is how actually it works like you know this product life cycle then we have this industrial ecology then we have this sustainable development. So, if we take care of like a such actually like you know the products and the material overall in such a way so that it sustains for a very long period of time that format will become like a sustainable actually developing actually model.

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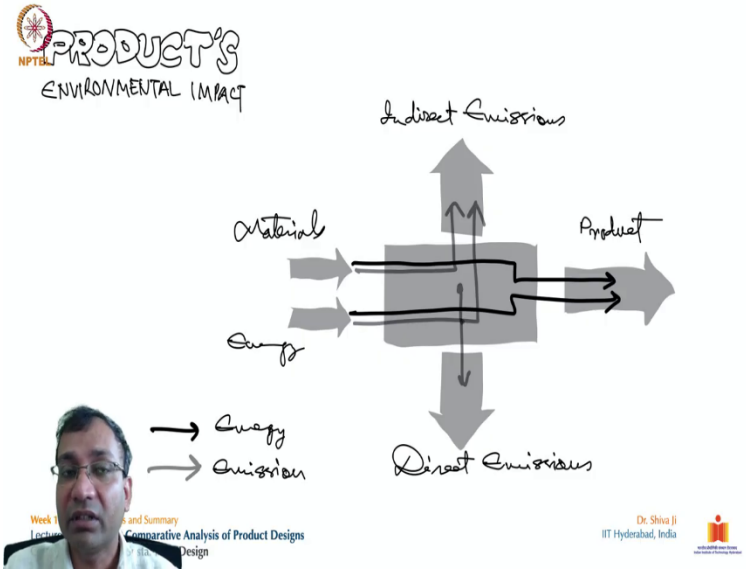

So, this is what it means from like this table over here and any actually system any like a product you know it involves you know certain like a consumption of material and the energy you know as you can see from this illustration it produces like a certain like a direct and indirect emissions while being manufactured while it violates and use and then we see actually the final product coming from here.

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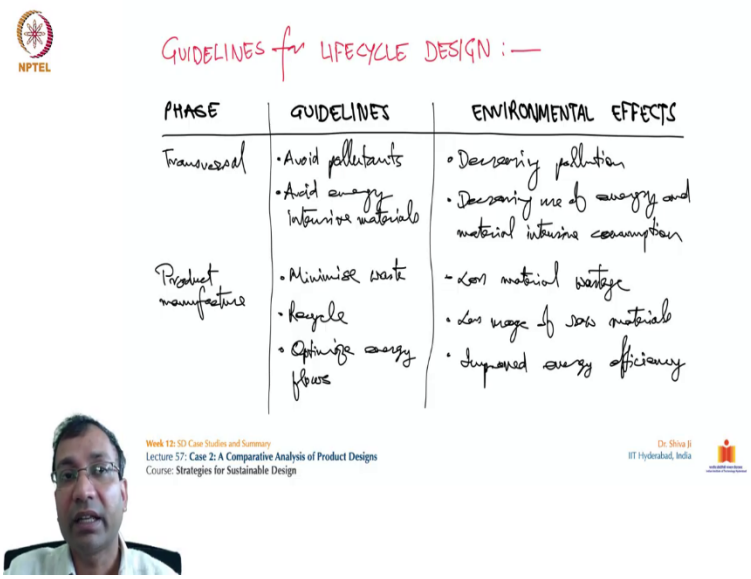

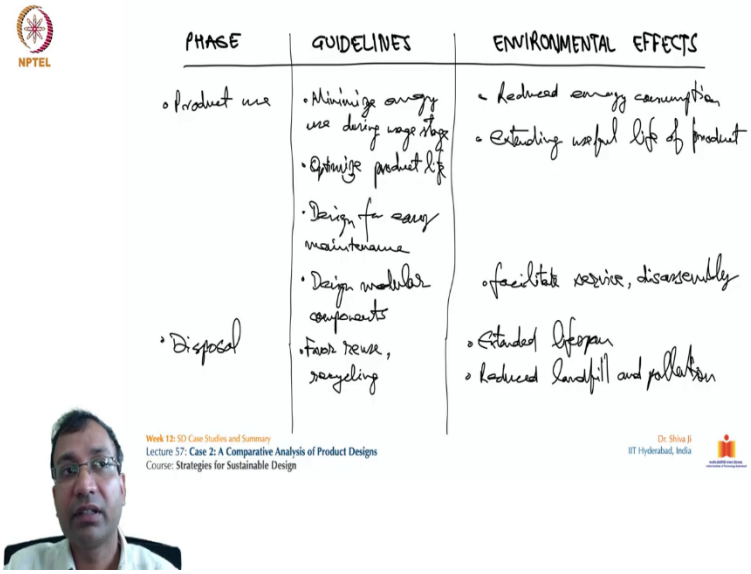

So, from here on we will discuss about like a sum like a life cycle design strategies on like a transversal you know product manufacturing level product use level. So, these are actually guidelines over here given this we have discussed in the chapter of in the lecture of life cycle analysis, but I have kept it here again because we are discussing we are going to discuss some actually product examples and before we actually go for those examples it is important for us to understand what kind of strategies what kind of approaches we are going to take you know to

address maybe one problem at a time, for example design for like a disassembly design for like a an extend actually uses of like a lifetime and etc.

So, these are the actually some environmental like effects caused by these are listed over here.

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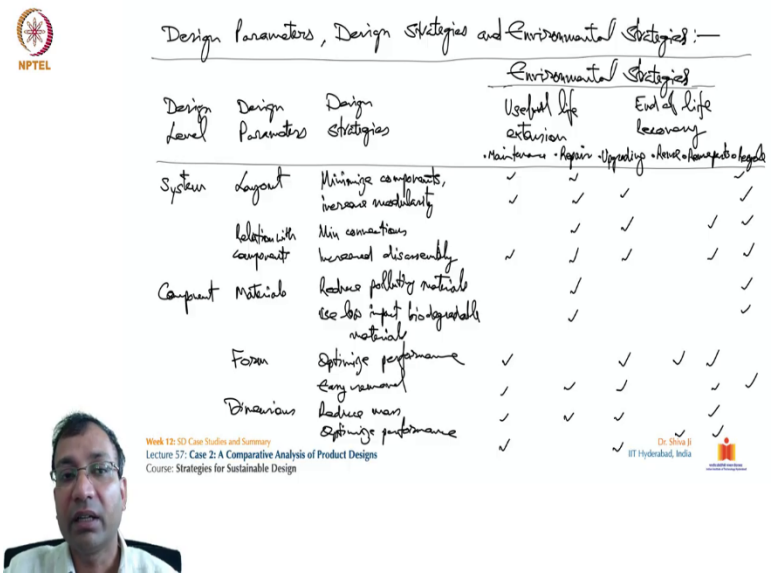

Further some like design parameters, design strategies and you know environmental strategies. So, like if you see at the system level at like a component level and also how like the environmental strategies of like a you know useful life extension end of life like a recovery may actually apply and how we can actually take use of these actual strategies and finally we will discuss about like influence of external factors and product durability over here.

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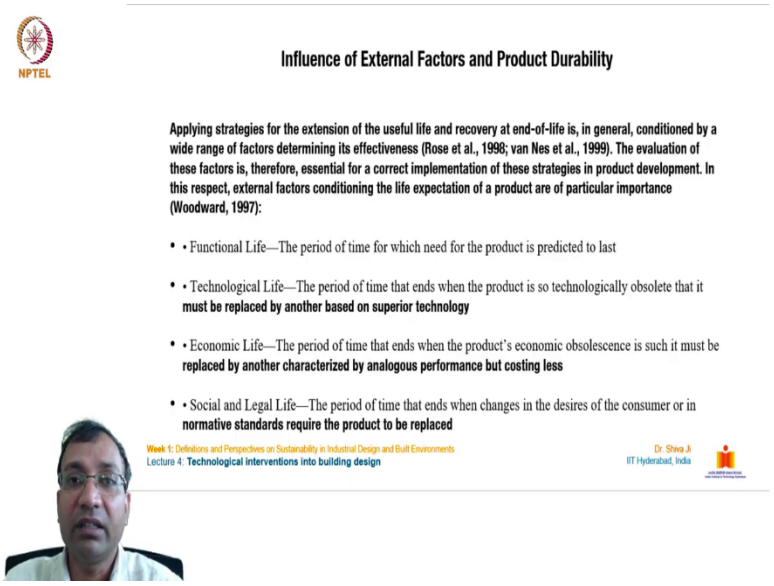

So, applying strategies for the extension of the useful life and recovery at the end of life is in general conditioned by a wide range of factors determining its effectiveness. The evaluation of these factors is therefore essential for a correct implementation of these strategies in product development. In this respect external factors conditioning the life expectation of a product are of particular importance you know so the functional life the period of time for which need for the product is predicted to last, the technological life, the period of time that ends when the product is so technologically obsolete that it must be replaced by another based on superior technology.

Economic life, the period of time that ends when the product's economic excellence is such it must be replaced by another characterized by analogous performance but costing less. Finally, like a social and legal life the period of time that ends when changes in the desires of the consumer are in normative standards require the product to be replaced.

So, these actually different actually lifespans mentioned for like any product from starting from like functional to technological to economic to like a social and legal life you know so one can understand like at what point of time and what at the which moment in the time you know on the like of this the passage of time you know product is going to like exist you know in any given condition and there may be another product which will actually replace the previous product you know in the like next time you know in the next time frame based on like a certain these are like conditions.

So, from here and onwards we will see some examples of like a product designs used by different designers you know across the world how they have actually tried to address the issues of like a sustainable development and how this consumerism can be actually addressed. So, we will see a wide number of actually application of the strategies which we have discussed like the previous lectures, fructifying in these actually through these designs.

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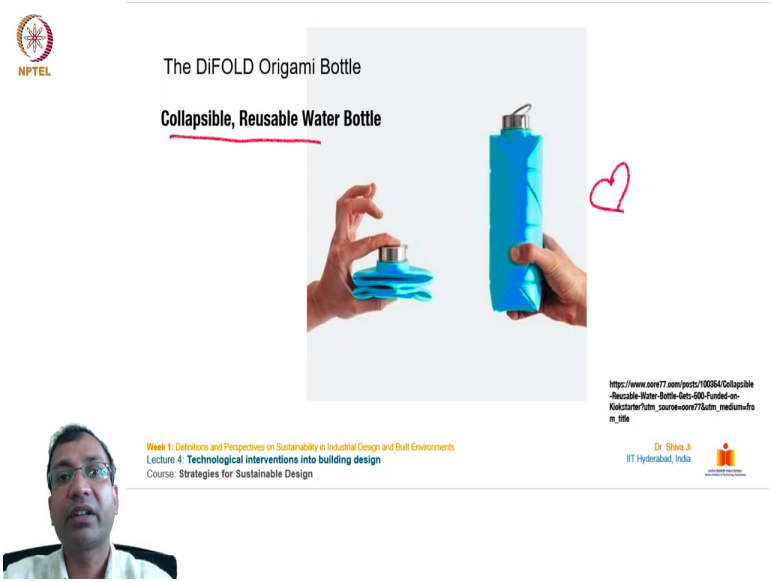

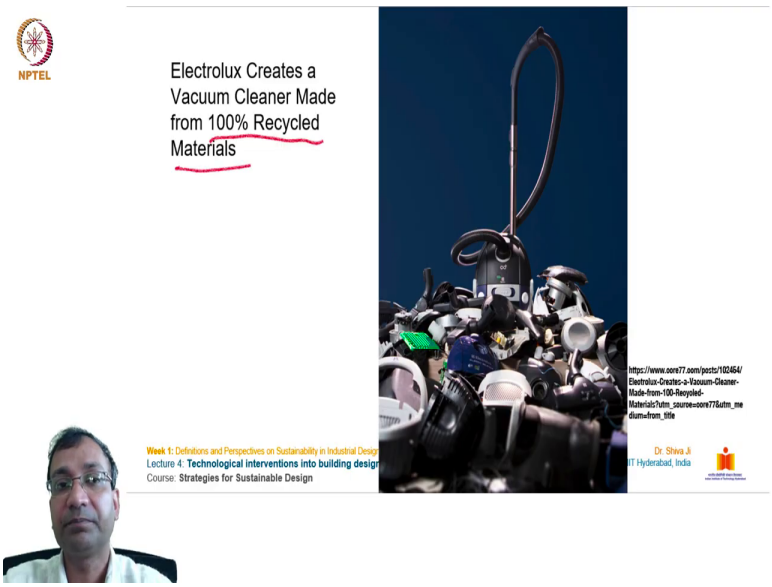

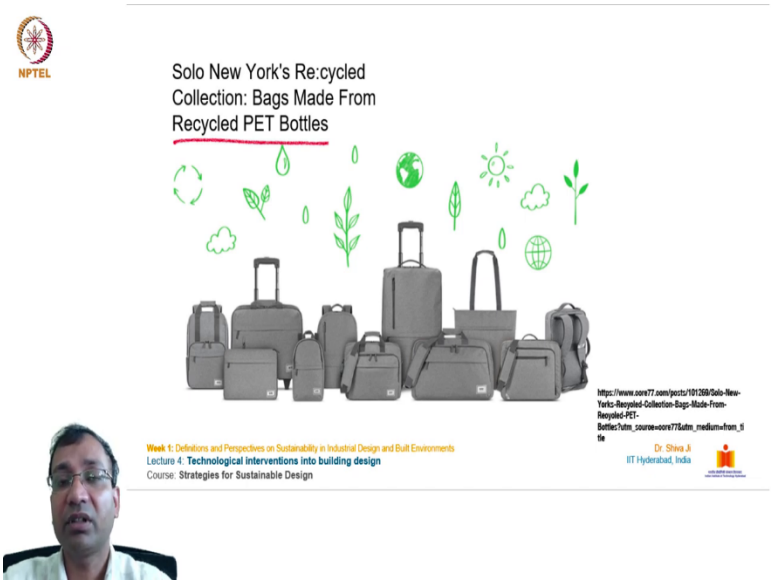

So, the first one here, this is an actually origami bottle which is collapsible and is a reusable. So, when this actually bottle is not in use or maybe the if you have exhausted the water maybe you can simply fold it and you can keep it inside your bag so it will not consume actually much space which it consumes when it is like a field you know.

So, the 1 liter of space can be reduced to maybe 50 or 100 ml of like space, so there will be a significant actually saving in terms of space up to like a 90 percent. Another actually example from like an Electrolux company you know so they have actually created a vacuum cleaner made entirely from like recycled materials up to like 100 percent. So, you see like a this is the actually consciousness and the effort given by a company which has resulted into a product which is a 100 percent actually recycled.

This next one if you see this is a like a recycled connection you know bags made from like recycled PET bottles these PET bottles which we usually we keep in our like houses in our like refrigerators for drinking or like a cooling waters and also that is one of the actually hardest materials to decompose and degrade on its own you know it takes a very long actually period of time for that bottle to actually go away completely from like a it is like existence in the nature.

So, how these bottles can be actually recycled into like making some other products so this is one of the actually best examples entire actually product range is developed out of these PET bottles.

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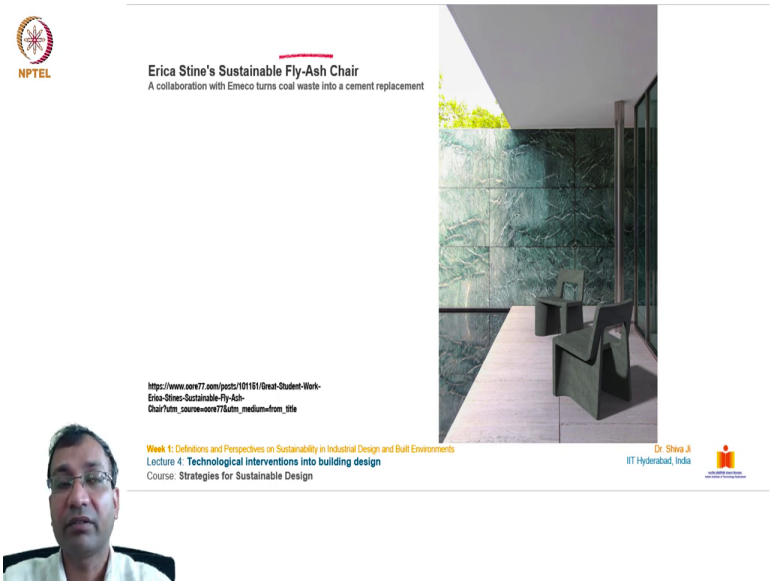

Further we have seen actually fly ash bricks you know which use this fly ash which is actually a by-product of liquor this is a thermal industry which are run on like a coal. So, how this fly ash can be further utilized into different other actually products other like you know things for following like creating those things. So, this is one of the examples you know these are outdoor chairs are actually casted into from this fly ash actually the material.

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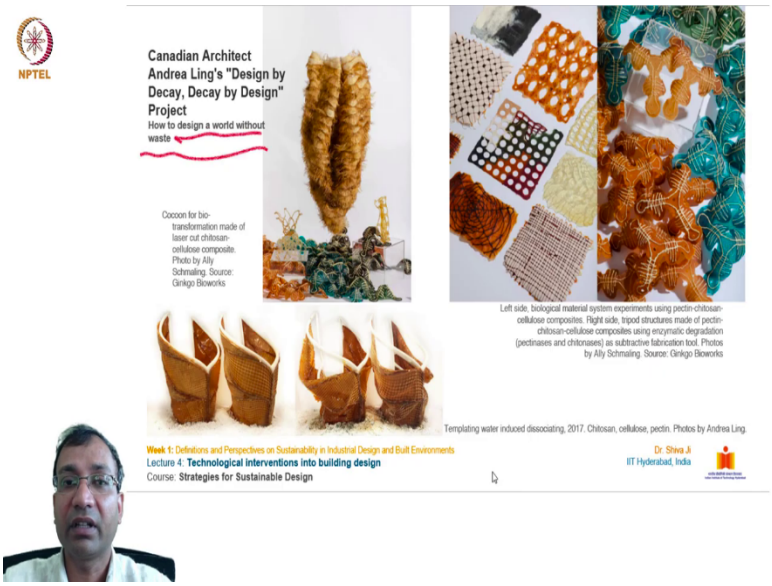

For that we have this beautiful example over here this is from like a Canadian architect Andrea Lings designed by decay, decay by design project. So, you see this material you know so how to design a world without waste, so that is actually motto that is the entire actually the main actually theme of this project and this artifact what you are seeing in front of you, you know so this is a cocoon you know for bio transformation made of like a laser cut chitosan cellulose composite for to buy like a (()) (14:33).

So, you see like this material uses you know these natural ingredients so and over the time you know it decomposes it just goes back to the nature you know as like organic material. So, how beautiful it is, it is like a natural material you know replicating the natural actual system we have discussed earlier.

For example, when a tree or a plant actually dies it falls on the ground it starts decomposing and decaying on its own without leaving any like a toxic like you know effluents or any like a toxic emission. So, this is how this product also will be having once it is like discarded once it is left over you know once it is left in the like a system.

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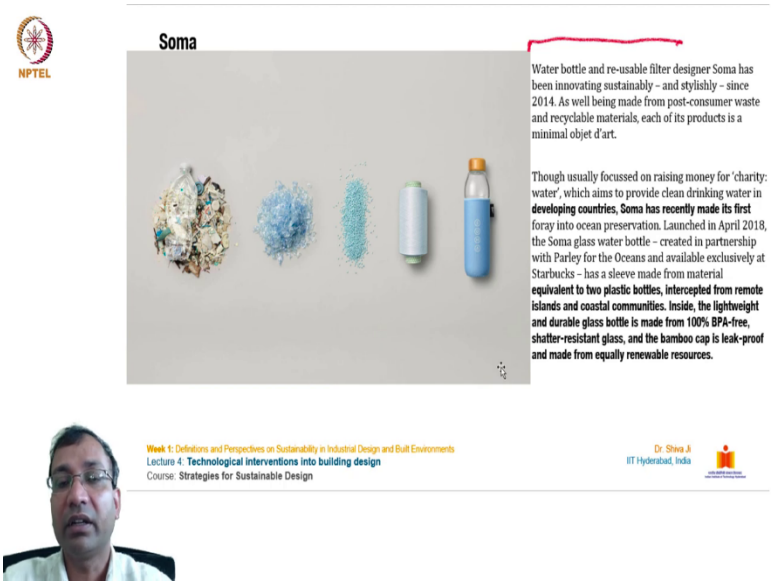

Further we have this water bottle which was also actually manufactured from the actually completely waste which was the actually collected from the like a garbage you know outside. So, further like you know segregation of these are different materials you know creating again these individuals actually these are threads, these plastic beads you know the other materials like a glass etc., and recycling them to create like you know again the new water actually bottles. So, this is one of the actually a beautiful example (()) (15:44) for reusing actually the material reusing the waste you know.

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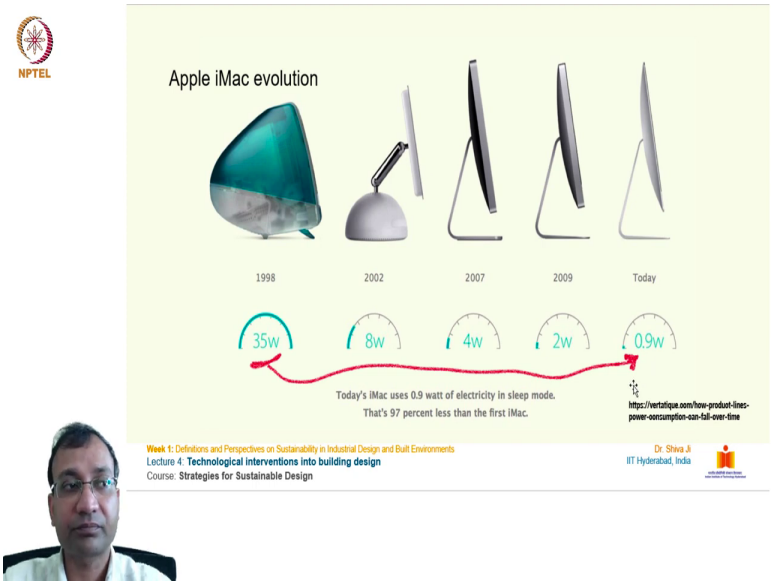

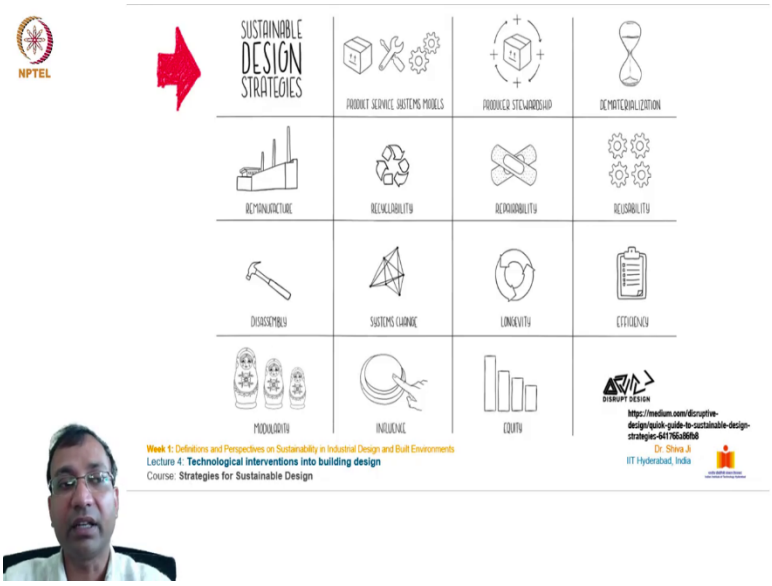

Another example here, so in this one actually talks about the like the Apple computers this I mac and how like they have actually managed to reduce the power consumptions once the computer is in sleep mode. So, from consuming like a 35 watt in a year 1998 you know in the recent years it has the power consumption while the computer is in sleep mode is reduced to like a up to like a 0.9 watt resulting into like the power saving at like a huge scale.

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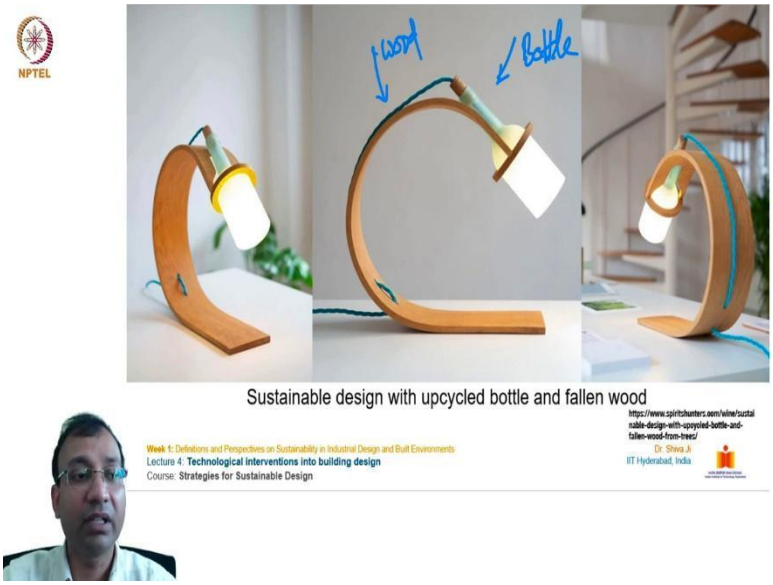

So, here are some beautiful examples like how actually repurposing can work you know to create actually interesting designs. So, you see here like this is upcycled bottle and fallen piece of like a wood how they have been like utilized for creating this interesting design of like a you know this a table lamp you know. So, it is all like there is actually you know need for this ingenuity and creativity to adopt actually such discarded actually materials you know to repurpose them otherwise they will be simply thrown and they will become like a part of the garbage.

So, we must actually you know put in us like creative thoughts together and think of actually applying some like a way to repurpose actually these discarded materials because they are very much fit for like a you know for like a several other types of like application even if they have like a you know exhausted their functional life.

For example, this water bottle if it has served it is like a liquid it is contained you know now it has become like a useless, so like how it can be like a repurpose so the second is like it can go for like a recycling you know it can go back to its like origin of the original factory and then you can again fill in the same actually liquids the same content and can come to like you know to the to the shop. But again, if we fill if you can actually rework some kind of like a repurposing so one of the actually beautiful examples in this actually slide.

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Further if you see like we have this shower pad, so usually we take a this longer actually you know sometimes we end up actually using showers for like a longer period of time. So, how we can actually pre-program it so that it reminds us like how much of water we have actually used in taking a shower and also one of the examples taken over here does exactly that thing.

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Further how this fresh rain water actually can be utilized for you know with the simple actually process of filtration can be actually repurposed for you know the direct actually consumption you know so this is one actually a visualization you can see over here you know the rain water which is coming from the terrace is going directly into the water bottles it is getting filled you know and it can be actually taken by the users.

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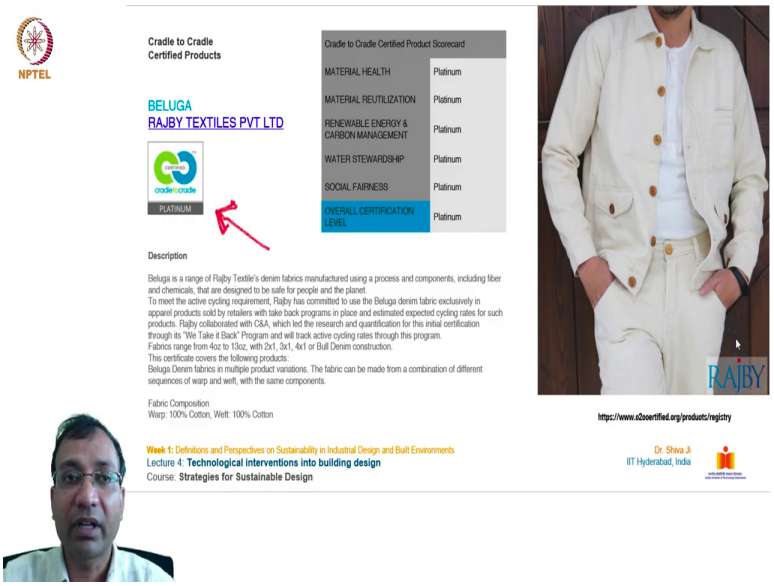

Further there is this cradle to credit actually certified actually products you know which are being actually made in different parts of the world. So, this is one example of like this company you can see the brand name is like a Beluga the company's name is Rajby Textiles Private Limited. They have received this cradle-to-cradle certification of like the platinum actually and the bifurcation if you see of this cradle-to-cradle certified product scorecard, so the for the material health all they have received platinum, material reutilization, renewable energy and carbon management, water stewardship you know social fairness.

In all of these they have received actually this platinum category and in overall certification they have received the platinum as well. So, you can see this the design and the finished over here from any angle it does not looks like that it has come from like a recycled actually source. So, how the value actually can be created from like going for like such methods so there are some more examples I have taken from this site you know which provides this certification of like a cradle to cradle actually certification for the products.

So, in this one like the company actually makes this a range of like this piping solution soft like a different diameter and it is like a joinery etc. So, this has also received this a cradle to cradle a gold actually certification you can see over here and also and the material health well the material health is like a has a scored is a platinum.

So, that means the material which was used in this product is of the excellent condition and in the excellent actually quality, so it shows like how much of potential these actually materials have which are like a simply like a discarded or like a thrown at them like a first use. So, how well these materials can be reintegrated into the system is the purpose of actually this cradle to cradle actually certification to promote actually such products. So, we must actually strive for achieving like a such levels of like a you know functioning of these materials.

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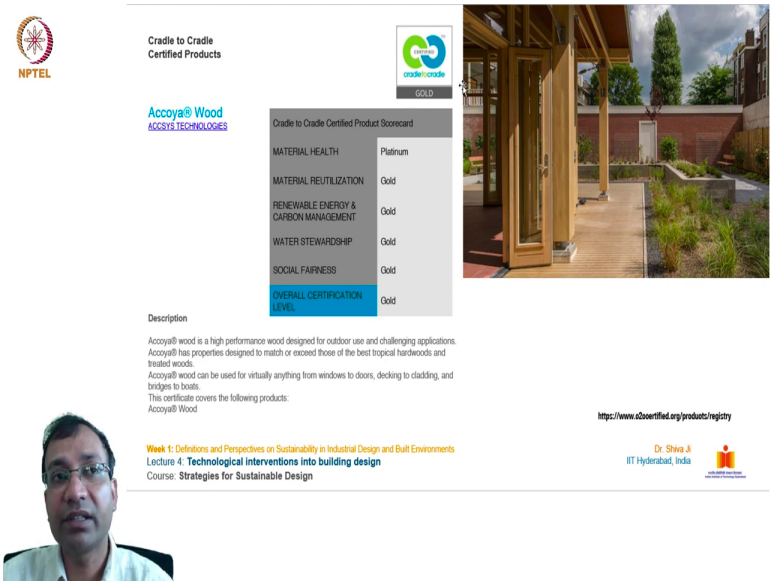

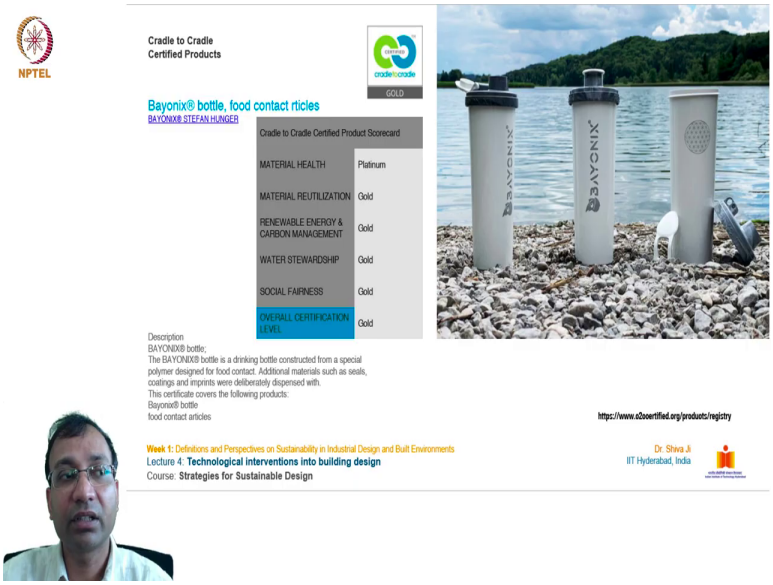

Further we have another example of this wood, you see over here the picture. So, this has received again like a gold actually certification. We have another over here like a food grade actually bottles, so this has also received this gold certification. Then we have these the other like a liquid actually containers this for cleaning agents or you know some other types of like detergents, etc.

This also has received this gold certification it shows like there is immense like a potential you know but we need a system in the place and we need actually this actually a mechanism in the

place and first of all we need to have that intention that yes, we are going to do this. So, once that is there of course it is not impossible to go for like designing such products you know.

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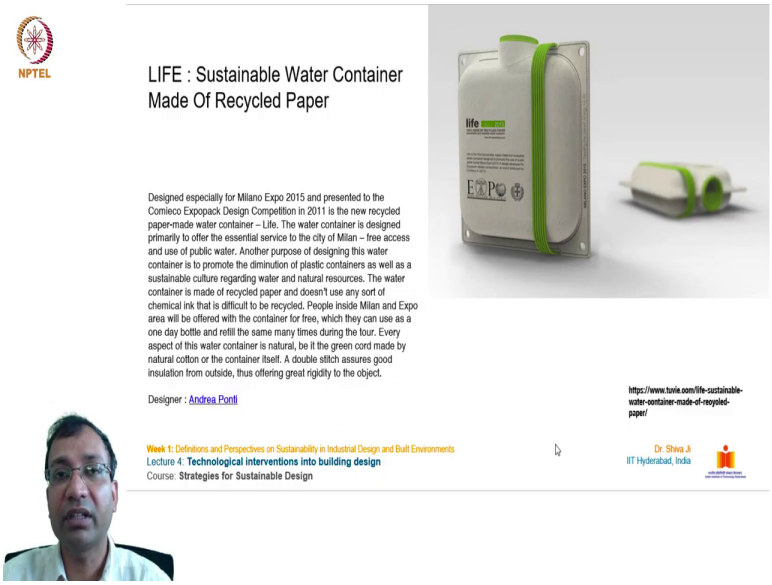

Finally, we have this example of like a sustainable water container made of like a recycled paper. So, you see like a with this like a look and feel and the overall like a design like a you know factor like it looks one of the beautifully designed actually products but it is made up entirely from this like a recycled paper. So, and again once like it is discarded and like a used it can go back again for like some kind of like repurposing and reusing in the like pulp industry.

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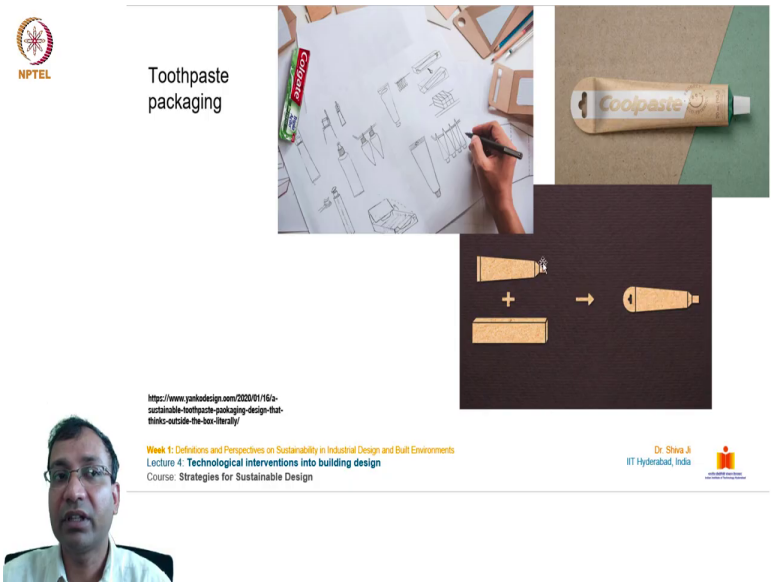

Further we have a this actually toothpaste packaging solution, so why to need this actually external carton because this this actually facilitates the storage and transportation so without this also this can be actually stored and transported. So, like how this component is actually completely like a you know removed from this actually the packaging of this toothpaste you know so you see from the here like a designers like angle you know like how they have actually come up with this solution and this material actually the choice of the material.

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Next, we have a this actually a bottle which is created out of this you know material, so this is taken from like the algae. So, algae is like a naturally like a occurring actually material and you know so once it is like a discarded you see this gradation shown over here it goes normally back to it's like a you know decomposed form and finally it disintegrates into the soil and it goes into it is like a molecular actually form. So, such like organic materials you know can be actually taken ahead for like you know designing like a several types of like a consumerism like a product which we use generally in and around us you know so which will benefit actually the overall like ecological actually quotient.

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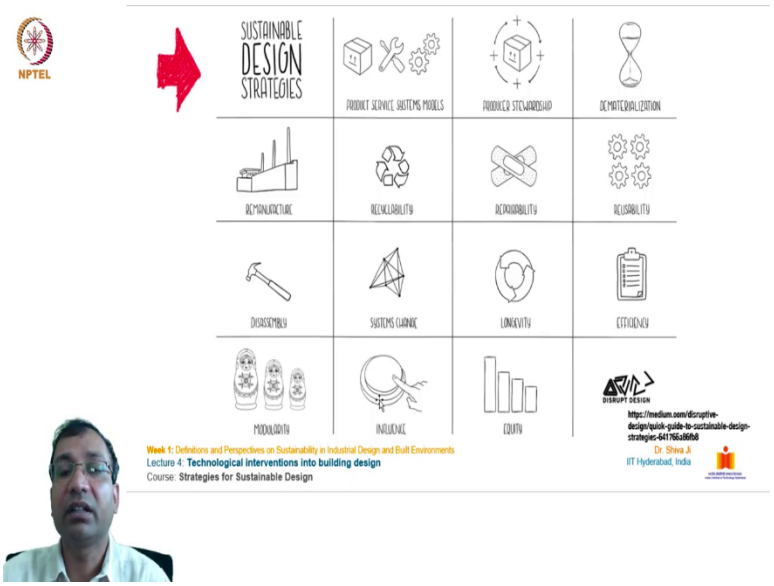

So, as like a giving a direction to the like an adopting the strategy for like a sustainable design you can see over here. So, like a designing like a for a product cervix system like models which we have discussed in the lens chapter, designing for like a producer like a steroid shape, designing for like a dematerialization how to minimize the consumption of the material or the components you know designing for like remanufacturing, recyclability, repairability, reusability you know disassembly, system change, longevity, efficiency you know modularity, influence and equity you know.

So, these are actually strategies one can understand if you keep in mind even one and design your product you know design your actually project you know there is a huge chance of actually you know positive impact on the system you know minimizing the actually negative impact. So, with this lecture we tried to understand the kind of efforts you know given by designers and manufacturing companies from across the world how they are doing it, how they are dealing with this sustainable development in their own ways.

So, this is worth actually replicating, worth propagating we must actually understand this lesson from this actually lecture.

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So, the next big change coming in design what I see is this circular rigid design. So, you must keep this message in your mind you know with this we have come to the end of this lecture, thank you everyone.