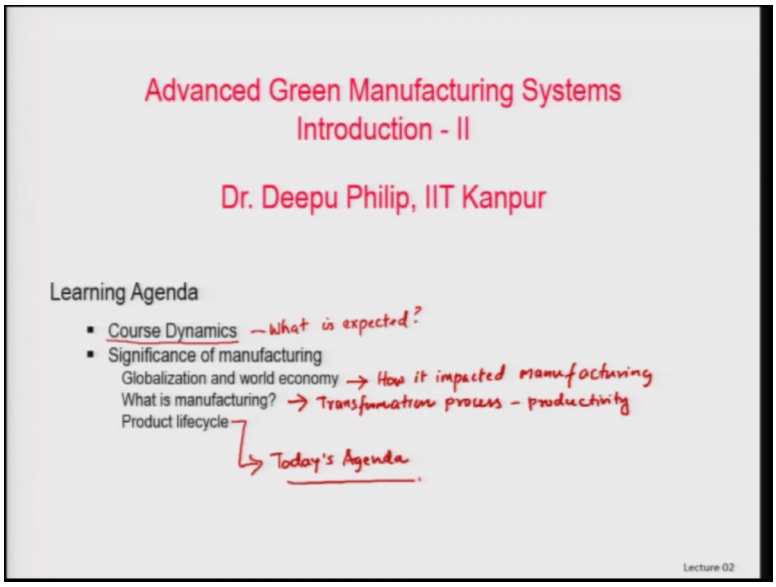
Advanced Green Manufacturing Systems
Prof. Deepu Philip
Dr. Amandeep Singh Oberoi
Department of Industrial & Management Engineering
Department of Mechanical Engineering
Indian Institute of Technology, Kanpur

Lecture – 03
Product lifecycle

Good evening, welcome to the Advanced Green Manufacturing Systems course and I am Dr Deepu Philip from IIT Kanpur. So, we are trying to complete the introduction lecture today and the earlier we have seen the major aspects of this course as the course dynamics what is expected out of this course.

(Refer Slide Time: 00:29)

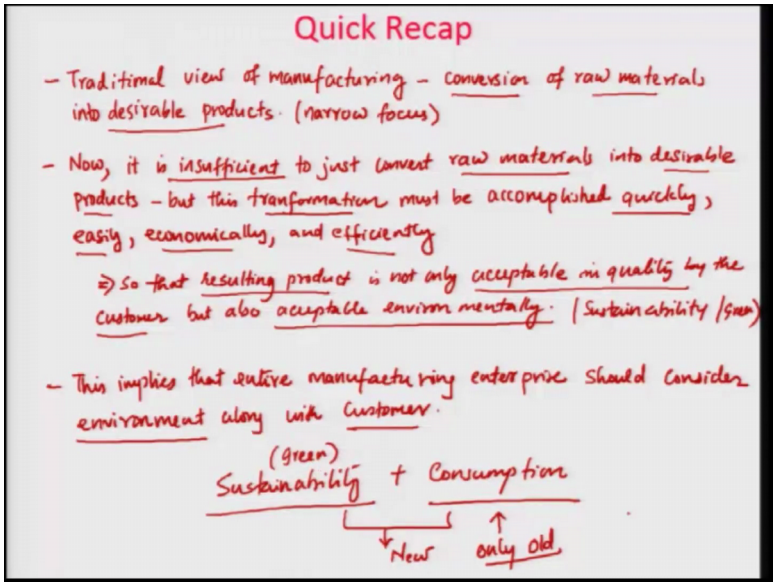


So, we have decided or we discussed what is expected and then we have already talked with significance of manufacturing and we talked about globalization world economy and how it impacted ok.

We did this and we also talked about the manufacturing what is manufacturing and the transformation process and why is this transformation process is important and we also talked about the productivity and the need of sustainability in this regard. So, these aspects we have covered in the previous lecture and now what we are going to talk about is the product life cycle.

This will be today's agenda mainly and with this we will be completing our lecture for green manufacturing systems.

(Refer Slide Time: 01:27)



So, if you do a quick recap of what we have learned so, far traditionally we learned that traditional view of manufacturing ok, this is something that we learned earlier the traditional view of manufacturing. What is the traditional view of manufacturing?

Conversion of conversion of raw materials into desirable products, raw materials into desirable products desirable products ok. So, the traditional view of the manufacturing is all about the conversion process of raw materials into desirable products and we have already seen why this is a narrow focus approach because the only is focusing on the consumption approach.

Now what we said is that now the latest times it is insufficient; it is insufficient to just convert just convert raw materials into raw materials into final into desirable products. In the present day world this approach is not sufficient, but this transformation the transformation to transformation from raw materials to finish products must be accomplished. You must be able to accomplish this must be accomplished quickly should be able to do it in short time period easily ok, economically cost effective way and efficiently. So, we just do not want to convert it from raw materials to desirable products that is insufficient it is not sufficient just to do the conversion.

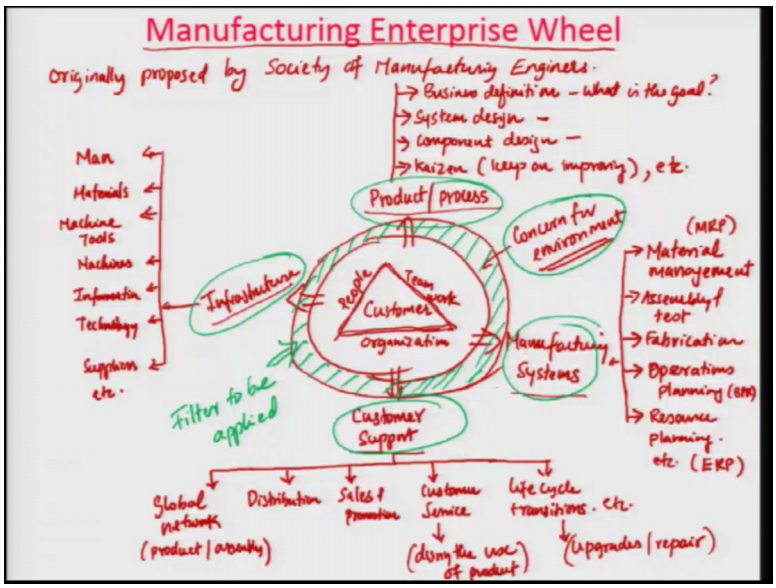
But this conversation or this transformation should be accomplished quickly easily economically and efficiently and why is this important. So, that resulting product the resulting product is not only acceptable in quality by the customer, but also acceptable environmentally. So, what we are saying here is that let the all these things need to be dones because resulting product should not just be acceptable in quality by the customer.

It is not just the customer acceptance of the product, but also the product should be acceptable environmentally or this is the new consideration. So, we call this consideration as the sustainability consideration or the green consideration or green consideration all right. So, the entire manufacturing enterprise so, this implies this implies that entire manufacturing enterprise entire manufacturing enterprise what do the entire manufacturing enterprise should do enterprise should consider environment along with environment along with customer.

So, you are not just focusing you know one customer you have to focus also on the environment along with the customer. So, this means a new focus will be sustainability plus consumption ok. So, overly at the manufacturing approach this was the old approach only old only consumption this was the old approach. The new approach is you combine both of these and these two it together will give you the new approach combined sustainability or the environmental or the greenest.

Sustainability we kind of use in this course green as a collaborative time for this all right.

(Refer Slide Time: 06:19)



So, now with this one all things that you are to think about it is there is a way to represent this whole manufacturing enterprise as a wheel, this wheel was originally proposed by originally proposed by proposed by a society of manufacturing engineers manufacturing engineers while this is kind of an all and compassing wheels, but the most important part is that there are some aspects there that need a relook into this.

So, as usual we know the customer is the center of this ok. So, I am trying to do a triangle and the three sets of the triangle you have people or man power and you have organization and you have teamwork. These three things with a customer in the middle they create an ecosystem in a way. So, that it interacts with the rest of the systems. So, you have one you have out of this is it interacts with the outside system in many fashions like this and then the outside systems we have things like product and processes.

Then we have what we call as the manufacturing systems and then we have also what we call as the customer support and then we also have what we call as the infrastructure ok. So, in this case the product and processes you can think about thus the there are lot of aspects there are associated with this one of them is the business definition what is your business going to do what is the goal.

Then the system design ok, then the component design, how would you design the system the product system and the manufacturing system associated with this then the you also have something called the kaizen or the continuous improvement keep on improving. So, these kind of things the product and the process will have is what is the goal of the product or what is the goal of the process what is the system, what is the product system, what is the support system, what are the components that are going to going to the product? And you keep on continuously improve in the system etcetera.

So, there are the major components, that actually goes into the product and processes, in the manufacturing systems the major part of this is this includes the material management. So, this is like the inventory another aspects of it, then we also have the assembly and test ok, then we have what we call as the fabrication; fabrication of components and subassemblies whatever you want to call those.

Then we have the planning of operations or ops planning operations planning and then we also have is the resource planning. So, these includes the material is management will probably include the MRP Materials Requirement Planning the this will resource

planning will include the ERP operations planning will be also the business processes reengineering kind of aspects fabrication manufacturing.

So, all these aspects will go into the different aspects of the manufacturing system ok, then we have something called as the customer support. So, I am going to do it this way and the customer support will include things like the first one will be the global network the global product process system network supporting this, then you have something called as distribution ok, then we have things like what we call as sales and promotion sales and promotion ok.

Then we also have things like a customer service and we also have thing things like life cycle transitions. So, what we basically talk about here is the global network this could include the product or sub assembly aspects distribution is the distribution of the product and the other and the support system aspects. Sales and promotion is how the product is sold to the customer and what are the promotion ideas as per to this customer service when the product is this is during the use of the product during the use of product and life cycle transition is once a product is gone that.

So, it is like upgrades or repair etcetera like this. So, these are all part of what we call as the customer support activities that is related to the manufacturing aspects and with the infrastructure aspects of it we have things like we start from here things like a people. So, we can call it as man or we call people is another way to think about it is then you have materials then you have machine tools then you also have machines or resources other term for this is resources machines is resources.

Then we have information ok, then we also have what we call as technology ok, then we have suppliers etcetera. So, these are all etceteras this is not the complete exhaustive list this list continuous. So, what we are saying here is there is a customer in the middle of the system and the people the teamwork and the organization really work together to satisfy the needs of the customer.

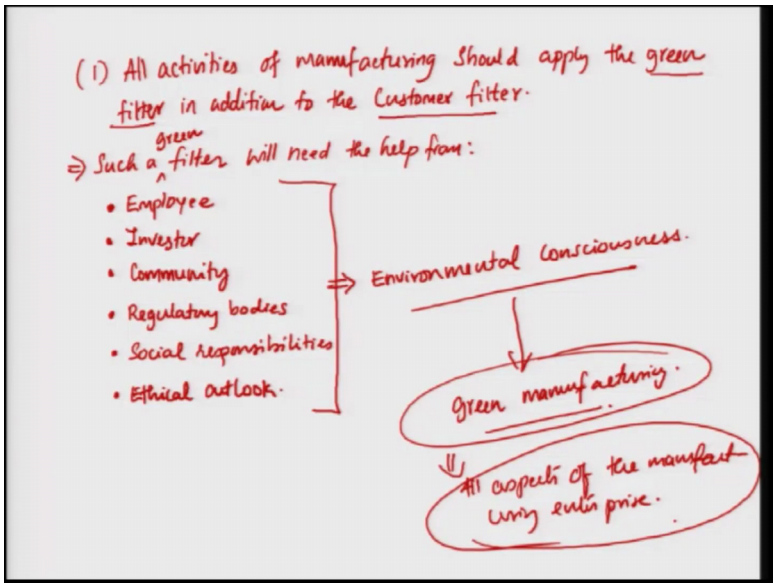
In that the focus of this is the one focus goes into the product and process focus, another is to the manufacturing system focus, another is a customer support focus and the third one is the infrastructure focus. What we are talking about in this point is one way you can think about all of this is you could think about adding one more filter on to this one

in this case and this is the this filter is what we want to call it as the concern for environment.

No matter whatever is the task that you are going to do. So, I would rather like to change this into a green color in this portion this concern to the environment this filter. We want to call this as a this is a filter to be applied ok, this filter need be applied to every activity on the manufacturing enterprise field whether it is the manufacturing system you have to think about making it green whether its a product or process you have to have an environmental concern to this.

The customer support you have to think a you have to think say environment or the sustainability in that part, infrastructure again you cannot ignore anyone of these into your it cannot say that I will make only this as green and I will not do anything with the customer support that just does not work. So, what we are talking in this point is that all aspects of this system this enterprise wheel whatever we are trying to do the customer into this. We also now need to focus on all activities try to it manufacturing.

(Refer Slide Time: 15:14)



So, one other thing that we need to remember is all activities of manufacturing manufacturing should apply the green filter; filter in addition in addition to the customer filter ok. So, manufacturing is well tune to apply the customer filter all the time what we are not saying is it should also apply the green filter or the environment filter.

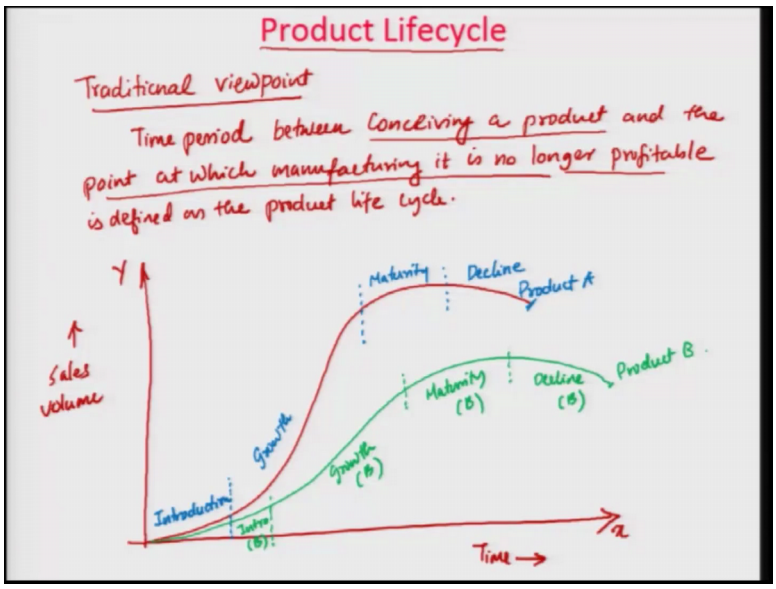
And this will help in once you think about it such a filter filter will need the help from ok. So, to apply a green filter such a green filter such a green filter will need the help from who are the people where we require the help from you will require the help from employee employee. So, the employees help is required then another help is required from the investor, the person who puts in the money it requires help from the community.

It requires help from the regulatory bodies regulatory bodies, it helps from it also requires help from the social responsibilities towards social responsibility abilities and this is something like CSR another things called Corporate Social Responsibilities, but the general social awareness and other things. Then ethical outlook so, like for example, is an organization it and we will anyway talk about this kind of things.

All these filters will together help us to achieve environmental consciousness consciousness which will translate what we call as green manufacturing ok. So, our job is not just producing the product green or just not just focusing on green on the manufacturing touch and along. So, what we are talking here is that, now not just this point we are not just focusing on this aspect.

Every aspect of it is considered this green manufacturing is all aspects of the manufacturing enterprise, but in this class we will be mostly focusing on the manufacturing system as such because that is the lovers hanging fruit, but other things other aspects of manufacturing enterprise need also need to be address in this regard.

(Refer Slide Time: 18:18)



Now, we will get into the last and most another part of this discussion which will come later towards in the class will be the product life cycle. And I am going to give a very crude definition of the product life cycle at this time period and we will talk about the product life cycle much later in the course.

But the first part the old definition or the traditional definition I do not want to call it as the old that is a wrong way to do it want to call it as the traditional definition traditional view point. So, the product life cycle in the traditional viewpoint always have been called as the time period the product life cycle is defined as the time period between conceiving conceiving a product and the point at which manufacturing point at which manufacturing it is no longer profitable profitable is defined as the product life cycle ok.

So, the traditional approach of the product life cycle is that the time from which you conceive a product you thing to a product or you conceives the product in your mind or in a sketches or drawings something like that to the point at which the manufacturing is no longer profitable, if you are making this product if you are mass producing this is no longer profitable then it is known as the product life cycle.

So, if you think about this is a graph system most of the grass will tell you this the x axis will have time on it and the y axis will have will have sales volume in it, typically this is how product life cycle has been traditionally defined. And if you think about drawing as a product life cycle it kind of is drawn like this. So, if this is let us say I call the this as for the time being let me call as product A if this is the life cycle of the product A.

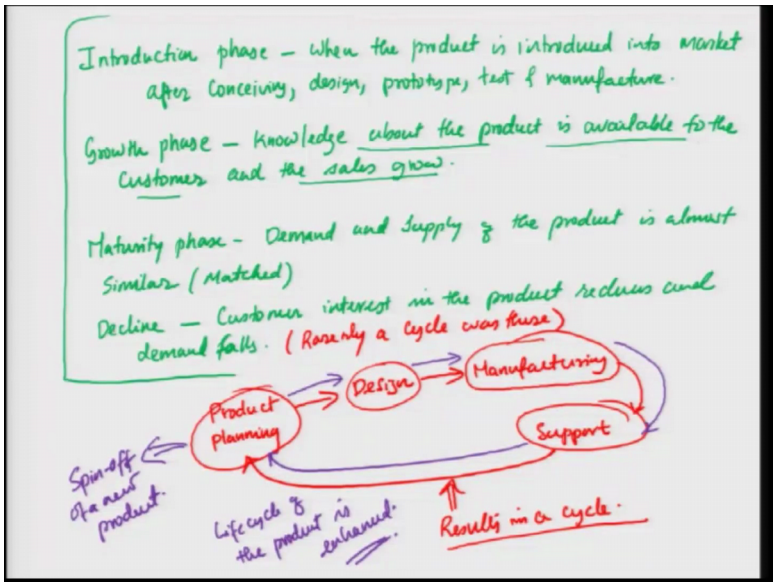
So, the initial part of it so, the first part of it we call it as this much portion is called as the introduction of product the introduction phase. Then is the second part of it is called as the up to this area is called as the let me call it as the growth phase then to this component before I it starts declining you can call it as the maturity phase ok, the rest of it is called as the decline of the product ok.

So, this point where it is no longer economically viable or no longer profitable to manufacture this is called as the product life cycle. So, this is for the particular product call product A. Now the same thing there company can have another product which might have a behavior something like this ok. So, this is like somewhere like you have the introduction. So, this is the introduction of B introduction of the product B. So, let me call this as product B and this is kind of the a growth phase growth phase of the B the

product B and this at a long maturity phase somewhere like this maturity of B and this is the decline of B.

So, the curve might give you different shapes, but the idea is the you can kind of come up with this four unique aspects of a product.

(Refer Slide Time: 22:41)



So, the introduction is introduction phase, phase is when the product is introduced into market into market after conceiving, design, prototype, test and manufacture. So, the product is initially introduced into the market after the consumption phase or conceiving phase.

Then comes is the growth phase growth phase is where know how of the product knowledge of the product knowledge about the product about the product is available is available to the customer it is available to the customer and the sales grow. So, at this phase the people get to know more about the product the knowledge of the product gets populated in the market and it becomes available to the customer and the sales the sales figures will start growing up.

Then it reaches what you call as a maturity phase ok, this is where the demand and supply of the product is almost similar or they are matched, where this product has reached its maturity and then you called as a decline where customer interest in the product customer interest in the product the product reduces and demand falls. So, the

demand falls what happened the sales will also for demand falls. So, this is the traditional this is what we call as the traditional outlook of the product life cycle ok.

The current outlook is more like you have like a design or what we call as even instead of the designed we call it as the product planning the product planning then you go through what you call as the design and then you go through what you call as manufacturing ok, then we go through what we call as support and with the support this information goes into what you call as product planning. So, what you end up trying to do is you are trying to ensure that the life cycle of the product.

So, this whole thing this is where at this point what we never had is rarely a cycle was there in the earlier definition now this actually results in a cycle. So, the idea is that when you are the people are there is the customer is using the product the information that is gone into the usage of the product from the feedback of the customer goes back into product planning so, that the second time through.

So, if you think about the first time through as red color these aspects the second time through the second revision of it will probably come across as the second revision like this and it will continue like this. And may be at some point of time you might have during some place you might have a spinoff of the spinoff of new product.

So, like there are many many scenarios where these kind of approaches has happened we will study look into some of those cases as laid down the road, but such kind of an approach where the feedback going back into. So, that the life cycle of the product is enhanced. So, this is the modern outlook of it, there is an environmental angle that we have not talked about this, in this which will come later down the road, but that is a discussion for a later part of this course.

So, with this our introduction introductory part of this course is pretty much over and what we will start now getting into which the second major component of this course which has said discussed in the beginning itself is called as the optimization. So, we there are next lecture the 3rd lecture will be on introduction to the optimization and the also how do you model a problem which is of complicated in nature where you require lot of you need to look into lot of variables and optimize them.

So, that you have you are actually doing something in the most sustainable fashion. So, you need to learn let us the basics of optimization to actually implement sustainability. So, the next lectures are all about the optimization meanwhile continue reading the topics.

And thank you for your patient listening good luck.