Computer And Manufacturing Systems
Professor Janakarajan Ramkumar
Department of Mechanical Engineering & Design Program
Indian Institute of Technology, Kanpur
Lecture 03
Production Systems

Welcome to the course on computers and manufacturing system. We are in lecture two.

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In this lecture, we will try to focus on production systems, automation in production systems, manual labor in production systems. And finally, we will look at automation principles and strategies.

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So, what is a production system? Production system is nothing but a collection of people, equipment, procedures organized to accomplish the manufacturing operation of a company. For example, let us assume you are trying to make pizza or you are trying to make some bakery items. So, we can call that also as a production system, wherein which you have people you have equipments, you have procedures laid and whenever a product has to come out the procedure has to be stringently followed.

So, that you accomplished the manufacturing operation of a company, it can be a steel company, it can be a bakery, it can be a food, it can be a chain, food chain shop, it can be even a small assembly shop wherein which they try to assemble bottles. It is that activity whereby resources flowing within your defined system. For example, a conveyor belt, a conveyor belt in an airport where whereby the resources flow within a defined system that is also called as a production system, are transformed and combined in an organized manner to add value in accordance with the policies communicated by the management.

So, here in which it is very clear the activities, whereby resources flowing within a defined system are transformed in a conveyor belt in an airport there is no transformation happening, but a security check happens on the bag and that tag has been put. So, are transformed but generally if you look at a manufacturing shop, and here the manufacturing shop what we are talking about is discrete part manufacturing. We are not talking about cement industry, cement industry, iron and steel, leather manufacturing, cloth manufacturing is not our focus. Our focus is wherever you can discretely count and make a product, and the discrete counting can be there, and a repeat of the same product is also allowed in discrete part manufacturing and combined in an organized manner to add value in accordance with the policies communicated by the management.

So, production system is the system which produces products of an organization products. Two categories are there. So, here we talk about facilities and we also talk about manufacturing support system, facilities means machines available is called us facilities and manufacturing support system is the office which helps in producing.

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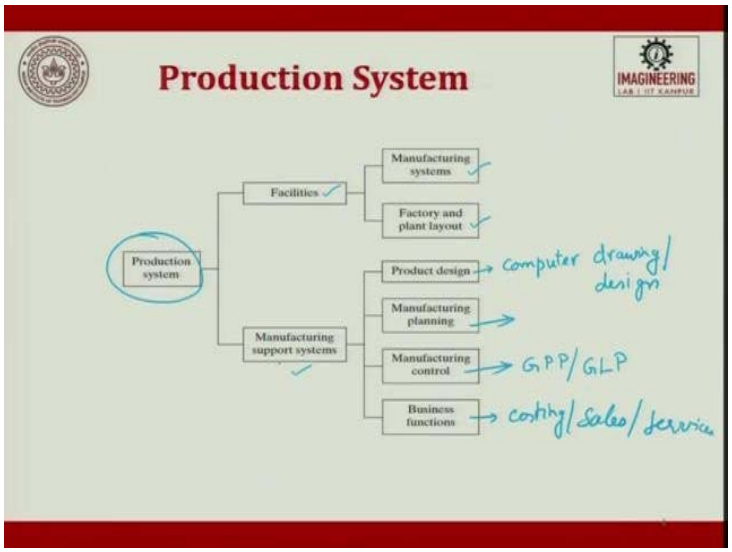

So, the production system what we were talking about is divided into two categories. We will have facilities and we will have manufacturing support system. In facilities, you will have manufacturing system, factory and plant layout will be there that is facilities. The other one is product design, manufacturing planning, manufacturing control and business.

So, here it is computer which is used for drawing, the for drawing or designing, drawing slash designing a part is manufacturing support system and what part to be produced? When to be produced? Is nothing but manufacturing control, whatever we have produced today is it under a good quality, so good quality practice good or good procedures practiced or people also call it as GLP they also call it as practice.

The next one is business function. So, business function is the costing which is involved and the sales, sales services all these things are part of manufacturing support system.

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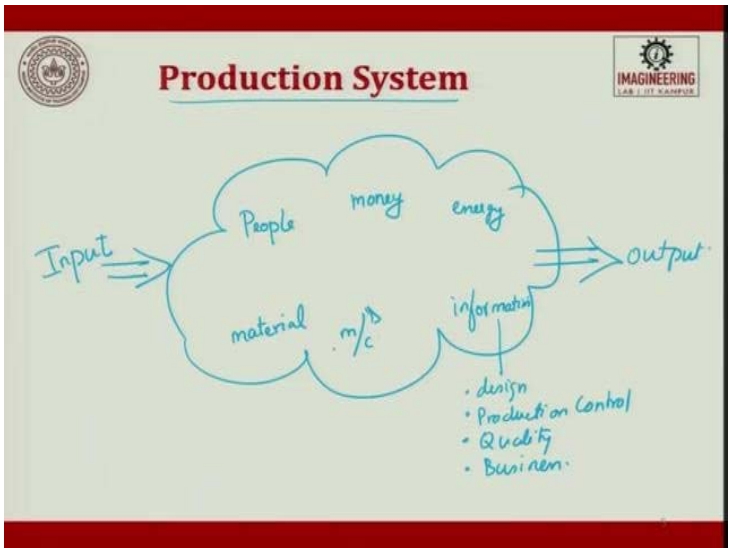

When we talk about production systems, let us see what are all there. So, you will have an input, and naturally, you will have an output, let us try to draw a system. So, in this system you will have people then you will have money, then you will have energy we will have material, we will have machines, and we will also have information. This information can be design, production control, quality and business.

So, this is what in a simple pictorial representation, you can try to talk about production systems; you will have people there you will have money there you will have energy, information, machine and materials.

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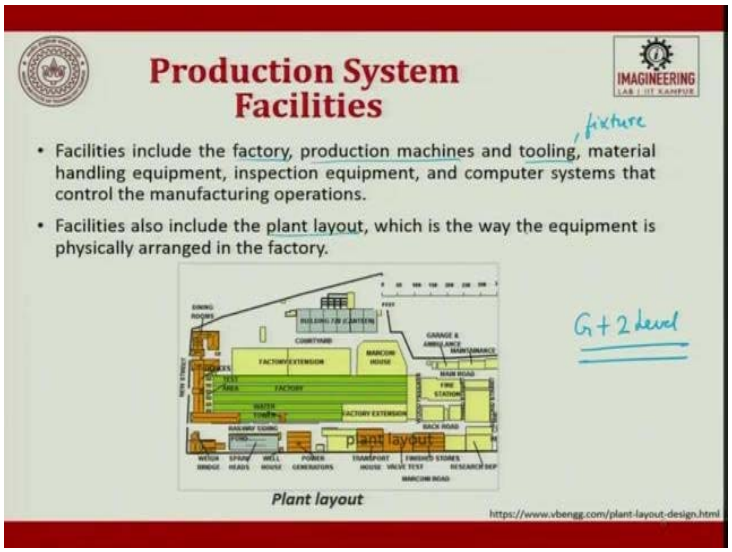

So, when we talk about production system facilities, the facilities includes factory, production machines, tools, tools include fixtures also, fixtures are nothing but work holding devices are called as fixtures. Tools are used to produce the given output and a product. Say, for example, in machining, use a cutting tool, in press you use a tool to give a shape.

So, tooling fixtures, which is included, material handling equipments, which is very important. Today, if we wanted to move materials, from one level to the other level in terms of vertical direction, we have a huge challenge. For example, if you are staying in a flat where there are ground plus two levels are there, there is no need for having a lift.

So, when there is no lift moving equipments like refrigerator, heavy equipments, washing machine itself is a challenge. So, in the same way, when we talk about factories, material handling is very important. Material handling does not mean only moving, material handling means at the right time, at the right place, the right quantity job getting delivered.

Today, we get all the courier service coming, so they have a very good material handling equipment and delivery. So, all these things are into this material handling equipments, inspection equipments, computer systems that control the manufacturing operation all these things are part of facilities.

If you look at it here in a layout, you will have weighing bridge, spray head, well house, power generator, transport house, finished stores, research department, factory extension you will have a factory you can see factory extension then you also see dining hall these are all part of the layout which is done. The facilities also includes the plant layout which is the way the equipment is physically arranged in the factory.

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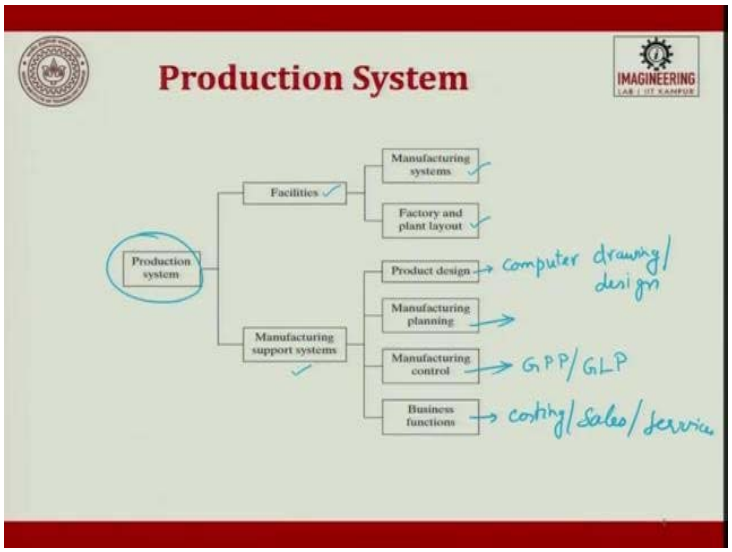

So, this comes under production system facility. So, production system talks about two things one is facility and the manufacturing support system. In facilities, you have manufacturing system and factory layout, and then in manufacturing support system, we have product design, manufacturing planning, manufacturing control and business function.

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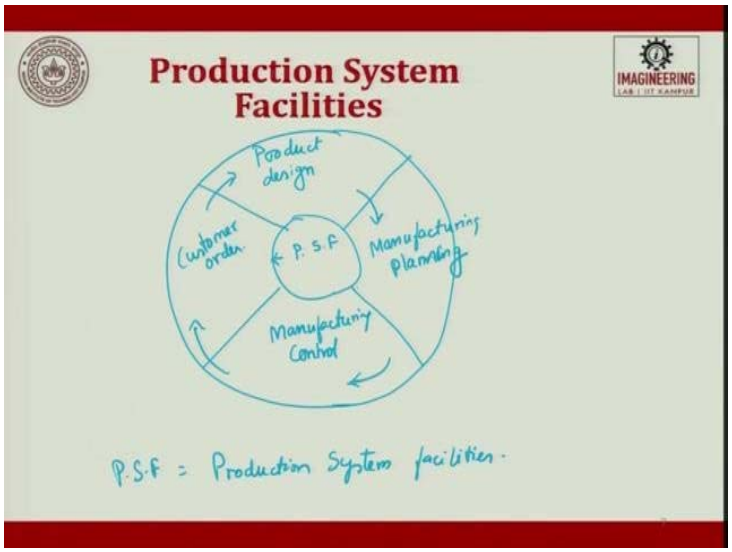

Now, let us look at the simple way of representing production system facilities. So, these are all linked, product design, and then you have manufacturing planning, then we have manufacturing control then we have customer order.

The center portion is nothing but production systems facility where P production systems facilities which is nothing but I have written it as PSF. So, this is what is production system facility. So, in production system facility you will have design which starts then you can start

with customer order then go to production design then product design, from product design you can go to manufacturing planning from manufacturing planning you can go to manufacturing control.

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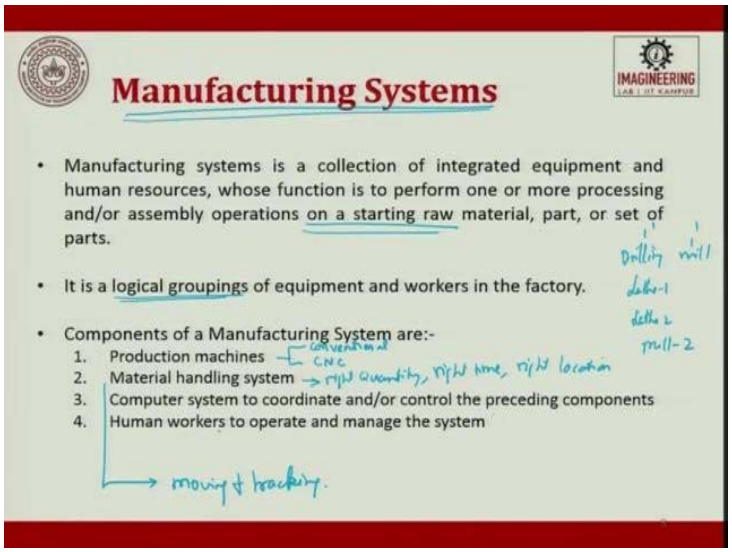

Now, let us look into what is manufacturing system. Manufacturing system is a collection of integrated equipments and human resources whose function is to perform one or more processing and or assembly operations on a starting raw material part or a set of parts, this is called as manufacturing system. So, if you go back if you look at it, where is manufacturing systems.

So, this is what is manufacturing systems. Manufacturing system is a collection of integrated equipments and human resources whose function is to perform one or more processing and or assembly operations on this is very important on a starting raw material part or a set of parts. It is a logical grouping of equipments and workers in a factory; this is manufacturing systems. It is nothing but logically grouping, what is logical a grouping? For example, you have drilling machine; you have milling machine, you have lathe machine, then you have another lathe machine, lathe machine two one drilling machine one milling machine one.

So, you have milling machine two. Now, what we do is we logically group these fellows such that, you try to bring in productivity in the company, what is productivity with minimum resources maximum output is productivity. So, it is a logical grouping of equipments and workers in a factory. The components of manufacturing system our, production machines

which include conventional machines and CNC machines, conventional and CNC machines. Then you have material handling system which I said in the previous itself.

Material handling system includes the or I will I will redefine I will say right quantity, right time, right location. If you can do that, then we say it is a very good material handling system, it is not only moving; it is also tracking. So, I will put this, it is moving and tracking comes under material handling.

See today we bought some plastic snipers, or we bought plastic buttons, we wanted only six, but the bag size quantities 500 minimum, though the cost is low, but our requirement is only six. So, now the material handling system is not very good. So, if I could get that in batches of 10 or 20, so, then I get the right quantity at the right time at the right location, and I also try to have tracking. So, all these things are gone into material handling system. Today or you are able to online purchase an object and then try to track it where is it and when will you get the delivery that is material handling system. Do not think that inside alone, today it has expanded.
Computer systems to coordinate and or control the proceeding components.
Human worker to operate and manage systems are the components of manufacturing system.

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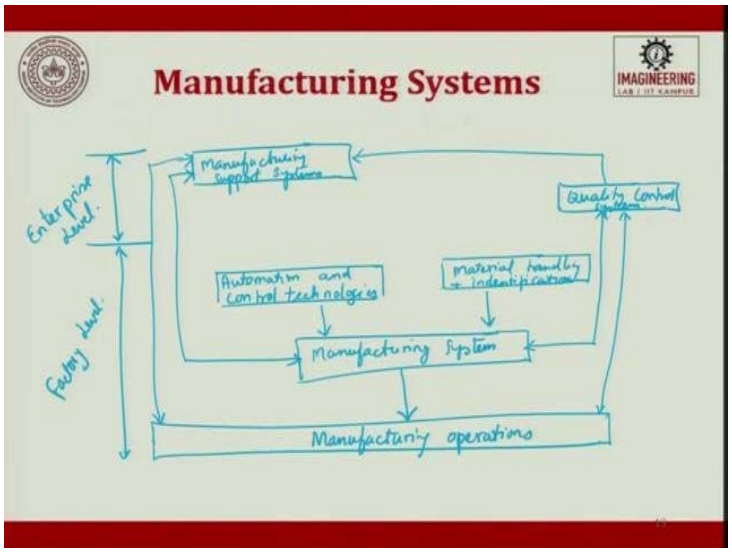
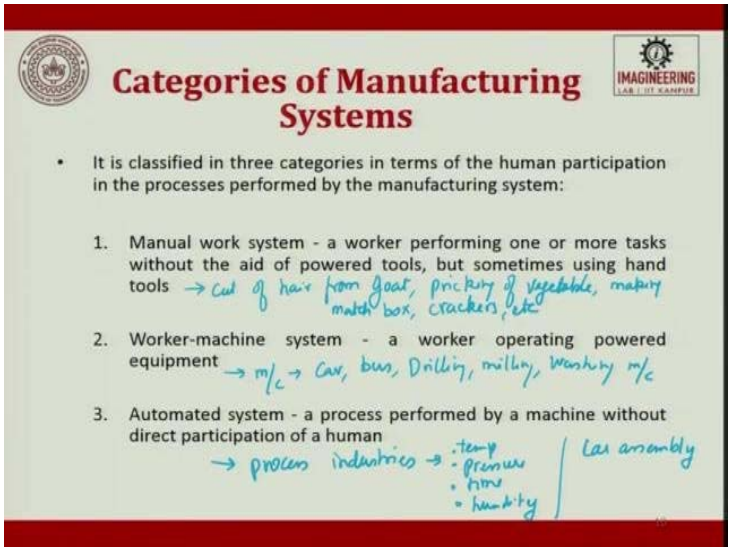


When we talk about manufacturing system, it is divided into two levels. One is called as enterprise level, the other one is called as factory level. This is manufacturing operation, so you will have manufacturing support system then you have quality control system, manufacturing system.

So, all these things are linked, so from manufacturing system to manufacturing support system from so, from manufacturing system, you are getting attached to manufacturing operations. Then, from here when the manufacturing system is there, you have quality. So, quality, in turn, is connected to manufacturing operations and then finally in the support system, you will have this also attached.

So in manufacturing automation in manufacturing systems, you will have two more one is automation and control technology will be there. Then when you come here, you will have material handling systems and identification, and a manufacturing system is supported here.
So, this is manufacturing operation.

So, here it is divided into two levels, one is enterprise level, and the other one is factory level. In factory level, if you see all these things handling, control systems, operation comes. In enterprise level, you will have manufacturing support system and quality control system. (Refer Slide Time: 18:16)



Categories of manufacturing systems there are three things. One is manual work system, where in which your worker performs one or more tasks without the aid of powered tools. So, here, we do not use a power tool. We use hand tools, for example, cutting of hair from goat, pricking of vegetable, then making match box, crackers etc. but predominantly it is done by a worker using his hand or a small hand tool, when we go to the next one worker machine system here, all machines, machines like car, bus, then you will have drilling machine, milling machine, washing machine all these things are example where worker uses a power tool to do some operation.

The last one is automated system is a process performed by a machine without direct participation of the human being, for example, all the process industries, what they do is they try to have also many processes, all these processes are automated and linked. So, it is basically it looks at temperature, pressure, it looks at the time, it looks at humidity. So, something like that. So, it looks at that and then it tries to control the process.

When we look at automate the automated system, today we are talking about car assembly, which is completely automated, wherein which they use robos and no human intervention, the human is only used for supervision.

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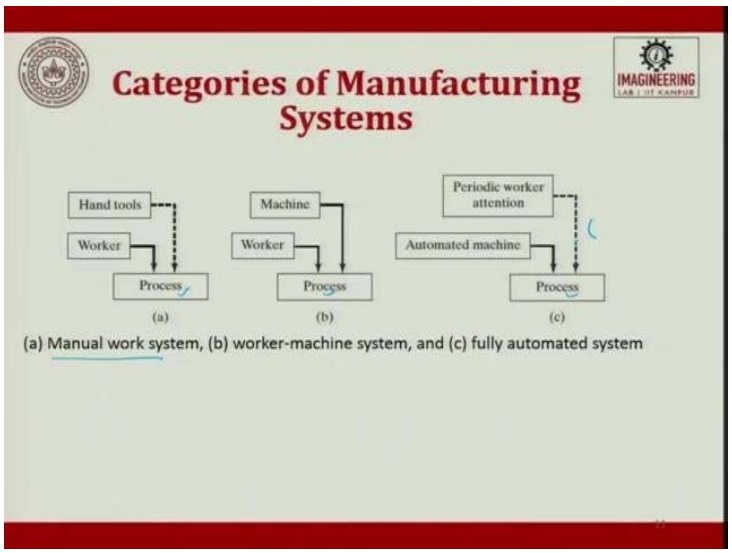

So, whatever we have discussed it is given here. So, we have a process you have a worker you have a hand tool, this is manual work, when we talk about worker machine system, you will have a worker you have a machine a processes there, then here if you see that these are the process and here you automated and then you periodic, worker comes and either supervised or gives attention for a very small span of time, as compared to that of the entire shift.

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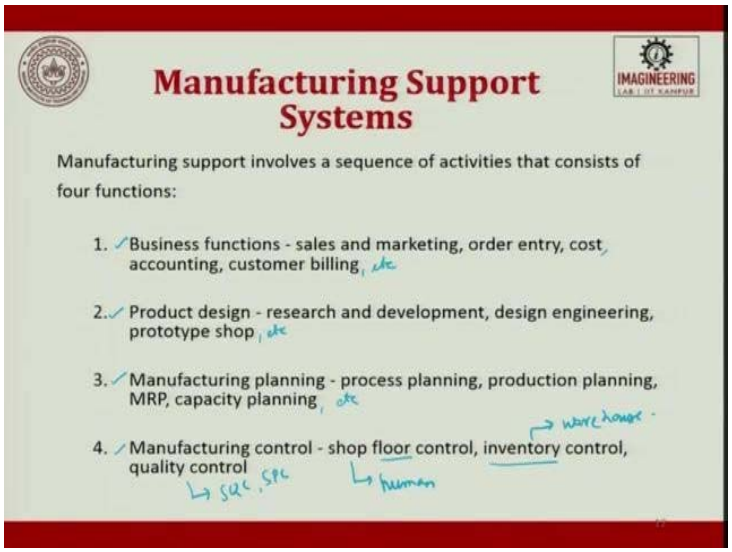

So, when we talk about the manufacturing support systems, the manufacturing support involves a sequence of activities that consist of four functions, business function, product design, manufacturing planning and manufacturing control. So, business function as I already told you, sales marketing, order entry, costing, accounting and customer billing etc. all these things are business functions.

Product design is nothing but research and development, design engineering, prototyping shop and etc. that means to say, many more things are part of product design. Then when we talk about manufacturing planning, it is process planning, production planning, you have material resource planning, capacity planning, and again it is etc. So, process planning is which process to follow in a process what is the sequence to follow production planning is when what, what shift it is to be done, that is what is production planning and then transportation all these things come in this. And MRP is nothing but material resource planning, in material resource planning you try to plan the material required when? How many at what time? So, that is part of MRP then you will have capacity whether these machines have to be increased, decreased, queuing sequence change, all these things are capacity.

When we talk about manufacturing control, it is more towards quality control, inventory control and shop floor control, shop floor control we are talking about human involved. When you talk about inventory, it is warehouse involved, and we talk about quality wherein which SQC, SPC all these things are followed such that you make sure the output of the product is perfect.

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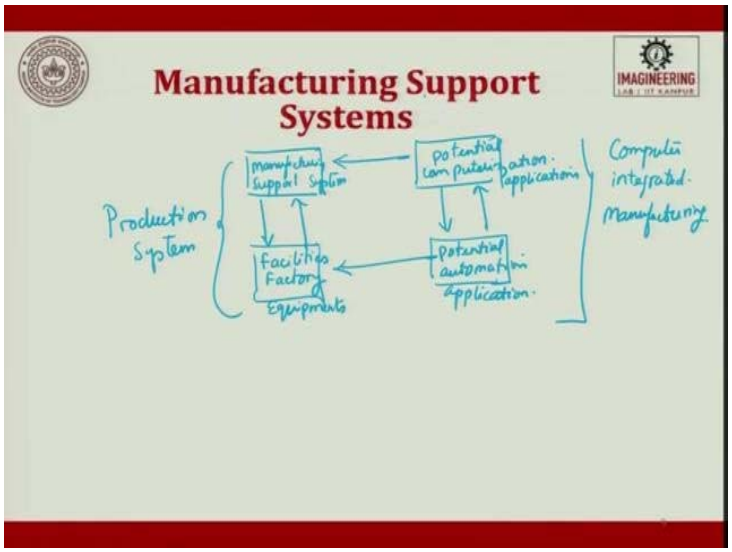

So, in manufacturing system, we will have production system, we will have manufacturing support system. So, you will have facilities, factory equipments then you will have potential computerization, applications, publications. Then you will have potential automation applications. So, this part is called us computer integrated manufacturing. So, production systems are these two. Now, these two what gets added to it, where in which the presence of computer helps up in a big way converts this production system into computer integrated manufacturing.

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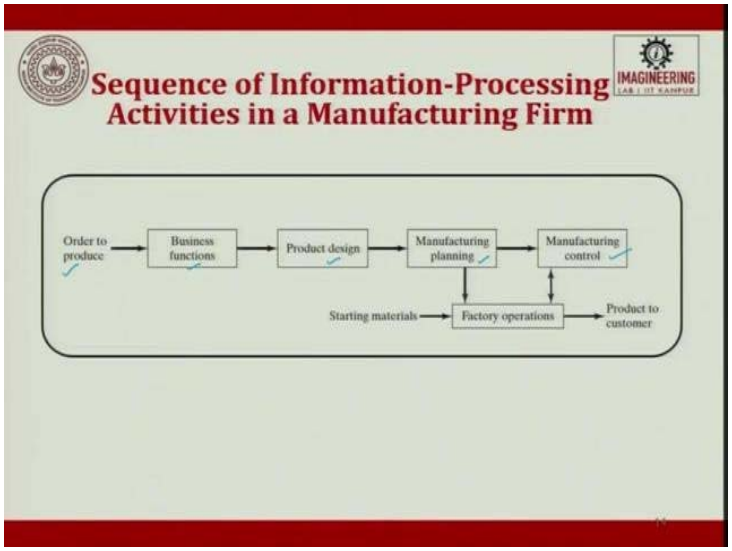

Now, let us see the sequence of information processing activities in a manufacturing firm. So, first, how does a information get moved or processed in a manufacturing firm? First, the order

is placed to produce; then the business function people look into it whether it is viable, whether we already have a stock or something new has to be done, can it be bought out from somewhere and assembled here, all these things are looked into business systems.

Then they give an order release for product design if it is a new product, then from the order business function gives to the product design, the product design looks into customer requirement, and then they make what is required and then they plan for manufacturing planning. So, manufacturing planning is what is the sequence of operation? What are the machines required?

So, all these things come under manufacturing planning, and once the manufacturing planning is done, how are we getting control? How are we going to track the quality variation that is what comes out our manufacturing control. So, all these things communicate in turn inside a manufacturing factory.

So, then you have a starting material you have an ending material. So, this is how the product is produced, if you look at it from here, it undergoes ordering then business function, product design, manufacturing planning, manufacturing control. So, all these things flow in sequence, and the last two keep communicating with a factory. So, in a factory, you will have a starting material and a ending material or a output material, which again is linked to the customer's order or customers requirement.