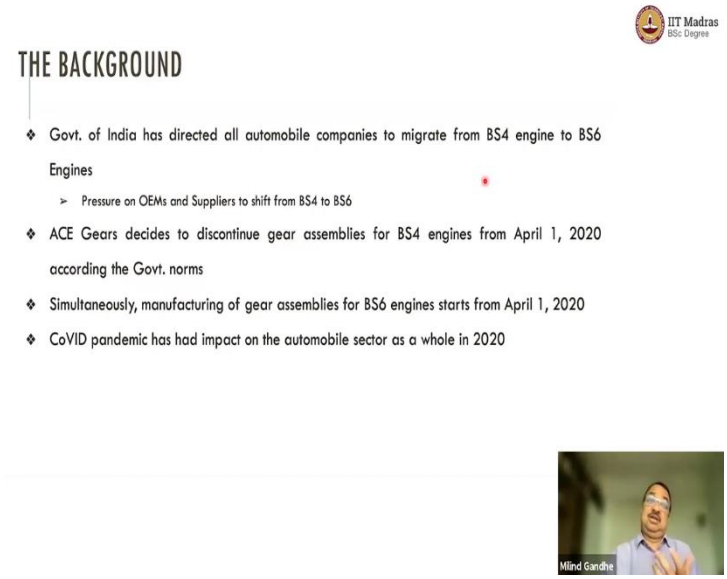
Business Data Management
Professor G. Venkatesh
Doctor Milind Gandhe
Mister Siva Kumar Padmanabhan
Bachelors of Science Degree
Indian Institute of Technology Madras
Background context to the case

(Refer Slide Time: 00:15)



Dr. Milind Gandhe: Siva, I think, you spoke about some of this, but the other interesting question I think is, COVID has sort of dominated the last 15 months in terms of news. How has COVID affected the automotive sector?

Mr. Siva Kumar Padmanabhan: Yes, that is a great question. And actually it has been quite a major impact for the industry, negative impact due to COVID. If you looked at how it developed. Right around the end of March, most of the activity in the country shutdown with respect to manufacturing and there was a migration of labor in April and May of 2020 away from the manufacturing clusters and the cities back to their homes and so on.

There were multiple impacts due to this. One was the disposable income of people to actually buy automobiles, like new cars etcetera and the willingness to buy. Even if you have the income or the money to buy, but the demand also depends on the willingness to buy and all of that dropped very sharply in the first half of the financial year 2021. You see the demand for the finished products dipped a lot, and that then there was inventory lying in different parts of the value chain.

Another thing that happened was because of the migration of the labor away from the manufacturing clusters such as Pune, Chennai and so on, even if the companies could even when they could reopen their factories, they found it very difficult to actually get those labor back and then get back to the full-fledged supply.

In the second half of the year, things actually started to normalize and you started to see production sort of pick up and you even saw a real sharp spike because there was some makeup buy, people who could not buy or go out so long, they actually went and bought more cars around the festive season and so on.

You see a very turbulent year in 2020 for the entire industry, and then again towards the end of the financial year, we had the second wave starting to come up and that again hampers the dent on the industry. You will see that and then even the suppliers such as Ace Gears had to go through a similar sort of ups and downs as you will see.

In the case study, you will actually see, two year, because we want to illustrate all these phenomena from April 1st, 2019, you will see the data for 24 months all the way till March 31st 2021. In these two years you will see both the BS4 to BS6 transition in the first year we will see that, the second year we will see all the impact that was tossed due to COVID.

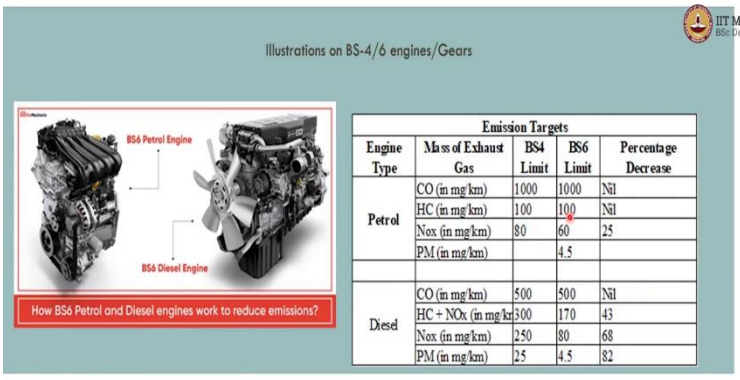
Dr. Milind Gandhe: G. V. would the students know what is financial year or should we explain it here?

Professor G Venkatesh: Worth explaining I think, what is a financial year? What is a difference between calendar year and financial year?

Mr. Siva Kumar Padmanabhan: That is a great point. India traditionally has a financial year and that is also true for our government or tax filings and everything that starts from April 1st of one year and goes till March 31st of the next year. When we talk about financial year 2021, it means, the period of time from April 1st 2020 to March 31st 2021.

Sometimes in short is just called financial year '21 which is a little bit illogical because it is only the three years that come in 2021, but usually we always go by the finishing year is more important. Anyway we went for simplicity we will talk about historically 2021 but if you look at the calendar year that is what a lot of companies in the Western world use is just basically January 1st to December 31st of each year.

Calendar year 2020 is January 1, 2020 to December 31, 2020 and financial year 20-21 is April 1st 2020 to March 31st 2021. (Refer Slide Time: 04:39)



Emission Targets				
Engine Type	Mass of Exhaust Gas	BS4 Limit	BS6 Limit	Percentage Decrease
Petrol	CO (in mg/km)	1000	1000	Nil
	HC (in mg/km)	100	100	Nil
	Nox (in mg/km)	80	60	25
	PM (in mg/km)		4.5	
Diesel	CO (in mg/km)	500	500	Nil
	HC + NOx (in mg/km)	300	170	43
	Nox (in mg/km)	250	80	68
	PM (in mg/km)	25	4.5	82

Source: Autocar India

Dr. Milind Gandhe: You may alluded to this shift, but this BS4, BS6, of course I have seen some of it as an example on buses where it says very often BS4 compliant or trucks will say BS4 compliant, would it be useful I think to explain to our student what is, what exactly is BS4 or BS6?

Mr. Siva Kumar Padmanabhan: Yes, that is a fantastic question. As you know, if you look at the few years before, we had some of the worst pollution in places like Delhi that has ever been recorded. And even going back 10 years, we saw that pollution in the country was increasing asset was getting more urbanized.

There was more construction activity, there was other activities, such as, how the cops are this position there is activity around automobiles and so on. The government decided to improve the emission norms. Emission norms are how much emission an automobile is allowed to have, so that is what it guides.

They wanted to increase emission norms, step by step and quickly catch up with the, what is prevailing in some of the modern countries or advanced countries like what is in Western Europe. And they have done a remarkable job and quickly ushering in BS6. What if you look at the diesel that is where you see the stark differences in the allowed emission norms for BS4 to BS6.

If you look at that table that talks about the diesel engines under the BS4 regime, they were allowed to have hydrocarbons and Nox emissions up to 300 milligrams per kilometer, and in BS6, they can only have up to 170 milligrams of 43 percent reduction. If you look at Nox itself, which is nitrous oxide, which is a very poisonous gas that comes from the emissions of the cars, that is the stark decrease that has been mandated.

From 250 milligrams a kilometer it was reduced only up to 80 milligrams a kilometer allowed in the BS6 cars or trucks, cars basically. And then particle in matter is another one. Again, from 25 milligrams per kilometer that was possible or allowed under BS4 vehicles, it was starkly reduced 82 percent to 4.5 milligrams only about per kilometer.

If you see in the petrol the changes are not that big because already petrol engines were less in Nox and PM. What is remarkable is, if you see the BS6 the diesel engines are almost as good as petrol when it comes to Nox and Particulate Matters. This is the basis of the transition from BS4 to BS6.

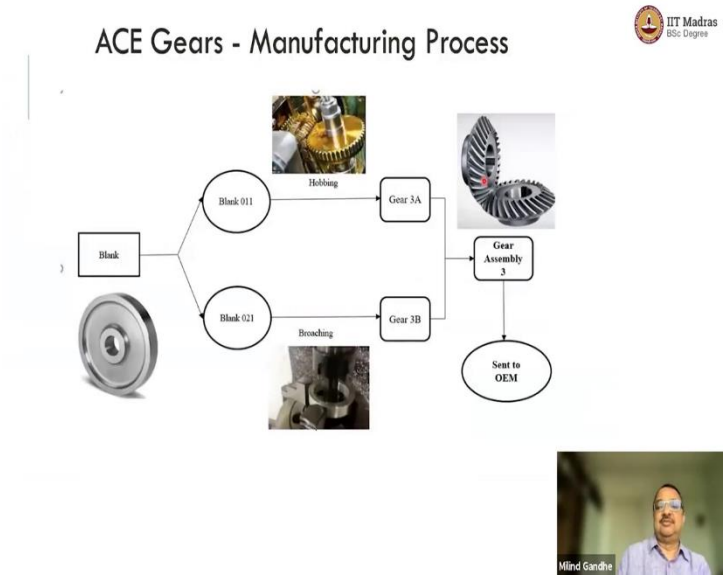
Dr. Milind Gandhe: And this helps to understand and appreciate if I remember 10 years ago, some of these trucks and buses used to give out so much black smoke and now in most of the diesel cars you cannot really see that much smoke coming out. I think it is because a lot of that has been cleaned up, is that is that correct?

Mr. Siva Kumar Padmanabhan: Yes, absolutely. There is a number of mechanisms that have been incorporated in the BS6 vehicles. There is a Nox trap which is a way in which the excess nitrous oxide is actually burnt off when the vehicle is actually going into high speed or a good steady speed, and there is also urea treatment that happens to the emissions that reduces some of the emissions.

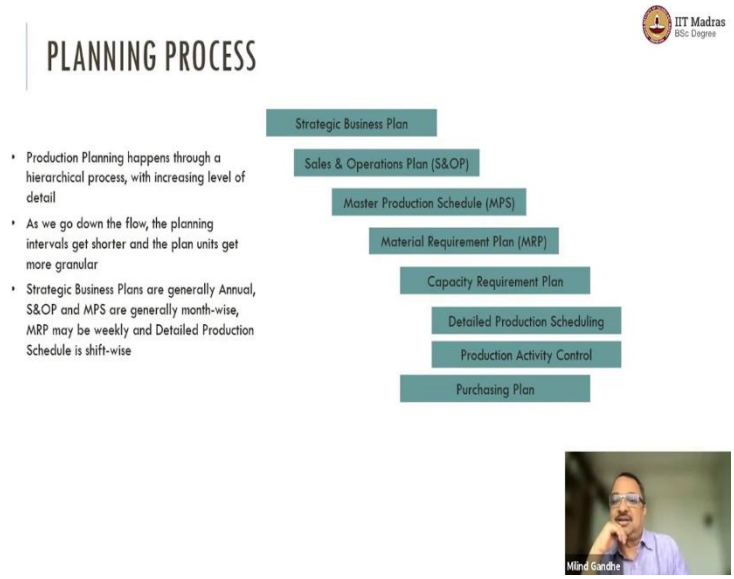
The technology in the BS6 diesel engines is actually quite remarkable, and we can see the drastic reduction that we see in Nox and PM. It has been a little bit of a rough change for the industry initially because they had to then change a number of things with engine, the transmission and the pollution treatment or the exhaust treatment systems in the car. But now it is bearing fruit because now I think people can actually feel less guilty about driving diesel vehicles.

I myself do when I drive my diesel SUV, but yes, it did cause some disruption and the transition was going on. But in the end, we have much cleaner vehicles. Today it is almost to the point that if you look at the overall composition of what the diesel does versus the petrol does, even in the carbon monoxide the diesel was always more efficient because the efficiency of the diesel engine, it produced less carbon monoxide per kilometer.

If you look at per kilometre in almost everything except hydrocarbon, diesel is actually almost as good as petrol or better in some areas. (Refer Slide Time: 09:50)



(Refer Slide Time: 09:57)



Dr. Milind Gandhe: One of the things you mentioned, and that sort of was overwhelming for me is the number of departments in a factory. Siva, you can explain to us, how do all of these departments work together? What are the kinds of systems? What are the kind of processes? Who holds all of this together?

Mr. Siva Kumar Padmanabhan: Yeah, That is a fantastic question. And this slide should help us to sort of talk through that. If you if you look at earlier, we talked about how planning was so important in this industry or almost every manufacturing industry it is really important. And the way planning works is that you want to make sure the right amount of resources are available at the right time to enable the production of the products that we are making.

And then we talk about resources, manufacturing industry has multiple types of resources. There is material resources, that means, you have to have the raw materials that are available to start the production process or the semi-finished products that are available to start the next stage of the production process. There is human resources, which is about the people that are required to operate, the machine lines and so on.

There is financial resources, which means, you have to have the cash to actually pay the supplier to get the product, and so on. All of these resources have to be planned, so that the right amount of resource is available. If you, if we spend too much to acquire too many resources, then your money is locked up, and essentially that is not good.

But if you have too less resources, then you cannot do a particular step in that production. All of the other resources will lie idle like, it is a waste. You cannot actually create the product and ship to the customer. The whole planning process is around making sure the right amount of resources are available at the right time. And if you want to really do that, well, you have to go top down.

You have to plan at a strategic level, year-on-year, what is this is going to do? For example, if you have to create an if you have, if you think that in two years, your demand will be twice what we have today, the number of products your customer want is going to be twice, then you may need to set up a new factory.

Those are called long range planning decisions. That is a strategic business plan that is at the top. The CEO, the CFO or the COO of the company of means the heads of different parts of the company may sit together and say, let us create a strategic business plan that says overall, what is going to be our products? Where is it going to go? How much we need? From there, very quickly, you have to come to what happens month by month within a year.

Once I know that 2022 is going to be strategically, I do not know 1 million units of product that I need to make, I need to then say, what do I need to make in January, February, March and so on, because there could be some seasonality, as the festive season comes a few months before that I may need to make more so that my end, my customers who are then creating product for the end customer is able to make more in that time.

That is what happens in the sales and operations plan. The sales and operation plan is the one, that marries the sales plan with the production plan at a high level. The sales guys come and say, look, I can sell one and a half million, not 1 million next year, then the production guys have to ramp up for that.

The sales and production people have to sit together and say, okay, what is the realistically possible, that I have to plan month by month, which is basically sales and operations plan. Usually you will have the sales head there, you will have the production head there, you will have the finance head there, in that planning sales.

Now, we may do that for 2022 today. But when I get into 2022, there are going to be things that happen month by month that is going to change my outlook. Let us say the COVID completely vanishes, very positive scenario and then everybody wants to buy like people are out there wanting to buy lots of new cars next year. Now, that I may not have forecast, I might have said one and a half million parts.

But when I actually come there, I find that it is even more than that or less than that. Now I have to do month by month planning as I get close to the month. That is the master production schedule. So, that says, very, very close by next two, three months, what is going to be my production schedule? How much capacity do I need?

How much materials I need, etc. that is month by month. That is again, done usually by the production head, the sales head and so on. And then you have the material requirement plan which is almost on a weekly basis. And sometimes it is even run on a daily basis. To say, okay, I know how much I need to make this week.

I know how much labor I have, how much material I have, I know how much raw material and work in progress I have. And I know how much I need to make this week. Let me now run a routine or a program to actually spit out exactly how much we need to make every single day of this week, so that is a material people requirement.

And it will spit out how much you need to order with your supplier for some of your raw materials. Similar to there is a capacity requirement plan. So, both MRP and CRP are run mostly by the production head, the Human Resources head the procurement head, and so on, because they are trying to figure out how much I need to make on shift day by day kind of basis, and how much capacity I have for that.

The capacity requirement plan also says, I might actually need to get more contract labor or I might need to send out some parts to a contract supplier, because I do not have capacity this week. Those things happen in the capacity of fireman plan. And, then finally, on a shift by shift basis, a shift is actually usually 8 hours of production so many factories in this case Ace runs three shifts.

They run a morning shift an evening shift and the night shift. And on that particular shift, you have to decide exactly which machines are going to be loaded, which machines are going to go under maintenance, how much product do I need to make in machine x and y and how much labor do I assign to that machine? That is a detailed production schedule.

And production activity control then is controlling that schedule. It is making sure that what you actually plan to make that shift you did make, is that efficient enough? Do we need a proactive maintenance to make sure that the machine is running better in next shift and so on? That comes now to bat, and then the purchasing plan ultimately, which is management purchasing and finance is aligned with the MRP material requirement plan and the stocking about how much do I order today, tomorrow and so on with my suppliers.

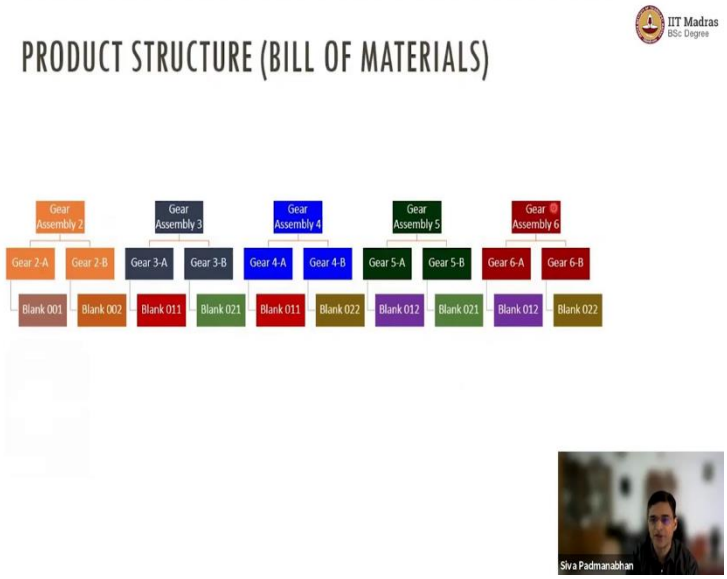
The whole thing is coming from multiple years to multiple months to multiple weeks to multiple days to multiple shifts and to one shift, and then, machines within that shift kind of thing. That is why the time phase, it comes from top down it comes from a wide time gap down to a narrow time gap as we go through the process.

Dr. Milind Gandhe: As you go down this down this par, you are basically paying attention to more and more details. Is that right?

Mr. Siva Kumar Padmanabhan: Yes, absolutely, you are getting more detail within a smaller time bucket. You have more information on what is actually happening, and so you can be more granular in your plan.

Dr. Milind Gandhe: And that from our course perspective basically means more and more data is being generated, more and more data is being captured and more work for us to do in terms of analysis, right?

(Refer Slide Time: 18:10)



Dr. Milind Gandhe: Can you just help us understand what this is, Siva?

Mr. Siva Kumar Padmanabhan: Yes. So this is what you will see a lot of the data in your spreadsheets is around this picture. You can use this picture as a backup reference, as you go through some of this data, you will you will keep looking at this picture many times. What this is called a bill of materials.

It is not a bill that you pay in a restaurant or whatever, it is a term that is the production industries always use to denote how the structure of the tree structure the product is made up of. As a company, what I am selling to my customer is at the top, they are called finished products. So, I am selling 10 different gear assemblies, and this slide shows 5 of them there is actually filled and it would not be fitting into a single slide.

But those are called the finished products at the top, those are the things that we sell to the customer. Now, to make gear assembly to for example, I actually need a sub.

Dr. Milind Gandhe: These are the finished products.

Mr. Siva Kumar Padmanabhan: Yes. Those are the finished products. Gear assembly 2,3,4,5,6. There is also 1,7,8,9 and 10, which is not there in this picture. But those are the finished products. Then we should talk about sub-assemblies. A sub-assembly is something that is used at the next level of the finished product.

For example gear assembly 2 is made of two gears, gear 2A and 2B. So, as we saw on that picture two of these gears have been put together to make gear assembly 2. So, these individual gears are called sometimes they are called semi-finished, sometimes I call work in progress, sometimes they are called components and so on.

But you can you can imagine. Now, to make gear 2A I actually start with raw material, which is at the bottom layer of this or those are called the raw materials. So, the plank 001 is what is used to make gear 2A plank 002 is used to make gear 2B and now these two gears are together making gear assembly 2.

This whole structure which is going it is a hierarchical structure is called bill of materials. So, when you, this is very simple for me because I am only making gear assembly, but think about the car manufacturers, look at, think about their bill of materials. If you think of a finished product which is finished Honda City car, for example, the bill of material if you keep breaking it down, it will have probably 50 to 60 levels or a very large number of levels because at the top level you will say car and then engine and transmission and so on.

And then within engine you could have multiple sub-assemblies and then within that multiple products, and so on. So, if you go all the way across the value chain, it will have a large number of layers in the bill of material.

Dr. Milind Gandhe: So even if I am using a simple screw, it will be there in the bill of materials.

Mr. Siva Kumar Padmanabhan: Absolutely. Yeah.

Dr. Milind Gandhe: Okay. So, that is a lot of detail.