**Innovation by Design**
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**Module - 06**
**Start of section 7**
**Lecture – 41**
**Materials and technologies: Durability with cost-efficiency**

So, we went ahead for pilot production or to the best manufacturers then we ordered stainless steel from the market.

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You saw the stainless steel which we use for prototypes, they were like undulated, it look like hand beaten, but in a pilot production, they need to have very very high quality surfaces.

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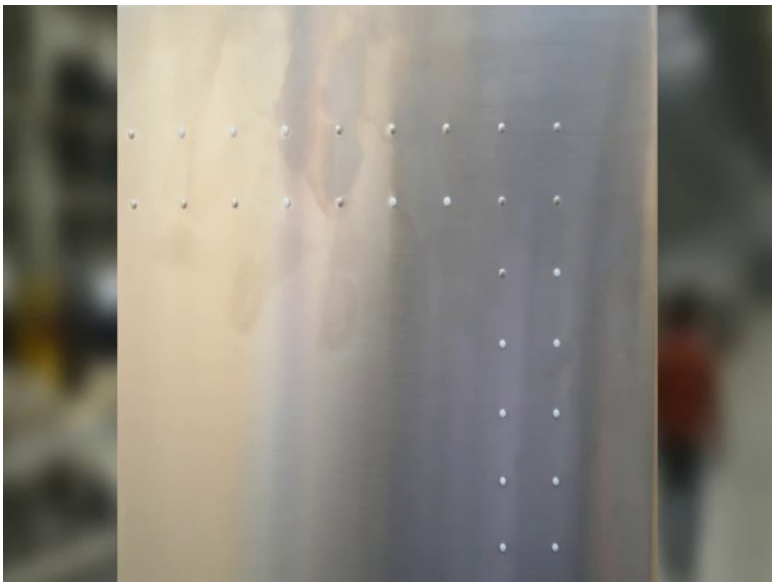

So, we went to Jindal Stainless Steel and they gave us one of their best, you know, grades of stainless steel which is called Scotch-Brite finish. So, that the headlamps of the car when they hit on that stainless steel they do not reflect back.

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So, and then they also took us to their manufacturing unit, which is called the Jindal Architecture, where we produced the components using CNC punching. What is the advantage of computer numerical punching of a sheet before you fold it?

Student: Accurate corners and folds.

Accurate corners and folds, saving of material, nesting of parts, I do not use any sheet, I just, you know, punch all along and I take all the parts out look at that, you know,

sections which are coming at the end. Every small part I punch and use for some purpose and I nest my components, so that I use all the sheet very effectively.

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As well as the most important point is that, it gives you very very accurate parts and gives you very very high quality and now, comes the laser cutting.

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In CNC turret punch and cut the material.

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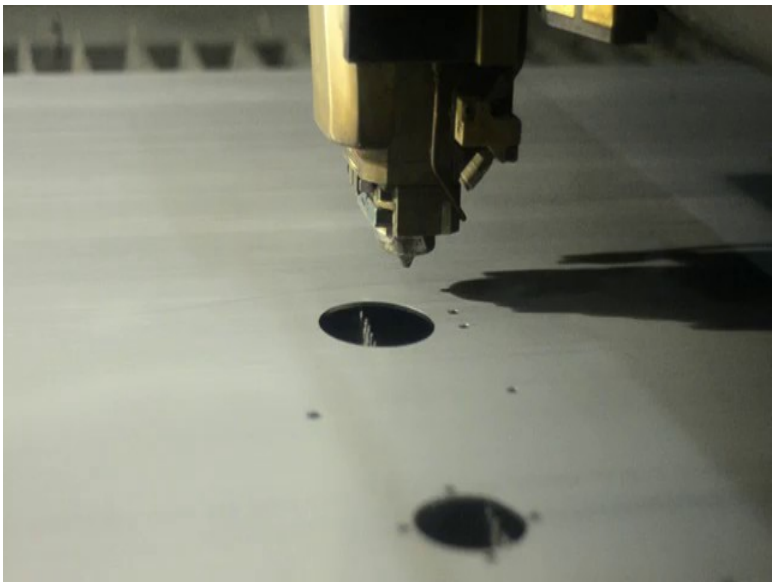

In laser, you cut using lasers. What is the difference between the two? Why do you need to use lasers sometimes and the punch sometimes in a prototype? I am doing a pilot production and I have got very less quantity. So, how many punches will I have? If I have different diameters, if I want to cut a logo, I want to cut a postbox logo on stainless steel.

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So, when you have prototypes generally what you do? Do use laser cutting, because your volume is less, you can use laser to cut the material and laser of course gives better edges laser also, you know, gives you very very intricate shapes.

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And then what is this beautiful machine here? This is computer numerical control bending. Stainless steel material is a very very tough material, here, we have all the inputs coming from our mechanical engineering professors, our professors from manufacturing.

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So, we have all the good features we built in, large envelopes can be posted, you have a posting rest, you can rest your hand to post the letters and then you have these, you know, design where you have no welding outside. Look at all the radiuses. Now are you able to see the radiuses? The edge you can see those shines which are because of the multiple 22 strokes of the round radius and then you fold inside and weld inside. When you bend and you weld on it, it makes lot of stress undulations. So, your sheet becomes very undulated then we have a tough composite top. What are composites?

Student: Mixture of two materials.

Mixture of two materials in this case.

Student: Plastic.

Plastic and?

Student: Glass.

Glass. So, glass, fibreglass. Fibre Reinforced Plastic is very very strong and you can see they called the Fibre Reinforced Plastics FRP you heard about FRP? They also using FRP, they make sculptures.

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Student: Most FRP structures and then you can see the pattern of the fibre.

You can see the pattern of the fibre, but you have more resin on the top, you won't see the pattern and you paint it  This is painted.

Student: But otherwise it was.

Otherwise it is of your choice. You want to show the fibre on the top, you put in a less resin, you have two layers of resin and then you put the fibre, you will not see the fibre. It totally depends upon how you process your Fibre Reinforced Plastics.  Why am I using Fibre Reinforced Plastics over here?

Student: Keep, but strong.

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No, engineering plastics needs tooling, injection molding and the injection molding dyes will cost me more than the order quantity.  All the 20 boxes put together the cost of that will, I will not get a dye to injection mold a engineering plastic.  What is the advantage? it is actually as strong as engineering plastics?

So, we are getting the advantage of the strength, but low volume production using this. But the component cost, per cost of a component is costlier than engineering plastic, because engineering plastic large volumes, then amortization of cost, whereas, in this case, you are making less number, so, it is more expensive.

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Then we have this very interesting feature. So, we put a sliding panel inside of the time.

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So, it doesn't need to take it out. So, we quickly slides the time and you can go and you can see the very prominent PIN number and the location address. So, this is a feature built into the door and the door is very strong in stainless steel.

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And then we had this contemporary look, because of the radius it looked very contemporary and because of the, you know, smart top, it had a look, which was very prominent. So, it was very easily visible from everywhere and we had this large surfaces, where we could advertise.

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And then we have, you know, all the features built into this, the door is also, you know, locking very tight, so, you have no insects going inside.

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Then we have the foundation bolts put, to see the reverse post box and you see the foundation bolts. So, all the bolts are, you know, like from inside. So, you know, nobody can uproot the box by using spanners.