Six Sigma
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Lecture - 62
Six Sigma : Case Study

Hello friends, I invite you to lecture 62 and in this lecture we will discuss a small Case Study using some of the concepts of Six Sigma.

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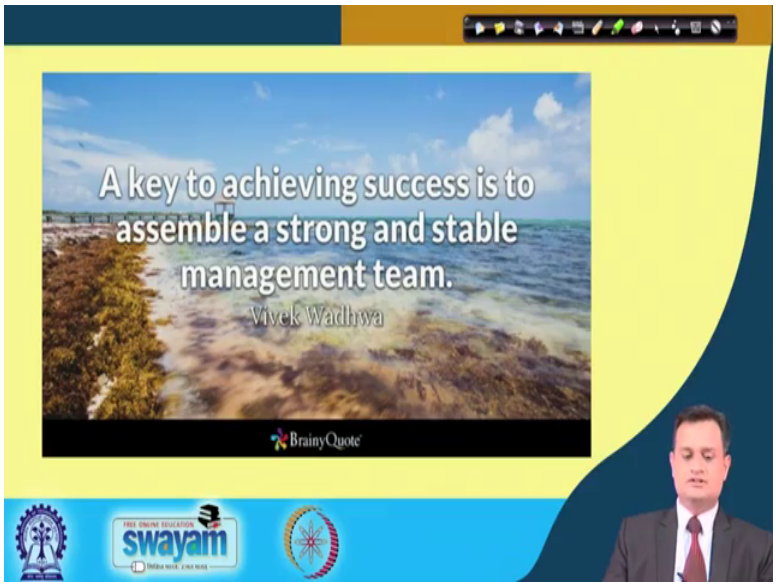

So, let us begin with a beautiful inspiration, a key to achieving success is to assemble a strong and stable management team we had seen this and you cannot execute really the six sigma project a case study we are discussing unless you have the team which is really strong in terms of skill as well as the team management approach.

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So, we had the discussion on various roles of the team members, team formation stages, communication and dynamics and various things we talk in detail in the lecture team management.

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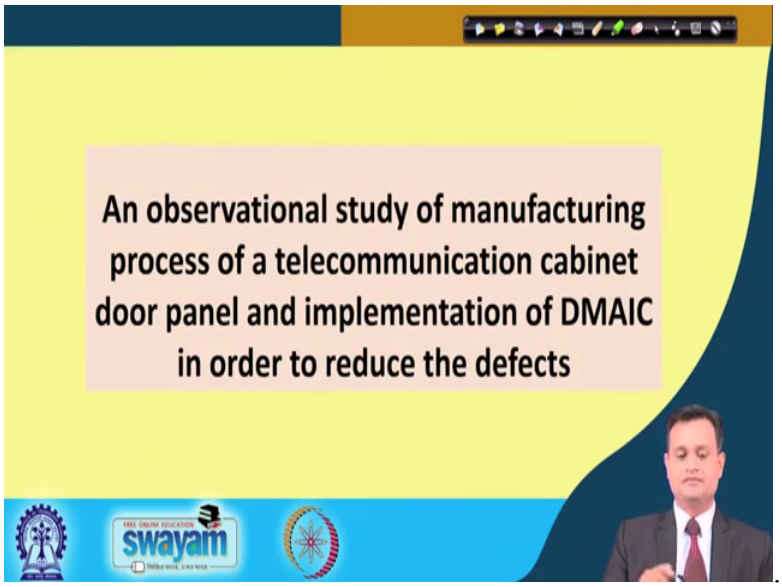

Now, we want to go through a small case study where some of the tools of the six sigma are applied to address a particular problem. So, an observational study of manufacturing process of a telecommunication cabinet door panel and implementation of DMAIC in order to reduce the defects.

So, please understand that whatever we have gone through was a full course on DMAIC and I have discussed all sorts of tools and techniques, but not necessary that you will use all the tools and techniques for a given case study, you have to judicially select that what is exactly required and then you can try to suggest the improvements in the existing process.

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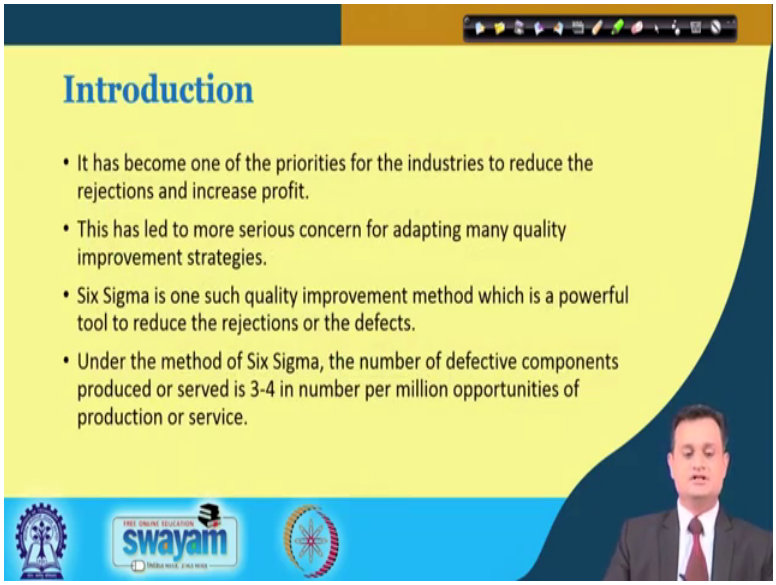

So, we know that six sigma is all about achieving very high quality standard 3.4 parts per million only should be rejected and my process is will have very less variability and sent it towards the target value or the mean.

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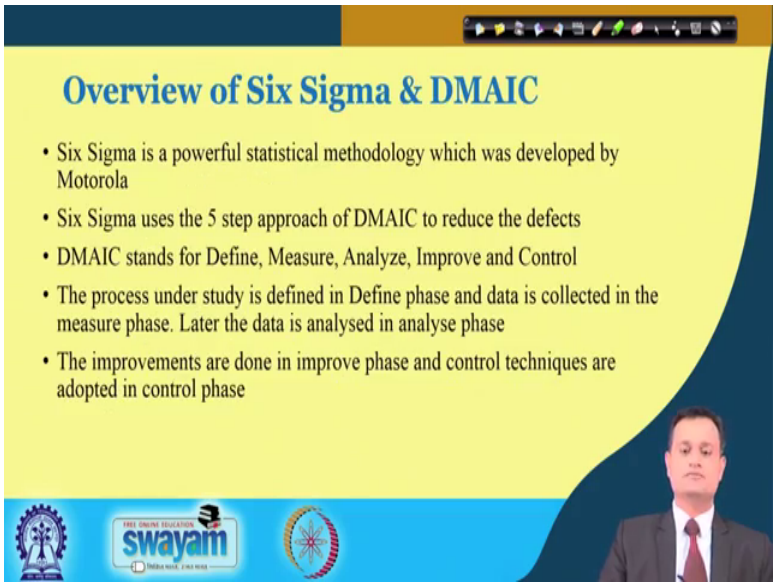

So, six sigma is the DMAIC approach and exactly we will try to apply this for the case study where we will try to investigate the particular problem.

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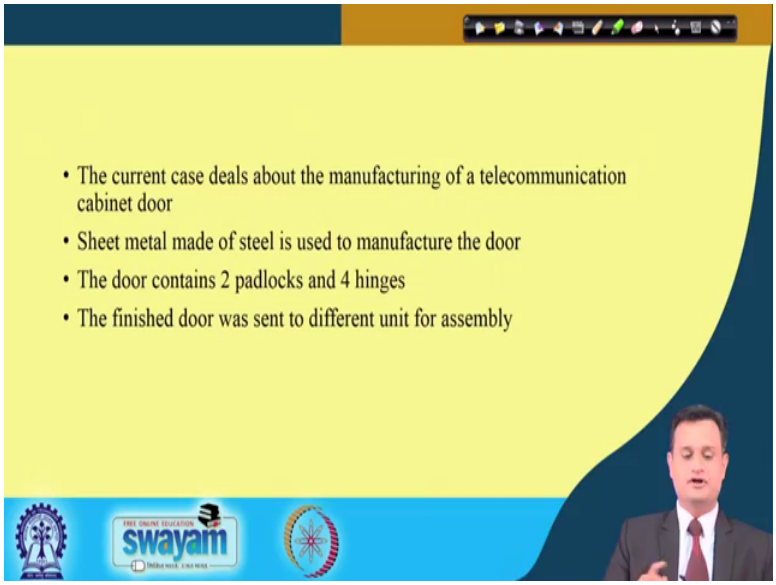

So, the current fake case the one which we will be analyzing deals about the manufacturing of a telecommunication cabinet door and sheet metal made of steel is used to manufacture the door. This door contains 2 padlocks and 4 hinges and the finish door was sent to different unit for assembly. So, it is very simple component, it is a say

telecommunication cabinet door includes 2 pad locks and 4 hinges and then it is sent to the different stations for the assembly.

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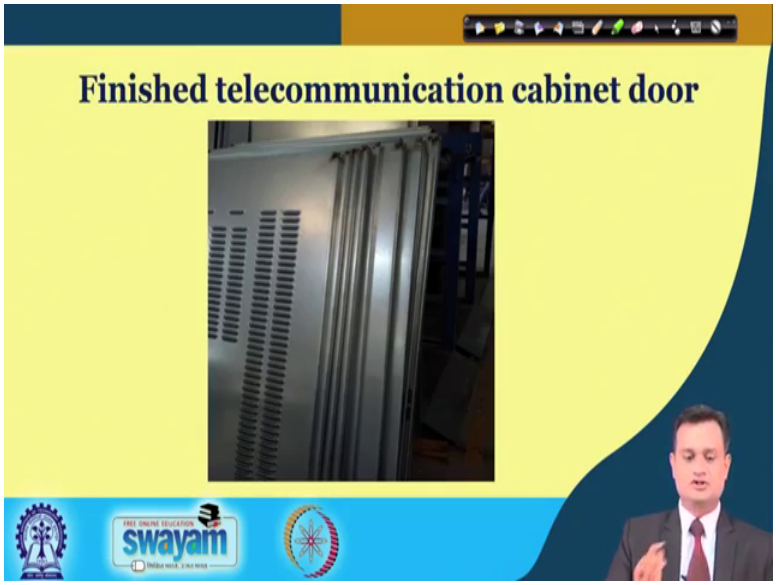

So, this is the picture and you can see that this kind of cabinet you must have seen at various places now company had encountered some problem. So, before we talk about that they have some coding system and the door panel had many dimensions to be measured.

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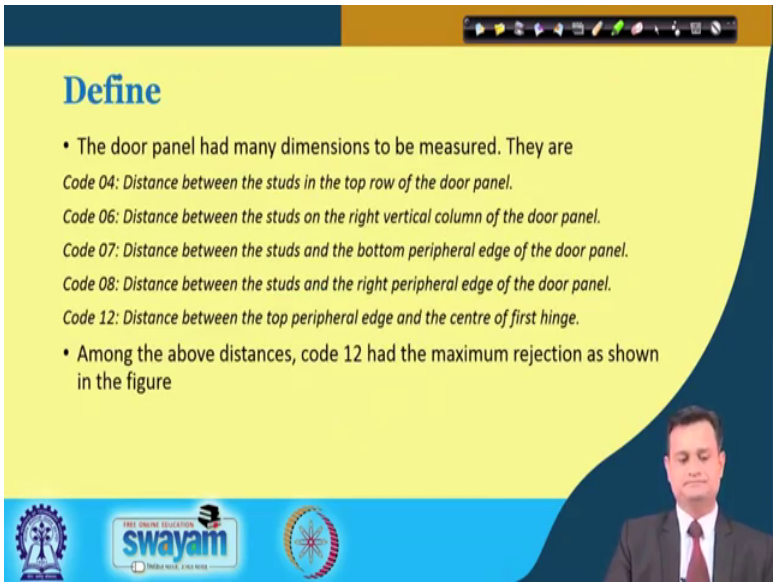

So; obviously, you cannot focus on all the critical to quality you have to find out the one for which you will really conduct the DMAIC cycle and the one which is causing the maximum customer dissatisfaction, either internal customer your next assembly stage or the final customer.

So, you have code 04 for distance between the studs in the top row of the door panel, your code 06 distance between the studs on the right vertical column of the door panel, you have code 7 distance between the studs and the bottom peripheral edge of the door panel, you have code 8 distance between the studs and the right peripheral edge the door panel and code 12 distance between the top peripheral edge and the centre of the first hinge.

So, in their own contacts they have defined the various measurement various characteristic to be measured and they are given specific code. Now, what is been observed? That among this distance is all this codes distance is code 12 at the maximum rejection and this is shown here.

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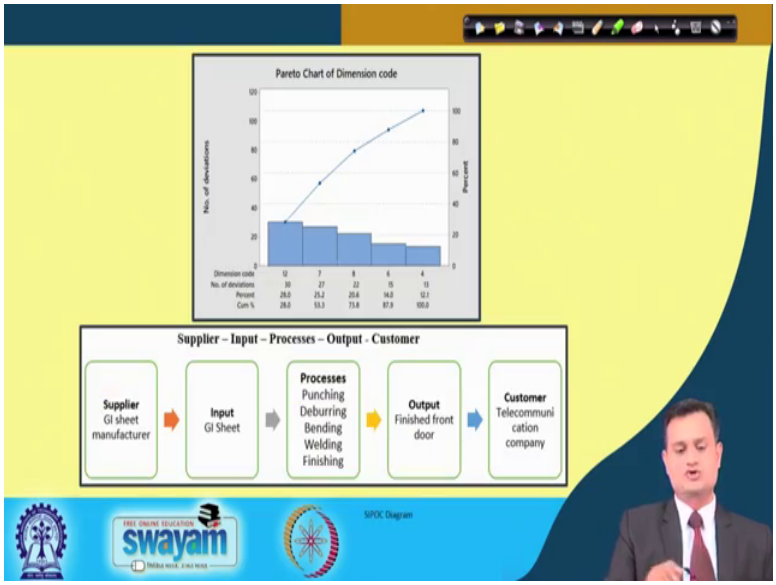

So, what we have done? We have used Pareto chart to see that number of deviations this is the cumulative percentage and what we found? That when I go to let us say some 80 percent it would be here, but if I just go by the number, then this one which is code which is your code I think 12, so this is receiving the maximum defects. So, this is your

code 12 which is receiving, this is the dimension code 12, 7, 8, 6 and 4, this is receiving the maximum number of division that is 30.

So, now, you have a typical SIPOC we have discussed in detail to map the process right from the supply to customer. So, the SIPOC for this is like this you have the GI sheet manufacturer this is the input, then process is punching, deburring, bending, weilding and finishing, you have the output finish front door and customer is the telecommunication company. So, this is what you can do in a very simple way.

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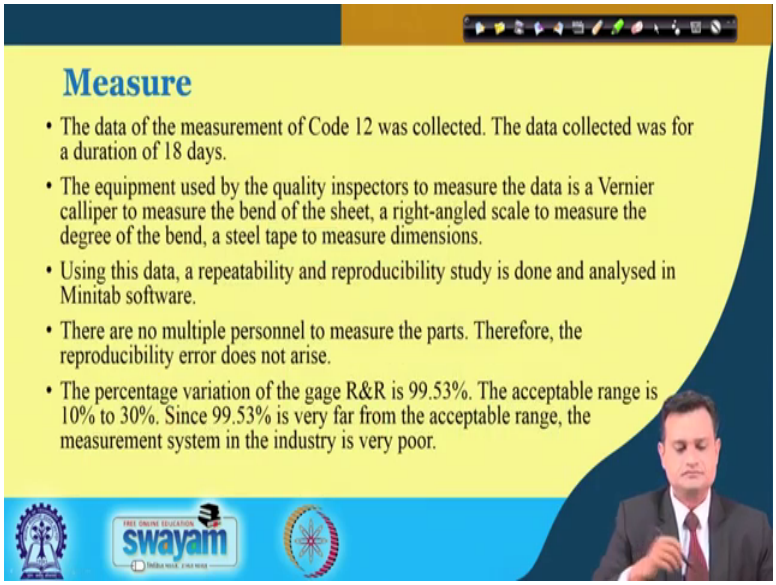

Now, in the measure phase this is the define phase what is the problem? Now in the measure phase. So, their data for the measurement of code 12 was collected and the data was for a duration of 18 days. So, the equipment used by the quality inspectors to measure the data is the Vernier caliper, we have to define all this and the band of the sheet a right angle scale to measure the degree of the band steel tap to measure the dimensions.

So, they have defined the instruments used and what they are measuring, using this data repeatability and reproducibility study was done and Minitab software was used for the convenience and more or less say what you can find? That gage R and R is 99.53 percent. So, I can say that my gage is acceptable range and the acceptable range is 10 to 30 percent. Since 99.53 percent is very far from acceptable range, measurement system is industry is very poor.

So, this is something that I can reveal from the gage R and R, it may be because of instrument there are or it may be because of your operator error, but you have gage R and R 99.53. So, usually we accept up to 10 to 30 percent sometimes even 20 percent or it is too much high and there is a problem. So, at least one thing I have identified in the measure phase that what could be the problem at this stage?

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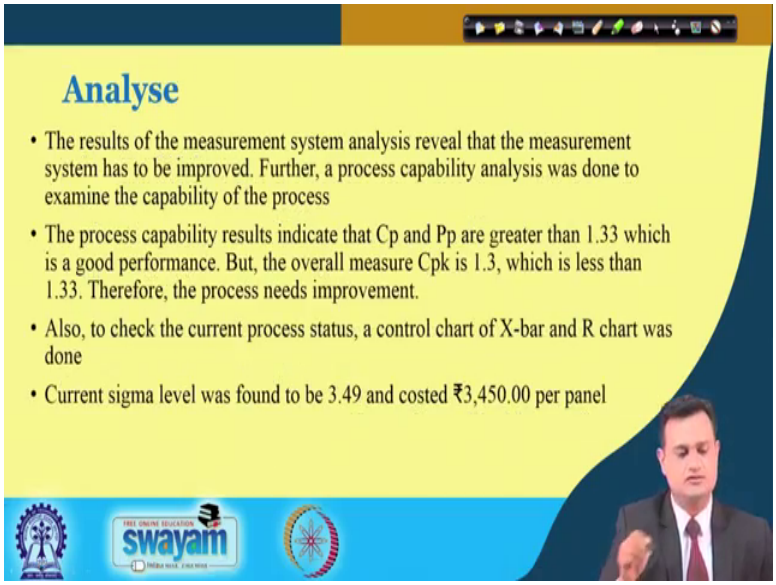

The result of the measurement system analysis reveals that measurement system has to be improved. So, now, there is a problem with the measurement system itself and otherwise it will follow the GIGO garbage in garbage out. So, process capability analysis was also done and this says that Cp Pp are greater than 1.33 which is a good performance. But, the overall measure is 1 point Cpk is 1,33, which is little bit less than the 1.33.

So, here you can be little bit skeptical you may go for little bit process improvement or you can go ahead and later on you can see that whether your mean shifting is really taking place or not. So, current sigma level was found to be 3.49 and costed you something about 3450 for panel. So, this is what I have done in the analyzed stage.

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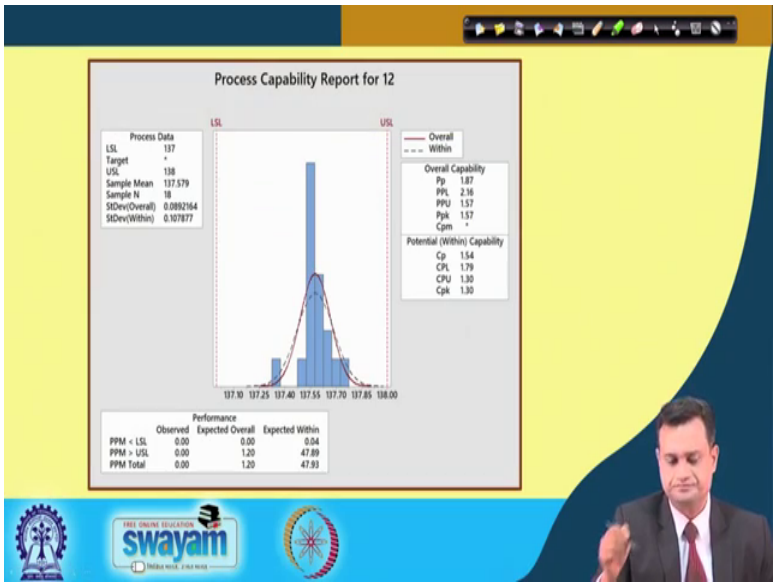

Now, you can see my Cp, so you have Cp diagram and Cp is 1.54 CPL is 1.79, 1.3, 1.3. So, not too much problem with the existing process maybe a marginal difference and if there is a need in future when the Cp value really goes down, you can really say intervene and take the corrective action.

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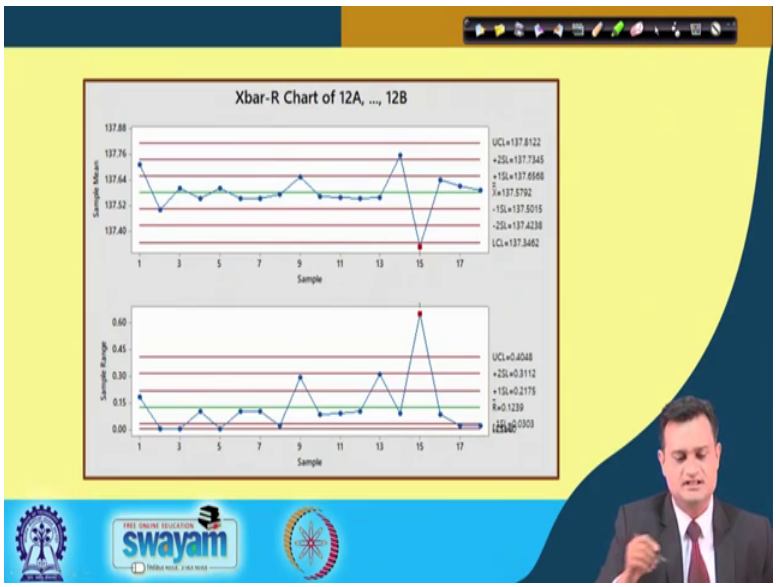

Subsequently say I have also plotted the X bar and R chart, so this is my X bar chart, this is my R chart and what I can see here that some point on X bar chart is falling below the

lower control limit some point on the R bar chart is falling above the upper control limit and this could be a say problem or point of concern specific to sample number 15.

So, if you are setting the trial control limit you can eliminate this point and set your this thing if you have already well established limit, then you try to take the corrective action in order to say get rid of as assignable cause and bring the process back to the control.

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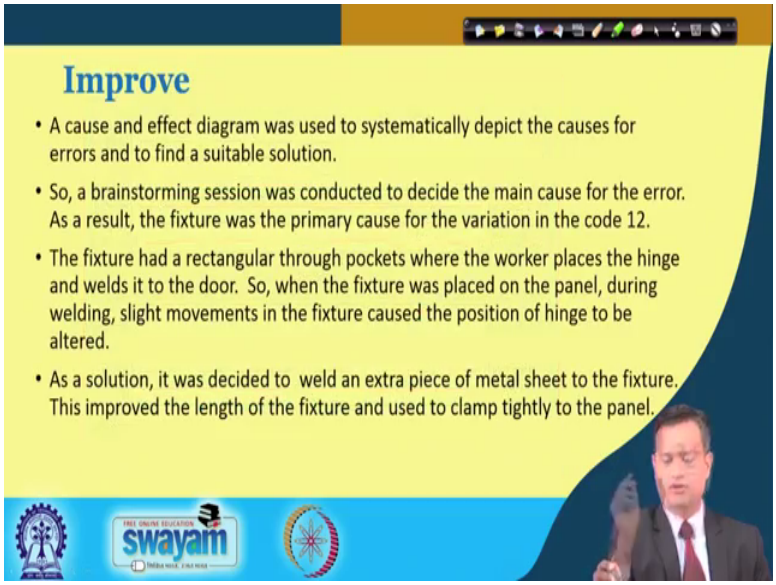

So, now, improve stage we are trying to say conduct the cause and effect analysis to depict the causes for the errors to find a suitable solution. So, a brainstorming session was conducted to decide a main cause for the error and fixture was primarily cause for the variation in the code 12. So, we add the problem with code 12 maximum number of defect we have also seen there was a problem with the measurement, we had seen that sample number 15 was indicating out of control process.

Then we delete the cause and effect detail critical thinking analysis and it was found that the fixture is a problem. The fixture at a rectangular say, through pockets where the worker places the hinge and welds it to the door. So, this was the situation of the fixture and when the fixture was placed on the panel during welding, slight movement in the fixture caused the position of hinge to be altered.

So, you see that somewhere there was the locational problem that where you are placing the fixture and what it does with the moment hand moment of the welder and this creates

the problem. So, then it was decided to weld an extra piece of metal sheet to the fixture, these improved the length of the fixture and used to claim tightly to the panels. So, there was some shakiness and this was removed by fixing an additional sheet and the problem was little bit say address.

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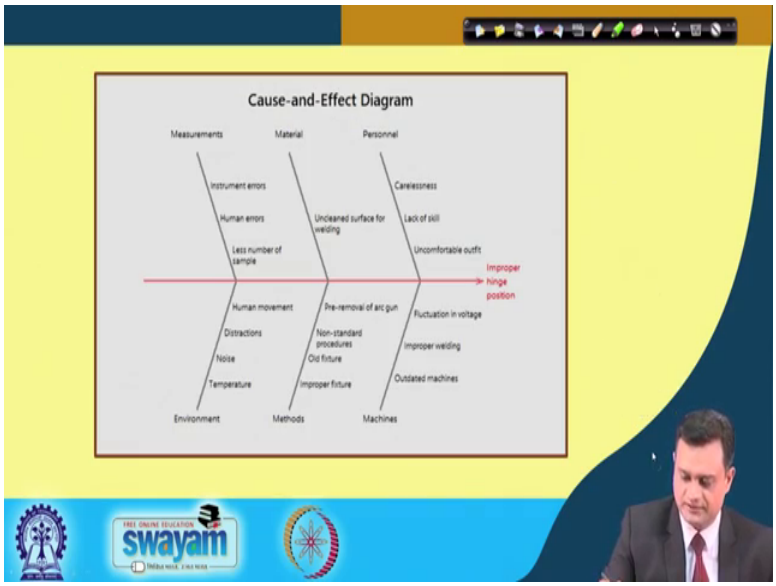

So, improve same proper hinge position was the problem identified and then cause and effect was conducted personal, carelessness, lack of skill, uncomfortable outfit, material may be say unclean surface, measurement instrument error, human error environment maybe destruction noise, temperature method, free removal of organ, non standard procedure and machine fluctuation in voltage and so on.

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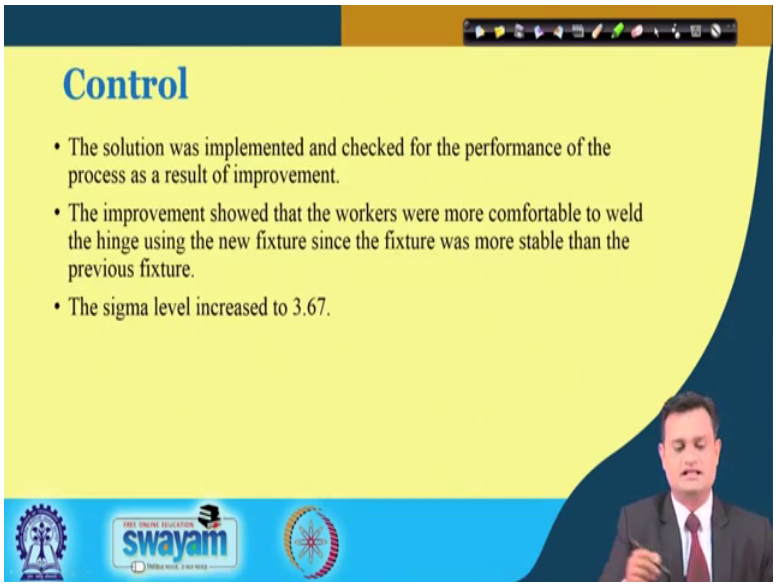

So, many things where thought as a part of critical thinking cause and effect and the appropriate action is taken to put and additional sheet to make your say welding position are quite accurate and the hinge welding stable. Finally the control phase the solution was implemented and checked for the performance of the process, as a result of improvement and the improvement showed that workers were more comfortable to weld the hinges they were having better and control.

So, with this new fixture or additional sheet they were more comfortable and hand moment variation was reduced. So, the sigma level increased to 3.67 still we are far away from six sigma, but still there is some improvement in the sigma level and it is an indication that my DMAIC cycle as operated well with some simple tools selected from the overall toolkit of my DMAIC and it is brought some improvement for the case industry.

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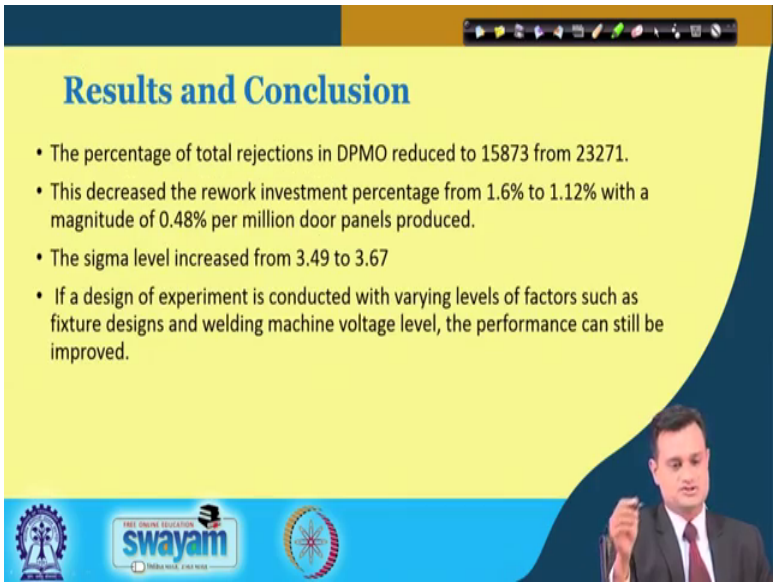

So, finally, results and conclusions where, the percentage of total rejection in DPMO reduced to 158733 from 23271 it is a significant reduction. The decreased rework has a investment percentage from 1.6 percent to 1.12 percent with a magnitude of 0.48 per person per million dollar a door panel produced.

The sigma level increase point 3.49 to 3.67 I will say it is just marginal they also need to look into the other factors they identified, so cause any effect, but there is at least some improvement in the sigma level. The design of experiment is conducted with varying levels of factors such as fixture design welding machine level and the performance can still be improved this is what is recommended by the six sigma team.

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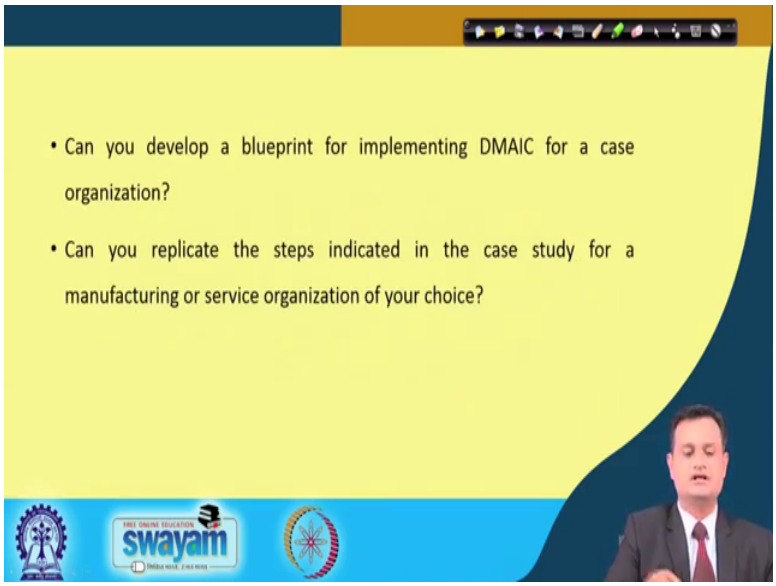

So, think it I am just giving you the open ended question can you develop a blueprint for implementing DMAIC for a case organization? And can you replicate the steps just the simple steps indicated in the case study for a manufacturing or service company of your choice and conduct some DMAIC analysis?

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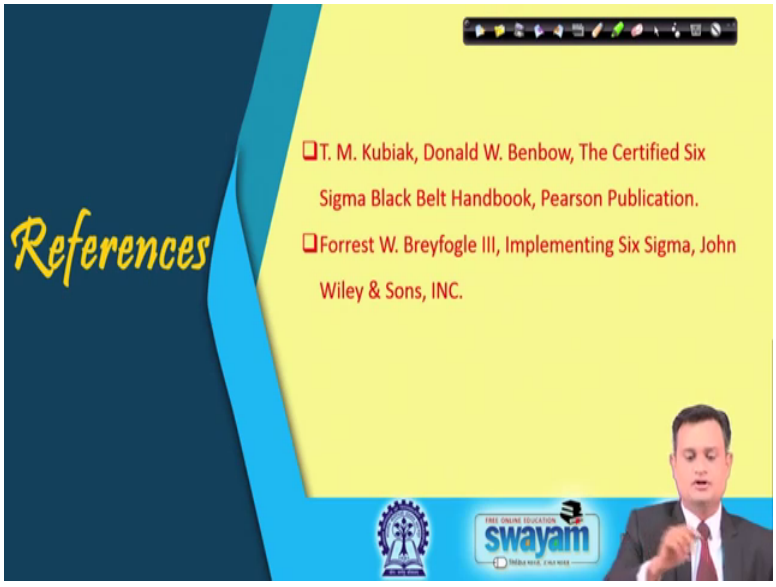

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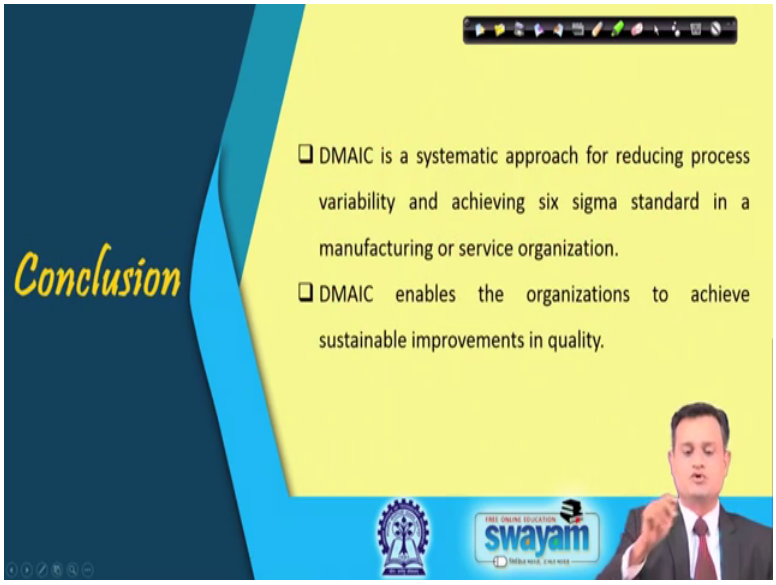

So you can refer couple of gases from these books also and DMAIC is a systematic methodology to bring the improvement on fact based management in the process which is producing more number of defectives. So, thank you very much for your interest in appreciating this particular case study and you can extend a particular case by using the different tools and techniques we have discussed hypothesis testing, ANNOVA, design of experiment and many others.

And you can really get into the depth of the case, problem and bring the significant substantial improvement in the sigma level for a company. So, please keep revising, introspecting through application be with me enjoy.