Manufacturing System Technology - II
Prof. Shantanu Bhattacharya
Department of Mechanical Engineering or
Industrial and Production Engineering
Indian Institute of Technology, Kanpur

Lecture – 09

Hello welcome to the manufacturing **s**ystem part 2 module 9. Today we will just be focusing on this failure mode effect analysis technique, I just quick recap of what we are doing in the last lecture, we were trying to identify on a system bases the various factors related to the noise factors as well as you know the several external factors as well as single factors we should be there for engineering system and again categorization of the factors as controllable and uncontrollable once. So, that finally, they response of the system we get generated. In the century also try to understanding on a transistor circuit what would really be the variability, you know factor which is valuable mode to what is the designers, what is also the controllable factors, which are you known mostly related to the operators, etcetera.

Today, we are going to investigate this whole technique FMEA, which is very important technique for quality control and you know quality implementation particularly at the processes level. So, most of the industries particularly the auto wheel industries etcetera very much into doing FMEA analysis and every level of the parts or components and also the fitment as regards the assembly process.

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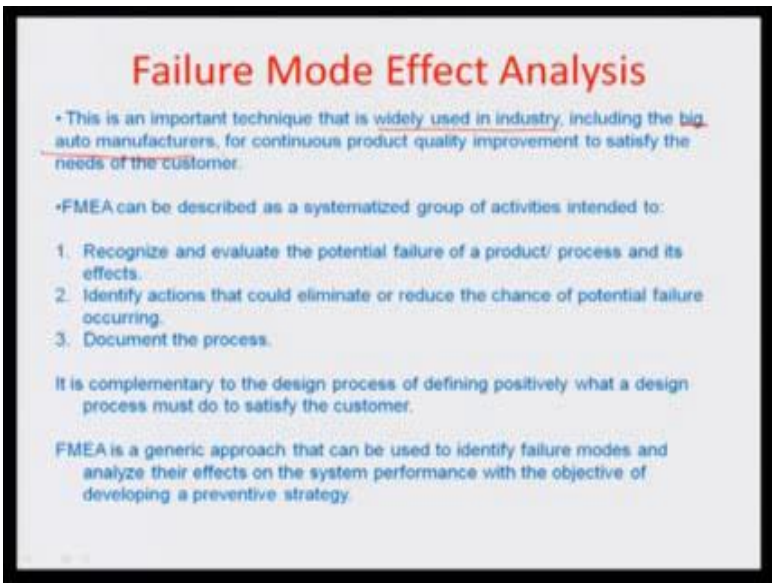

So, what really is this FMEA. The term FMEA actually means failure mode effect analysis, it is an important technique, that is widely a used in industry as I told big auto manufacture and also typically the goal is continues product the improvement in terms of its quality to satisfies some each of the customer extract which are very, very a important for sustains and business.

So, FMEA has a in fact began a gratin butter of several engineers working at process control level, and it can be describe is a systematize group of activities intended to recognize and evaluate the potential failure of a product or process and its resulting effect. So, you have to list down the cause of various a failures, and then you will have to again identify the most important cause, that is the whole purpose of the FMEA analysis. And then you identify some action that could eliminate or produce chances of the potential failure occurring, I am going to give you a detail process example of a auto motive paint shop that I have assembly it can carried out down in a painting process where will understand what I am telling more realistically or practically where we recognize and evaluate problem and identifies counter measures to a eliminate possible the cause of the problem.

And them also FMEA a needs to a document to the whole process; a whole idea is that once a very organize the study of the failure modes and with its ratings as well as the potential, you know action that could eliminates such failure modes and well as ratings are documented is idea is that in future such problems get the raise in due to a process decontrol or the process going out of, you know the limits a whatever guidelines it has to follow it should be a able to get it back on track using reference from the previous documentation has been done for the industry. So, there is why documenting process is very, very important in this particular case. So, it is complementary to the to the design process of defining possibility what is the design process, I what is design process must satisfies the costumer and it is a generic approach that can be used identify failure mode and analyze the effects on the system performance with a objective of developing a preventive strategy. So, that is what FMEA of a failure mode effect analysis these about.

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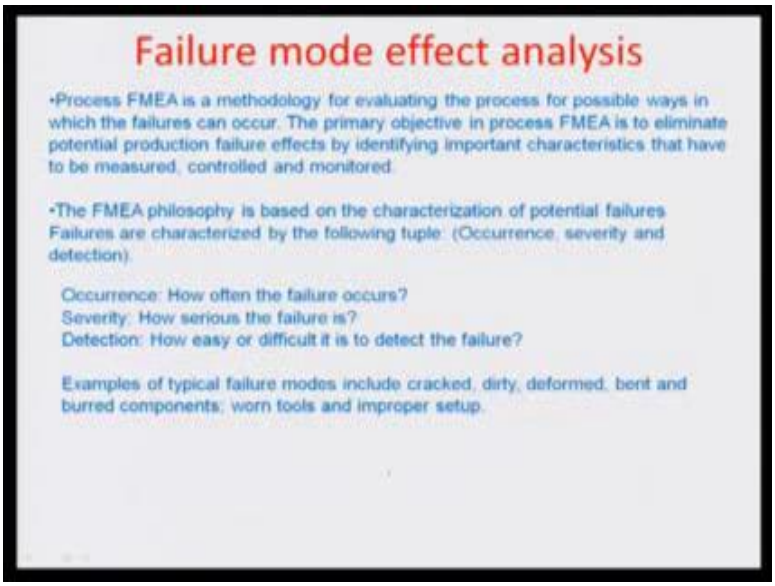

So, the methodology that is typically used for the process FMEA is to again, you know the philosophy is really the characterization of various potential failures, and its causes of a particular system. And the failure can further be characterize by three important thinks; one is the occurrence; that means, how often a particular failure mode occurs. If I am talking about a paint peel off or may be let us say dust spot in a painted documented body. The idea again is that how often this failure happens, you know a it was undetected from the paint state bond to the next stage a automatic which is assembly stage.

So, it they may be a situation where shift of let us say about 300 vehicles a about 10 percent paint vehicles are 30 vehicles are seeing paint spoil paint dust spots of the painted body. So, this is the… So, occurrence they are about 10 percent. So, in this same manner between process, and in every level whether it is a components coming from the a wander process your process or it is a components could you seen how which comes to your process at some stage, you have to identify some stage, you have to identify the failure modes which are created disturbing influence the on the overall quality of occurrence. Then the question is the similarity and how slimier or serious failure is for example, if it is the failure related to the life and death of the driver of a not only for example, a wheal nut you know go cross the way and finally its breaks a particularly nut which is used the mounting the wheel this, now a very, very serious problem concern the safety of the operators.

So, obviously, severity aspects of the failure is very important. So, first step in the occurrence a frequency at the which the failure is happens, second step is the at which

your waiting to this failure to be happen a happening, and the finally is the detection. So, a if there is a failure mode analytic is detectable then obviously which should be able to recognize that to relatively a lot such a serious activities, but then is if there is a failure mode were detection become real issue or a real problem, and it grow a undetected to all way to the customer that becomes a very, very critical issue. If I want to develop mathematical ratting system who identify all this different aspect associated with the failure neglects the occurrence severity and detection together, and then we analyze how frequent how difficult to the detect, then those are the kind of failure mode which really should identify, and never let it happen on the a hole process processes.

So, that is the governing philosophy when the a fee a FMEA process, and a we like to now evaluate such difficult mythology the mathematical mythology of the detecting the ranking order, and then identifying most ranks to once to the least rank once and taking those most rank once. So, there can be a chance of the elimination of all such failure mode, which have a how value of occurrence such we… And then a very low detection possibility or the difficult levels is higher detection. So, we will we do that, but folk that related to actually study how the ranking is done.

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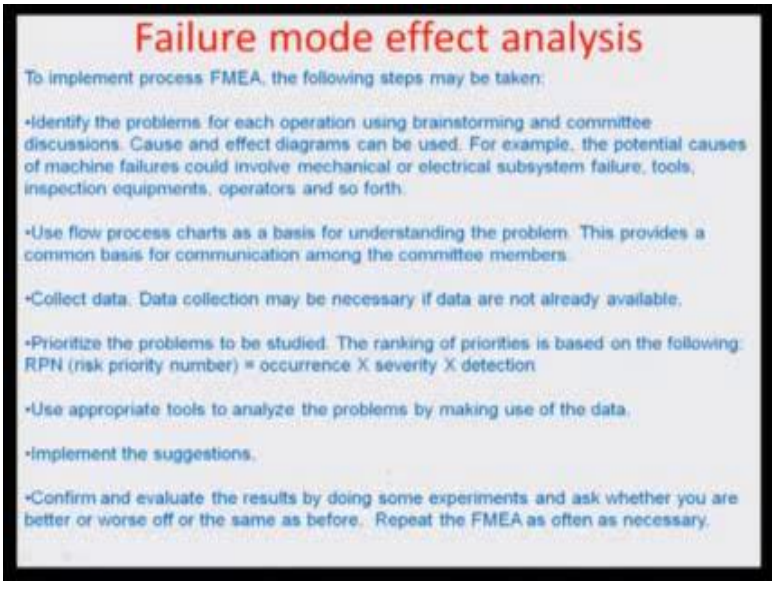

The implementation of the FMEA process a necessities the following steps, first a fall you identifying the problems for each operation and that can be identify the a mostly of the local level. For example, we will talk about automotive shop. And we are talking about problems related to the pain of the FMEA of the particular components in to the final vehicle, when the group of the governing members who are associated with the

fitment would be the best people, and that is basically also the people who are the online and who are doing the effect who would take a decision on that particular component of that particular failure mode.

So, basically there a many ways a of you know a presenting the caught process, which comes out to a committed discussion with a prince formal one of them can for example, be cause and effect diagram which are illustrate a which are we put little it also put diagram a helm diagram, then for example the potential causes of a machine failure a could involves mechanical or lift subsystem failure tools inspection equipment operators and so far, then this has to be very clearly laid out has the exact problem or exact problems and what is the responsible problems.

And then you can use flow process charts as basic for understanding the problem, which provide the common bases for communication among the comity members also collect some data from time to time, and you analyze necessary if data is already a available or if it is not available you collect the analyze what ever with basis. So, all these a important thinks go to works words really we identification all the problems coming in certain area on a given a area period of time, you have to directly relate the concerned local a manpower which is sitting in fitment of the part or component or even the process. So, the process a level personas persons a really involved may the brains terming, because they are the best people to actually comment on the quality of that particular level on the potential failure modes which may be go out on that particular production, now I priorities the problem.

So, in study the problems by means of this statistical analysis, and I will actually a give you some bases there about 7 or different tools of political tool, but which a nothing but process. And then based on this process which should be able to clear organized way collect the data of problems related to a certain process or a certain components. So, that has to be documented in back particular order, I will discuss to the end of the FMEA activities. First of all as a focus more on the FMEA as of now, but there are organized method in which this process data will come out, which will identifies these are the problems, and these are the a potential failure modes associated with the particular stage of the process or the system, we are the concerned with.

So, then you prioritise the problems. Once you identify the problem and prioritize the problem, and priority is are based on the ranking. So, this ranking again done by those

personal who are involved in the process level itself. So, the ranking basically would mean that will have to a rank how frequently the problem happen, how sever the problem is and how difficult or easy it is detect the particular problem, and then basically a rank each of these categories and multiple the ranks each other to formulated something, which is now known as the risk priority. So, supposing of the defect is high frequency defect the occurs more and obviously rank should be more, and similarly if the siviority of the problem is very high the and rank should be more server.

So, let say scale of the 0 to 10. So, if supposing the we are let us which talking about, let say the engine mounting nut on the a food area on the particular engine. So, here the nut needs to be a high quality; obviously, a nut is going to whole the tore tork of the boat a nut is typically well in the body, and there is useful brackets is to hold. We can obviously, there is engine mountain cross member which comes in the bottom of the engine to support the engine which actually gets help to those particular nuts in the body. So, idea is that here we cannot effort to have a cross study.

So, if there is coastal engine in the possibility to the bracket of the engine, we come out from one of the sites it may result some kind of failures associated with that engine mounting step. So, we have to study that what is the severity level of this problem this is probably, one of the severs, most severe problems which would come out in comparison something which is related to ascetics of the vehicles. For example, all though you know sometime these strategy of the management also involve to make fallen certain decision, may be it is a very important that these a issues related to that is the painting of the body a not a emoted is given priority over functional requirement sometimes.

Obviously, we have to at least make a system were painting defects or also equally are some particular level. So, the idea is more on shop bases you identify your own problems and how your contributed in to the process, and qualities based on the ranks there is priorities number that your are given on the shop bases for a paint shop. For example, a paint dust may be a that critical important which is from the same healthy engine mounting engine members cross away for some gives the… So, based on a individual area you can a mark, you know the 19's accordingly then you obviously, you have the detect ability you of the system how difficult, how it is easy is detection, if it is a problem which is very hard to grater than; obviously, the rank of that the particular problem who go up 0 to 10 scale. And if it is tenth in the rank would be slide to the glow. So, if this formulate RPM on the risk priority numbers. And now you organize on the

bases of increase decrease order of the RPM, obviously the first rpm which is highest numbers would have a very occurrence very wear problems, and very difficult detect to situation or vice versa.

So, you order on a rpm now analyze a problems and goal is that you should start eliminating that is the a first year problem is totality, and in study what is the you know level at twist the problem gets resort or sorted out. And then studies the next three or next four, we should not a parasite yourself you also all of them, but study may be the first 3 or 4 RPS a or the potential failure and eliminated them, and the goes to the next wants and then there may be some occurrence may not be that high that rank may be lower, so obviously, those who be in the lower category. So, you approve you… So, appropriately tools analyze the problems by making use of the data that has been, you know characterizing in the various formats to map this rpm on this priority number.

And then obviously, implement some of the suggestions a given by the process engineers to reduce them, and that way you able to actually see how the RPM is warring after the improvement. So, basically a when you have identify the failure mode. So, they rpm is associated with you can always do a countermeasure and counteraction. So, that those most scale eliminated, and then again the rate the rpm after the countermeasure happening implemented on the system seethe rpm is coming down. So, there is a tracking of how the eliminating the highest talker in most severe difficult defect effects on a very organized manner on the mapping is given by a best person who is associated with the process itself directly. So, you having an rpm number and your trying to reduced rpm number the giving the counter measure.

And then finally the idea is that once all these RPM's are reduce to the next level, you can take next three RPM, again to try to reduce the next level so and so forth. So, that way you can actually do evaluation of the whole process by doing this whole analysis, this analysis essentially is known as the failure mode effect analysis. So, I think I have made in theoretical introduction, we will closed this module here in the interest of time. The next module we are actually going do an FMEA on a paint shop buzzer is illustrated for particular effect which happens, and we will close on here by a take on message that this theoretical introduction what has be happened in the rpm would actually be implemented now, and you see table are made or you know very critically examine what is the format in which this whole FMEA made, which you are talking which better know is the documentation related to the FMEA.

Thank you so much.