Manufacturing System Technology - II

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Lecture – 01

Hello and welcome to this Manufacturing Systems Technology Part two course, today being module one. Just a brief recap of you know sort of what we did in the part one we tried to learn about computer integrated manufacturing systems really starting with the cad design part then going into the different aspects of how you do process planning and then finally, also trying to write a code using numerical control on machines. And then finally, studying a little bit about inventory management keeping the lean manufacturing concept into mind. This particular module would be dedicated more on issues like quality associated with manufacturing process. It will also be looking into various aspects of material handling systems like let say automatic storage retrieval systems or automatic guided vehicles AGV's, which are the most important concepts of production management in the current technology regime, which exist in the industries. We will also looking details to some of the issues related to robotics and robot programming in this particular module.

So, let us talk about quality; quality really is the key parameter that is determinant of whether an enterprise can be in business, gone of all those days the probably the late eighties when we should talk about minimum cost and also to some extend about the leap time in which production processes would be able to converge and realize a product to the customer. The major issues, which are nowadays very important to stay in the business is how repeatable the performance matrix of product is, once it goes to the customer of the market. And the whole essence is about changing the quality management philosophy of an organization, and the changing the focus of management of an organization geared to the quality aspects, so that there is no value non value added work, which comes out of any process.

So, push back as far as possible the metrics which determine the quality into the process, so that at the stage of the process output, you really need not worry about the quality level. So, this is all called in process quality build up. And all the organizations, nowadays are more or less intending to do that. So, let us understand how quality can be

done at the product level or the process level. Normally by designing the process of the product and introducing a lot of robustness in that design stage, so that the non-conformability or the you know not meeting of the performance matrices out of the question of given a product design or a given a process design, which has been laid out, so that is the essence at which we will be looking at of this quality engineering aspect.

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And let us look at some of the basic principles, which are important for understanding quality. So, obviously the best approach as I think I had illustrated of product quality is to build quality into the product and process, right at the product and process design stage that is called robustness by design. And also you know, it may be improved at the production stage by confirming to the process design, and trying to see whether whatever you have laid out you know as your process, follows the norms for the process at every stage the norms that have been formulated at the design stage of the process. So, for this purpose, the techniques such as SPC or SQC, which is also known as statistical process control or quality control is used; and the idea is that you have to somehow we able to reduces the number of non conforming products and non conforming parts, which come out of a production process. So, the reducing the number of non-conforming products, and thereby improving the quality is basically the goal. So, one aspect obviously is the design stage and one aspect; obviously, as the production is going on what you do to rest the production problems at much an earlier level before it really gets into a minus, so that is all about quality engineering.

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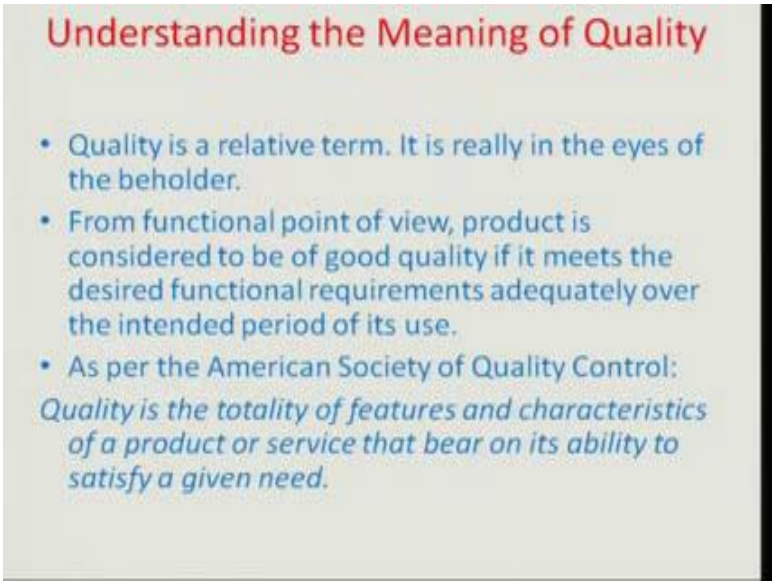

And if I really looked at quality, it is a really you know relative term some person may perceive something as high quality some person may perceive something else as high quality. So, you have to have some kind of a customer mapping of the customer needs and the aspiration that the customer has behind the product exactly into the product. So obviously, we did a lot of this analysis before, when we talked about how variability can be introduced at the production process stage given the change of perception, how quickly a process can be altered to produce something which changes or maps that perception on the real time basis. So, all this we did in part one Manufacturing Systems Technology.

So, here it is really you know depended on the eyes of the beholder I would say who is the customer who would actually tried to treat quality in some particular manner. So, from a functional point of view of course, the product is considered to be good quality if it meets the desired functional requirements adequately over the intended period of its use. And so the definition of the you know quality as per the American Society of Quality Control includes all these concepts, which have been illustrated here and says that the quality is the totality of features and characteristics of a product or service that bear on its ability to satisfy a given need; and need means a customer need basically. So, how values are confirming to the characteristics mapped from the customer need is what the quality means philosophically.

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So, if I look at some of the dimensions which are associated with the let say quality of the product, there are principally about twelve dimensions related to the product into which you can categorized the quality of a product. The first being the performance of course, the primary operating characteristics we are talking about let us say the engine meeting a certain break horse power output. So, you know the primary operating characteristics of the engine then would be how much BHP the engine is designed for. Or let say for example, if I wanted the flow rate coming out of a head you know let us say of mechanical pump then the flow rate would be the primary operating characteristics for which primarily the product is intended - the design of the product is intended, so that is performance the primary operating characteristics.

The other aspects are features, for example, there may be many secondary operating characteristics apart from the primary operating characteristics. For example, you know in an engine if we look at let say the secondary operating characteristics, there may be many issues like for examples whether the engine meets the emission norms, so that can be one of the secondary operating characteristics given the primary operating characteristic of the engine rpm or bhp which is very, very critical. Can the next need could be that is it going to meet some kind of quality layout for meeting the emission norms, so that can be secondary operating characteristics in this particular case.

So, then you have of course, time, time waiting in line, time from concept to production of a new product, time to complete a service, these are all a very important part that how much lead time you are having in the process which includes probably the design

concept all the way to the production stage of a product. Or you know let say when you are talking about a service industry, time to complete given service. Like for example, when you talk about restaurant, and you want to see how you know the food from the ordering point to the point when it is delivered is taken across you know all that time would be considered as very critical because a customer may have to wait more or less depending on the food arrives faster or a later and so that is very important aspect of quality. So, performance features time.

The next is reliability, the extent of failure free operation. For example, let say when you are talking about the Indian driving cycle we might as well see that if let say there is a quality parameter or an oil seal an engine, and you want to simulate the engine to run on conditions like the Indian driving cycle and see that how many revolutions of the crankshaft can these oil seal bear without leaking, so that is a reliability of the oil seal. So, something which is more related to the extent of time up to which the product would operate without the any failures that is very important part of the quality. Durability again very important part of amount of use until replacement is preferred to repair, we all talk about product warranty and product guarantee you know in some of the cases, where there is this issue of durability which is talked about. Can you up to what amount of time you can use the product right until the product really become so non conforming that you will have to rather replace it rather than doing some changes and trying to use it, so that is the durability.

Obviously, uniformity is the important quality dimension. So, low variations among the repeated outcomes of a process we are taking about let say production of a circular shaft cylindrical shaft by turning process and there you know the uniformity could be concerned with what is the variability in the output dimension that is the diameter of a particular shaft if you a producing 20000 of a shaft it may be a day's time on a high speed NC controlled lathe machine then the question of uniformity would come as to if you look at all the outputs is it all coming out be within the dimension plus minus that tolerance, which has been provided in the design itself as are going out you know other process is going on a run out. So, that is the uniformity that is the very important aspect or dimensions of the quality.

Consistency, so consistency basically talks about match with documentation advertising deadlines or industry standards. So, whatever has been planned for the process bead the production process are the marketing process are even the design first principle of quality

says the document everything that has been planned if at all the different related you know certification agency are basically nothing but overall guidelines of how to document certain processes or certain products or certain you know systems with then an organization. So, this documentation once done has to be matched at every level consistently that is called consistency of a organization that if you have documented a process to do carryout in a x or y way are you sticking to that process sticking to that documentation as far as the regular running of the process is concern year long is something, which is related to the consistency. So, this can go through for even things like you know the deadlines to an organization, how the deadlines are being meet, how you are advertising for the particular product that the organization produces or are there any industry standards, which are there in your complained to them. So, these are all part of consistency.

Serviceability, so obviously, there may be product failures in the market are the product non complaints non complaints of the performance matrix in the market because of which frequent servicing may be required of the product you know the particularly for the dynamic product is very important that one sold you have to have sort of annual maintenance of this products to set it right every time and set it and ensure that it keeps running. For example, if you by a not to mote a there is; obviously, a service plan given with a automotive that you have to come out. So, many kilometers have so many numbers of days you know back for servicing are there may be some free services given by the organization just to ensure the average of quality checking to the customer and ensuring that the customer returns once in a while, so that the overall vehicle health can be monitored at that particular level. So, the serviceability of the product is very very important of dimension of quality and these has to be planned at the design of the product stage you designing a product, which is invisible let us say for example, after the full assembly you are not able to open a part from a system it is a major problem to the other issue the aesthetics of a product.

Obviously, as the name implies it means how beautiful is the product you know it is make or construction. So, it is basically all characteristics related to quality to the senses of the customer and it is basically mapping of how you peruses the product to be you know a good looking product. You know so that is what the aesthetics means is a very important trade of quality again incorporate in the design stage for a product you know so, that there is good amount of perception about the product in the customers mind so

obviously, there is a personal interface, which talks about characteristics such as punctuality courtesy and professionalism for any particular organization, this is a very important a aspect that you know related to let say process for an organization or related to for the system for the organization are the essential elements of that organization the human factor is it really disciplined and punctual this would be very important for determining whether, the overall quality level would be afflicted of the particular product or maybe make systems in manners so that become people become regular and punctual you know then you have things like how professional personalize aborted own work.

For example, does hide anything which goes bad in the production that he has made or the sequence of operation that he has added on to a certain system or a product. So, this is also very important that trade to personality trace of a person who is in involved in the product in production level is inherently related to the quality. So, this is a personal interface of the human force, which is associated which is the production or even the design you know is very important dimension of the quality again you know so, for example, in systems in places where, you can ensure that the work force by en large discipline and the work force by enlarge is honest about what they are doing you will always be able to get a good level of quality harmlessness so obviously, this is the characteristics related to safety health and environment any process for example, which is the production process will have an a issue related to over all safety, whether this particular product when the production process is going on is safe to be produced.

There may be products were are topic fuse or harmful you know vapors may be generated, which were not be that consumer friendly or which may not be that friendly to the personal who are making the product at that particular stage. So, will have to make separate guidelines for sort of an environment production there so, that the human safety aspect of the people who are involved directly in the production can be taken up and this has to be again a important part of process planning and so, that would in way influence the quality of the products. So, for example, in automotive plain shops if you have a certain level of let say you know environmentally cleanliness it is very important for the quality of the particular product.

So, if there is a certain amount of dust level let say for example, if you are talking about plain shop with class 1000 or class 10000 you know cleanliness level where we are taking about how many dust particles per millimeter cube or ml of arc is available in the particular system is a very important concept of quality, because is a related to the

environment in which the product is need to be used. So, the harmlessness and also issues related to the environment are very critical for the product quality obviously, perceived quality is again is a very important factor, which is actually an indirect measures or inferences about one or more of the dimensions and then over all reputation etcetera of the business. So, if I am well known to produce a high quality products. So, the perceived quality just by looking at that particular brand of the product will be that yes it is good you know so, that also in a way is a dimension to the quality which needs to be promoted at the design stage itself. So, these are various I would say one to twelve dimensions of quality which are important for a insuring that there is the quality system in place with an organization for the process or even for the product design.

So, we will stop this module here the interest of time in the next module. We will look at some of these the cause which can be associated at various stages, which can be a sort of penalty cost two any non complaints to the quality standard, which are been layout in the process are design itself or even in the product design itself. So, if we have this fast approach everywhere, you are doing some kind of and non conformance there would be a penalty a cost penalty. So, these is the idea is that the conformance level would be high in that particular case. So, this is the concept which will had in the next module.

Thank you.