Sustainability Through Green Manufacturing System: An Applied Approach

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Lecture – 17
Green Manufacturing Modelling Continued: Developing Green Manufacturing System

In this lecture I will discuss a green manufacturing system model. So, we talked about one of the approach that we can start from unit inflecting process level to process chain level and we can use those process chains and flow lines to simulate a overall green factory. So this was talking about factory another way to do is to do it other way round. We see the overall status of the factory anything that has to be assessed one can it improve unless he is able to buyer that. So, assessing the present status is most important in green manufacturing.

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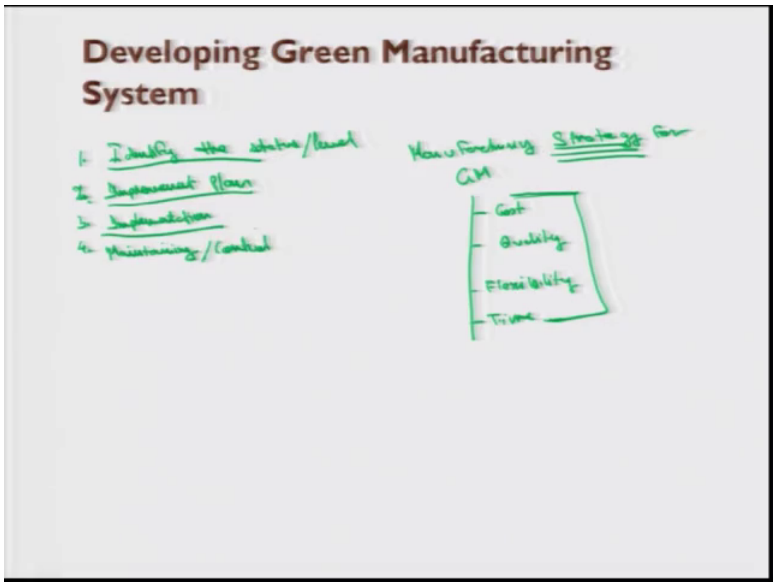

So, if I say a manufacturing strategy has to be there, manufacturing strategy for green manufacturing this involves cost quality, flexibility and time is also one of the constant. So, I am talking about strategy here. So, this strategy involve these factors. So, when one has to develop a model, one has to develop an approach for this any improvement process starts from assessing the current situation. So, in the present model the objective

is kept to identify how green the system is. So, I will put here four steps; the first step would be identify the status present status or level. So, when the present status is identified here, then we need to have an improvement plan and this improvement plant has to be implementation in the third step and four step is maintenance for maintaining the present stunt maintaining or control.

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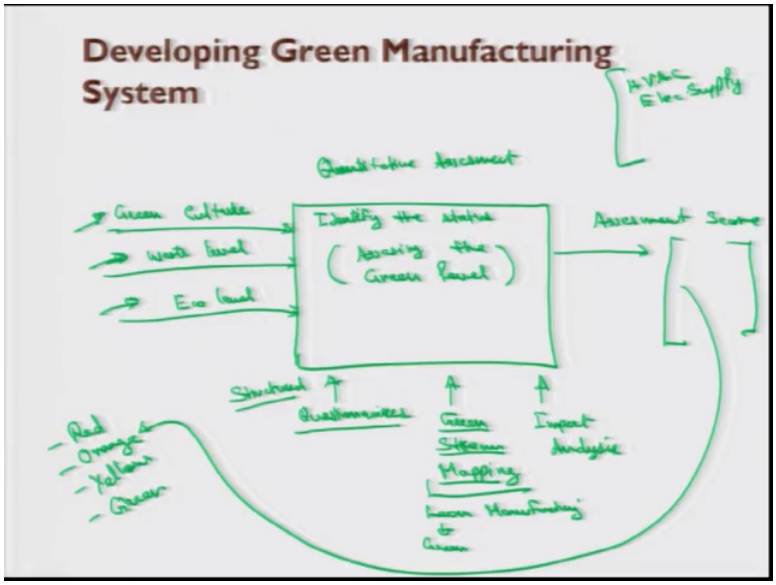

So, I will go step by step; in the first step what we have we need to identify these status. So, in this case I am trying to identify the state of my overall facility my manufacturing concern. So, this is I am talking about system. So, what we need to see here is that do we have a culture in our manufacturing concerned, that is the way towards green manufacturing or sustainable development, I would put do we have green culture here and what is our waste level.

What is our equal level what practices we were doing for this a quantitative assessment has to be done and how can we have this quantitative assessment for my overall manufacturing concern? We can have a questionnaire structured questionnaires, these are structured questionnaires then we can have green stream mapping. Now this is very similar to value stream mapping and what is value stream mapping? Value stream mapping is a lean management methods that is used to analyze the current state and it is used to design a future state for the series of events and value stream mapping is actually a lean manufacturing tool and this is also we are talking about green, we are more

focused to what. So, the value change is here green stream mapping now impact analysis like we did.

So, what basically we are doing here, we are assessing the green level of manufacturing concern we are assessing the green level that is what colour we have; if I say the colour is red, orange, yellow green at what state are manufacturing concern is. So, in this case we will have some assessment score that will put my manufacturing concern into one of the box here for example, if I say it is orange here. So, we need to move to the next step for orange to yellow. So, what are the structured questionnaires? The questionnaire is a set of printed or written questions with the choice of answers it is device for the purpose of survey or maybe some study.

So, in this case what questions are needed to be asked in case of assessing the status of our manufacturing concern the question that may be ask may be regarding the energy or waste level or may be green culture for example, it may be asked then what are or how are the various energy systems being used for example, energy systems where may be in the in manufacturing concern may be HVSC then electrical supply. So, how many energy systems are there and what part of energy is renewable and how do you asses these what are the energy metrics that are used this kinds of questions maybe asked and also regarding work environment it can be say that do we have a high risk assessment and do we have a register that documents all the incidents or complaints for of the workers.

So, this kinds of questions may be asked; similarly in case of water assessment or waste assessment the question that many be asked is do we have a sustainable drainage, what is the water efficiency, what is the water quality and what are the pollution identifications here. So, what is the status of may be packaging what is the culture what is the worker what art of workers or the participates doing to move towards green manufacturing, what is the status of cleanliness these types of questions maybe asked. So, do you have ISO 9000 certification?

So, the final output here would we have is the status of our company we will have some assessment score and we can find what is our status and what is to be done to moves to next step. So, the second step here is improvement plant.

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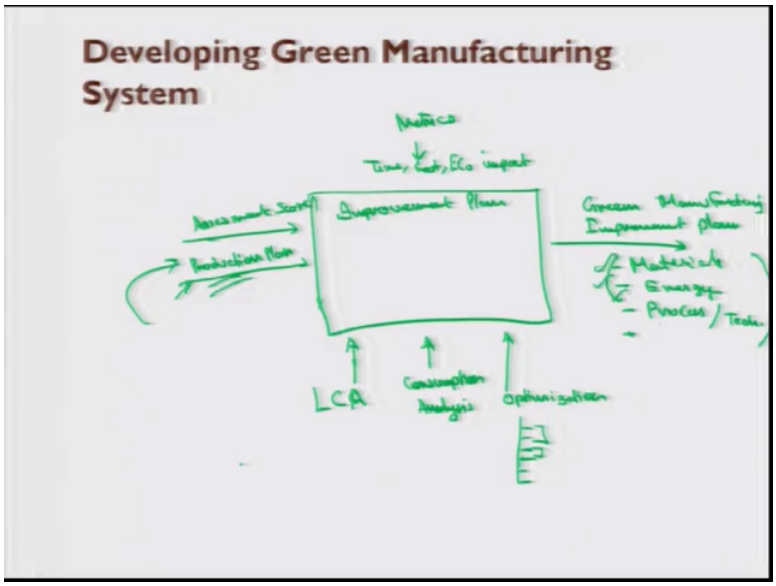

So, how can we have this improvement plan? In this case what we need to have the assessment score which we had earlier would go as an input here and with assessment score we have the present production plan, now we can do CA here life cycle analysis and may be consumption analysis. Optimization may be carried out of the all available choices to do this production best practices may be chosen this is optimization. Then what are the matrix we have here? The matrix where may be time, cost then eco compact.

What will we have finally, here is a green manufacturing improvement plan for materials improvement plan for materials improvement plan for our energy for processes or maybe I would say technology here. So, what we did here, we have actually develop and improvement plan for the areas to improve and also this improvement plan has to have a order that it should not affect the production plan here. So, the present production should not be affected much and improvement steps maybe added improvement initiatives maybe there to move to next colour.

So, this phase is actually bounded by their production plan their existing production plan that planning development should be carried out at the operational level, machine level, process level, system level at all the levels this planning has to be done and the qualitative quantitative actions Items with regard to material energy and other consumption other processes here and final technology implementation and implement

plan is required here, the plan at this stage is at very initial stage. So, optimization process is there and the objectives of the optimization is to just to move to next step that is a sudden change should not be there, it is not recommended gradual implementation required in the next step.

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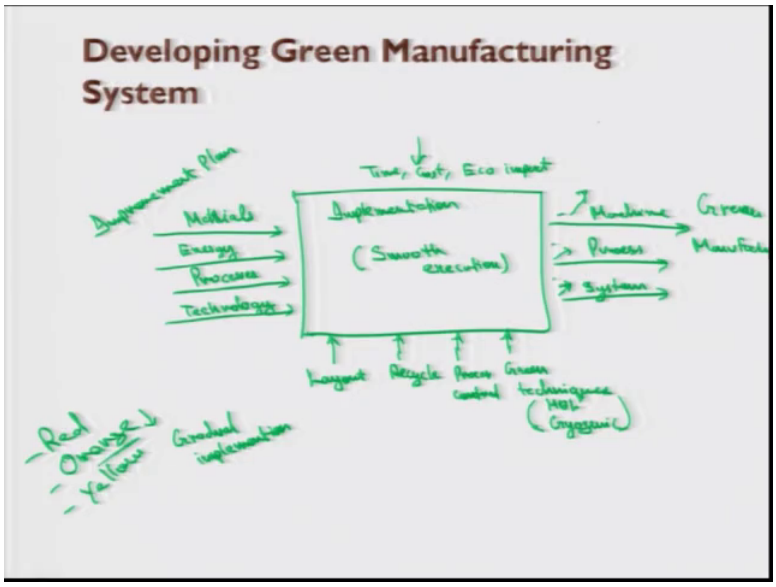

So, what we can have in the next step is implementation.

Now in implementation the output of the previous step would be an input to this. So, we have improvement plans and this plans would be for be improved plan for materials, improvement plan for energy, improvement plan for processes, improvement plan for I would even put technology here. What is essentially here is smooth execution that is gradual implementation has to be there.

So, the performance metrics is would be here again time, cost and eco impact. So, what would be the output? We had an improvement plan, we have implemented it through this one, now what are the tools a certain number of tools would be required here some of which can be layout a backer layout like layout we can use some plant simulation softwares for this one as well, then recycle recycling plan right then process control like in process control and we can have other green techniques. For instant water pollution is very high we can use MQL or maybe cryogenic machining, then what will have we will have machine level, process level and system level green manufacturing. Here by an green we can say that earlier it was at this stage for example, the colour was orange, now

it is trying to move to yellow or the colour is lighten in some of the case is here in this example at machine level the improvement is better.

They will it can move directly to yellow in case of system level for example; there is some intermitted colour where as where as well. So, as a little improvement is there. So, this is our purpose here to move to next level only. So, at these three levels it can be implemented may be separately or concurrently, but it is important that our production plan should not be affected and balance between crane system configuration and practices and those of the optimal plan that is obtained in the previous step that should be maintained, that is gradual transformation without affecting productivity has to be there. So, we will make the green improvement degree at various levels here, now next step is to maintain our factory at the present level or the improvement level I would say maintain.

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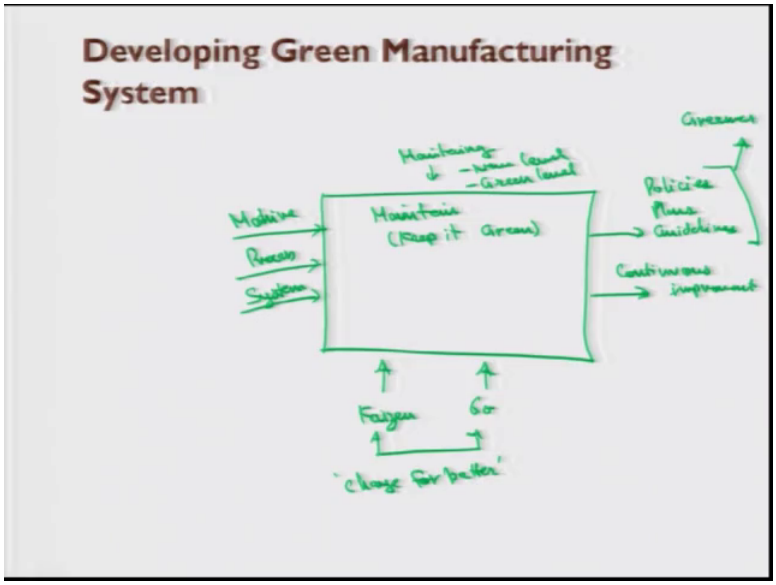

Or I would even say keep it green to keep it green it is important to use tools like chazzan or maybe 6 sigma like those are aim towards continuous improvement, now chazzan here is change for better chazzan is change for better.

Now, chazzan is actually at technique that in towards a continuous improvement of working practices and personal efficacy etcetera and these techniques needs to be here. So, here we have green manufacturing or a better product better inputs here in terms of machine process and system level. Now here we need to maintain this new level which is

a green land. Now if we maintain this further we can move to continuous improvement and we can have better policies or plans or guidelines to move to next colour in further stages greener manufacturing. So, this is a kind of system model here which is divided into four steps, first we identify our status then we make them improvement plan implementation and maintaining it at the improved level.

So, the important thing is that what type of inputs we have what type of tools we which are being used here questionnaires green stream mapping impact analysis are used to assess the primary status and we need to know what is that the status of green culture waste level equal level and then that assessment score which is obtained here this assessment score would go to my improvement plan and this assessment score and production plan both would go together to have an improved plan.

In that case we can use LCA to quantify consumption analysis certain optimization time cost and eco impact are the factors which needed to be optimized here and we will have a better plan for these three different levels materials energy. And process and this better improvement plan here is implemented using the implementation tools here, better layout we can have transportation model recycling plan, process control and green technologies like manchurian cryogenic and we will have a better production that is green production than that needs to be maintained here.

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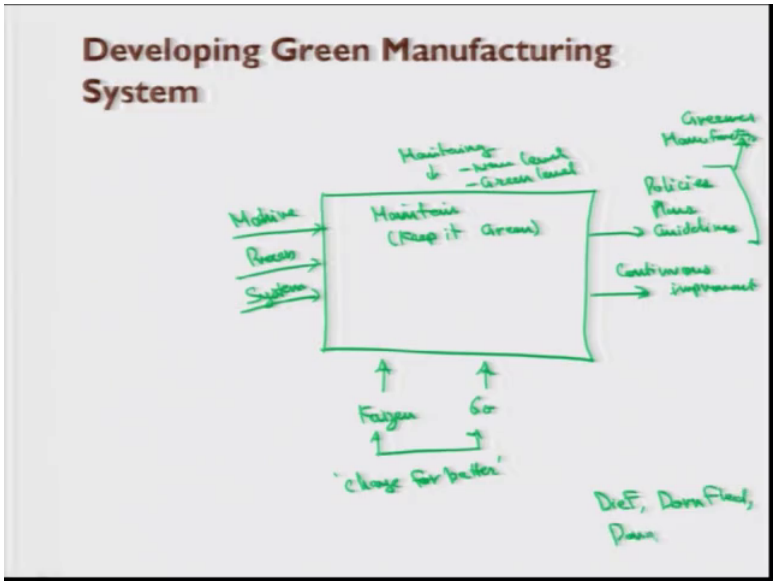

So, this was one of the model. So, this model I read it from the work that was done by the Down flag and Dengalico. So, these are the different research papers from which this model is adapted here.

So, if we talk about the environment conservation activities these can either be divided into three different steps here, that is number one is passive stage, number two is proactive stage, number three is responsible stage.

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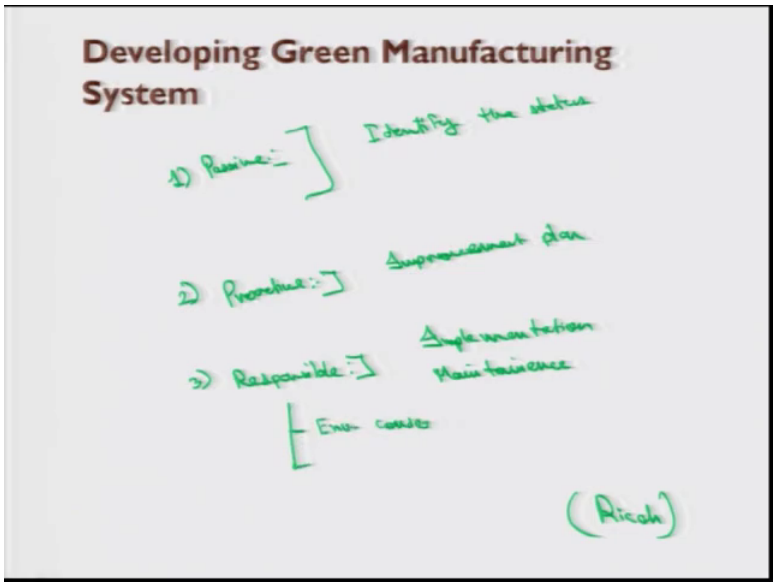

Right in passive stage what we have we need to cope with the laws and guidelines competition and customers that is the initial stage only. In activities here may be meet the laws, regulations compete with the other companies satisfy customer needs and proactive stage the mission or aim is defined that is carry out its mission as a global citizen right. These are all given by Ricoh they have defined the same kind of model that is the different you to look over it this at first the passive stage is there when only the stage is identified identify the status. So, that one is a passive state. Proactive state is improvement plan and in responsible stage comes implementation and maintenance.

Now in the responsible stage one have to simultaneously achieve environmental conservation and profits. So, when we talk about practical implementation the responsibilities to keep the balance between environment conservation and profits. So, this is the responsibility here.

So, with this I will conclude this lecture and I will come up with some other green manufacturing techniques in the fourth coming lectures.

Thank you.