Fundamentals of Environmental Pollution and Control
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Lecture No. # 36
EIA, EMP and EA

See, this you know the topic is EIA, EMP and EA. We will come back to that I mean before we conclude this and I will talk about all of them because you know these are also very import aspects nowadays.

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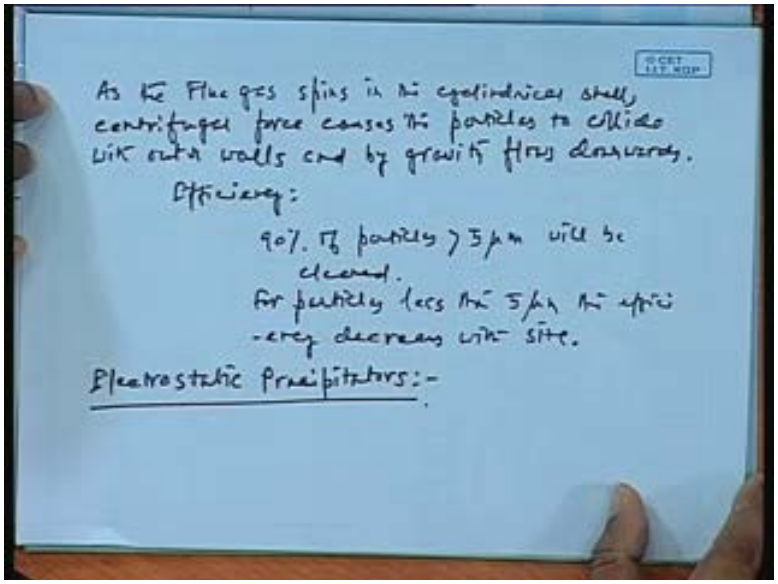

One important thing that is you know electrostatic precipitators that we have been talking of to see an electrostatic precipitators you know how it looks like is the what is the generally please take this diagram down. You see this is what is you know we generally in all cases as you can see in all cases we have to, we have to create a charge you know potential difference mostly for this one is required for the case of this electrostatic precipitator and as you can see what I has these two are important where these two are repeated only on this kind that the dotted portion is only a repeated, I mean only the repetition of these two blocks.

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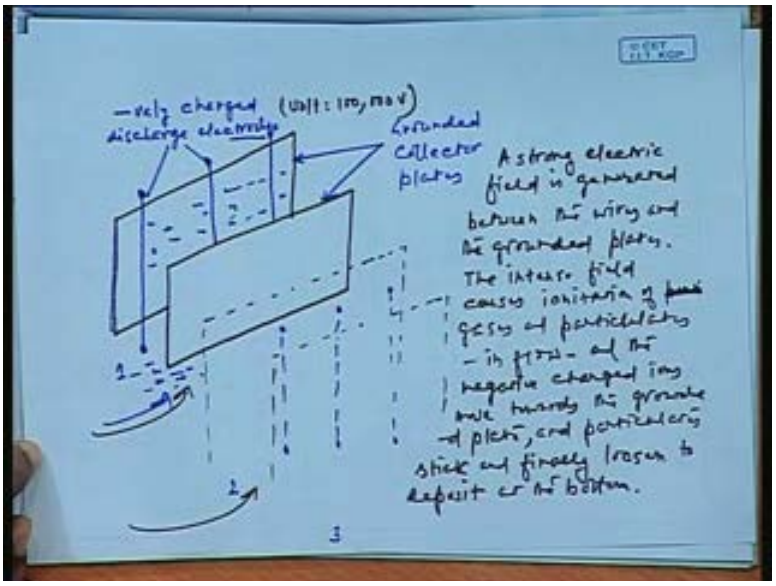

What is this say this grounded collector plates, grounded collector plates. So, you have a negatively charge discharge electrodes this is about say this one, this discharge electrodes these are the electrodes, these are the electrodes that you can see. These are the electrodes and these are the grounded collector plates, grounded collector plates. So, what happens here is you know this is just to understand that this is not a single column, it will be in multiple columns of this, in the, in the electrostatic precipitator say there may be say about 1000 such blocks where there will be two grounded blocks insulated by another grounded, two grounded blocks and in between there will be 3 say 3 or 4 positively, negative charged discharged electrodes and the potential difference as you can see can rise up to 100,000 volts, 100,000 volts.

So, heavily, so heavily charged electrical grounded collector plates would be used through which, through which the air would be passed, so through which the air would be passed. So, you can see the movement of air, movement of air would be from here, movement of air would be there from this. As this water, as this air flows in through this electrostatic precipitator, what is generally what happens is like this, a strong electric field, electric field is generated as you can see generated between the wires, between the wires and the grounded plate, grounded plates. The intense field, the intense field causes ionization, ionization of gases and particulates in flow. Remember it is in flow, intense field causes ionization of gases and particulates in flow and the negative ions charged ions, ions move towards the grounded plate, moves towards the grounded plate and particulates and the particulates stick and particulate stick and finally loosen to deposit, loosen to deposit at the bottom, right.

If they are deposit at the bottom and from the bottom they are removed, so from the bottom they… What is happening let me explain you this. So, this gaseous particles here say all those the air that is moving in, say the air moving in having gases and they are being passed through this negatively charged discharged electrodes. Now as they pass through this, as they pass through here, as they pass through there they get ionized, as they get ionized, they get ionized they would be ripples from the negatively charged poles, isn't it and they would move towards

the, this relatively positively charged grounded collector plates. They would go there and collide with the grounded collector plates. Many of them would remain stuck to the grounded plates that is also possible but particularly this magnetizing substances and then then after that the gaseous part, the gaseous part would generally travel upward. They cannot remain stuck, the gas would move upward but the particulates would remain stuck to the grounded wall and they would be either by gravity they would settle at the bottom and otherwise after periodically the grounded plate has to be cleaned so as to get rid of the all the particulates. So, this is, this is also the same thing as I have said that there would be a number of coarse of electrostatic particles, electrostatic chambers like this which would be set and a many of them would look like you know particularly if you observe this say this is how it would look like you know almost all of them as you can see this is from here this should be sent through and you can see the columns, a different number of columns of, number of columns of electrostatic precipitators one after another, set one after another.

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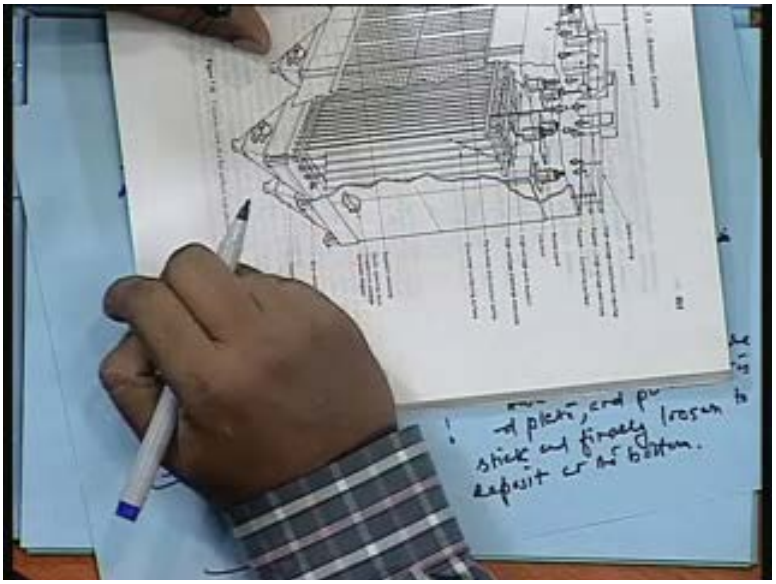

This is where from where this you know the, the voltage would be generated. This is the, this is where this negative voltage would be generated. These are the other aspects of the and this through which you know this particularly through this outer surfaces, the particulates, the gaseous would be coming out and the particulates would settle at the bottom, the particulates would settle at the bottom here or would remain struck to the grounded filaments or grounded collector plates, isn't it so right. This is what is mostly how it looks like, this is how it mostly looks like so it's say this is what you say in electrostatic precipitator. Nowadays in very common in use, actually it's very common in use almost all power plants today use them, almost all cement plants use them. There are many other industries where this is where, where there is a, there is a locality very close by, where there is a locality very close by these are mandatory, these are mandatory and we should know about them. So, okay this is about this mostly the electrostatic precipitators briefly what it is working principle that we have discussed and the second one you know the next in the line that we would discuss today is the particularly is the

bag houses, if you have seen, if you have seen the say the dust cleaners at home you have seen this bags almost.

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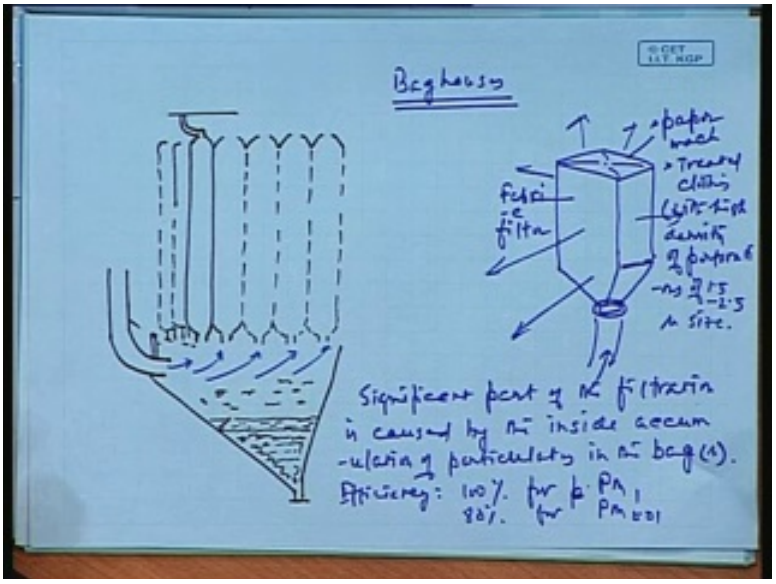

What is there, there inside that is inside the most of these vacuum cleaners that we have seen. Just open the vacuum cleaner you have seen a bag house. What is there is inside that you know is a particularly if you just observe, if you just see this the bags that you generally observe here, here it is like this mostly you will find that you know this, this is a bag which is, which is looking like this and through which you know this is where if you remember having seen them this is where okay. Say this is, this is called the fabric filter is basically, basically made of the paper maches, paper mach, paper mach or say by say treated clothes with a, with a, with high density of, high density, with high density of perforations of 1 to 1.5 to 2.5 micron size.

So, what is happening here is so the air enters through this, as in a vacuum cleaner as the air enters the air is suck through the dusted air, these dusted air so out of this dusted air here you can see the, the dusted air, the dusted air would pass out perforate through the perforations, through the perforations and the particulates would be arrested on the, on the bag itself. The perforation should be, this particulates should be arrested in the bag itself. So, it just create a say positive pressure on the other side so that you know as this the air would essentially from the positive side to the negative side as the air would move in, move out from the bag the particulates should be arrested in the bag and this bag will be time to time cleaned and many of them, in many a time it would be, many of this dust particles when it is I mean having no velocity when it is still it would generally come down through the column okay. Only when it is with energy you know it would travel otherwise it would generally settle, so more than the critical velocity that you know. So, here also the same thing I mean say this is the, this is the typical bag house whereas all these things are, is a, is a columns of bag houses like this 1, 2, 3, 4, 5 and then on the other side.

So, you can say 6 12 18 kind of bag houses and through which you know the air enters through a common entry and directed to each of the bag houses and this, through these bags the air, the air,

the air would go out mostly and the particulates would settle, some of them would be, would remain stuck in the bag and many of them would settle down, many of them would settle down. This is also a very typical, very common type of bag houses that are generally used say this is just write down a line here the part of the filtration is significant part, significant part of the filtration is carried out is caused by the, caused by the inside, inside accumulation of particulates in the bag or in the bag or bags, right. These are efficiencies, efficiencies if we just observe the efficiencies, the efficiencies this are, this part is drawn, efficiency is, efficiency, efficiency can be 100% for Pm, Pm 1, 1 micron and about, about 80% for Pm 0.01.

So, Pm 1 and 0.01, so you know is these bag houses are becoming extremely popular nowadays more and more they are replacing electrostatic precipitators now most of this bag filters because you know wherever the new filters filtering is being done electrostatic precipitators are being discarded as against this bag houses. The reason one of the big important reason is the consumption of energy because energy being scarce you know mostly in the power plants I mean in particular areas in India you know various plants you will see the energy is scarce you know they are actually worried about energy. So, this one relatively requires less energy, only the bags have to be replaced time to time and bags have to be cleaned and maintained time to time so with that you know this method is becoming more and more popular this bag houses, okay. So, I have mostly discussed about this air pollution control methods. These are the standard very popular industrial air pollution control methods. Now, having gone from here you know I will just briefly discuss about this mostly the most important thing that is we should talk about is EIA, EIA EMP and EA.

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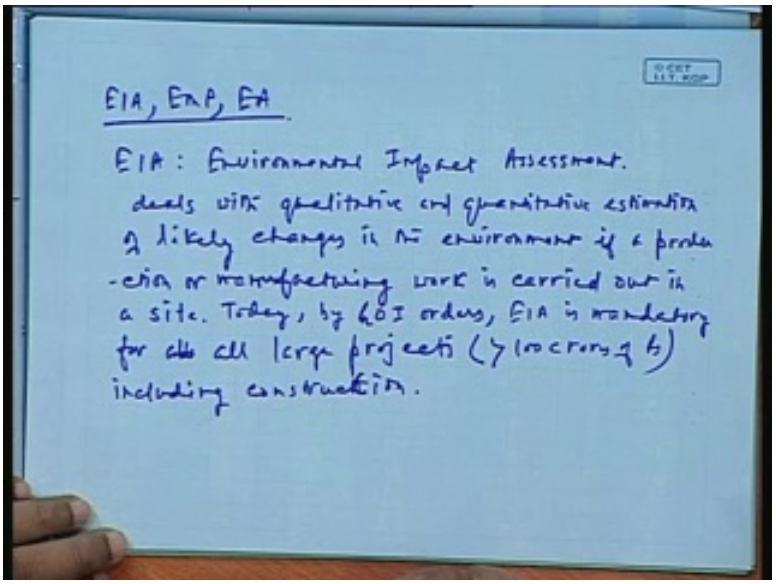

EIA, EMP and EA, EIA stands for environment I think you know let me explain here as I have come in. so, this air pollution control is complete I mean so you have completed this. So, there are, these are the additional topics of environmental control nowadays is very important for engineering projects mostly because very important for engineering projects.

So, I will just briefly discuss about their main objectives and what they try to do say environmental, environmental impact assessment. The environmental impact assessment is you know if is I think you know if you know for any large industry, for any large industry it has become now mandatory to have environmental impact assessment before they are allowed to operate before they are allowed to operate for most of the industries, particularly any large industries where there would be some kind of production, some kind of manufacturing there is mandatory now to have environmental impact assessment to be carried out, being carried out I mean environmental impact assessment has to be carried out so as to get certification to carry on with the manufacturing or production job.

Now, what is this? Environmental impact assessment deals with is a basically deals with, deals with, deals with qualitative and quantitative, quantitative estimation, estimation of likely changes in the environment if, if a, if a production or manufacturing, manufacturing work is carried out in a site. In, today, today by government of India GOI government of India orders EIA is mandatory for all large projects, all large projects, all large projects say more than 100 crores including construction, including construction, including construction.

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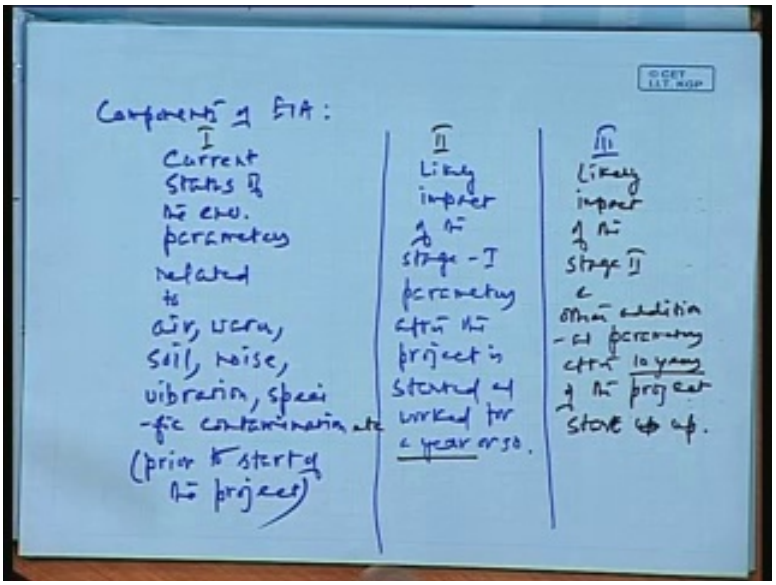

So, what is done so this, this components of EIA, components of EIA, so is components of EIA, a components of EIA say this you know say current status, current status of related to air, soil, air, water, soil, noise, vibration prior to right. The current status you know what you would first of say stages components say stage one or say component one, the most important thing is to obtain the values of current status of environmental parameters related to air, water, soil, noise, vibration, specific contamination, etc, etc, etc, prior to the start of the project, I mean the project has not been started but you can have a general assessment say something what is the quality of water. What is the TSS, TDS then dissolved oxygen or say the particular amount say sulphate, bicarbonate, the ferric ion all these can be estimated for water.

Similarly, for air also you can find out what is the concentration of oxygen, nitrogen, sulphur dioxide, carbon dioxide, carbon monoxide all those things prior to the startup of the project and also related to this is related to soil, the soil typical soil parameters that you know mostly that we have known of soil acidity, the soil organic matter, soil texture, structure all this you know and say is a noise, vibration what is the ambient noise, what is the background noise, all those things can be found out vibration say specific contamination.

Suppose, if any it is already being done in a contaminated site. So, what kind of contamination it take say general contamination may be nickel, copper, cadmium contamination in of the land or say water if it is lead enrichment of the water, this or arsenic enrichment of the water whatever is the status, the current status is the component of EIA. This is what the EIA should be composed of. Second thing that should be you see is the say, say from this you know impact assessment now you would consider the impact part, impact part is this the likely impact, likely impact of the stage, one parameters after the project is started and worked for, for, for a year, for a year or so. This is where likely impact remember these are not taking place actually these are likely, this is what you say in the how do you do the likely impact assessment. Suppose, you say you know you are going to produce 10 million ton of coal, the 10 million ton of coal if it is a say if you are working on a stripping ratio say one in three that means 10 million of coal, there would be about 50 million of over burden that has to be cleared. So, you have produced, you are going to dislodges about 60 million tons of material.

If 60 million tons of material is dislodged per year what is the likely effect on that, on the or in matters related to say dust, in matters related to say carbon dioxide, in matter related to water quality. All these, what are that going to be the likely impacts. This is what has to be found out at the stage two, this is what the likely impact this is and the third one which would generally do is we make an a futuristic assessment likely impact, likely impact, likely impact of the stage two, stage two and other additional parameters after 10 years of the project start up, start up. Current status likely impact stage is say 10 years, after 10 years this is after a year or so this is before the project is generally done, this is called the EIA this is what has to be, this generally for a mine generally is conducted by a third party consultant say whom in India this kind of projects are generally done by say IBM does for mining companies, Indian Bureau of minerals does this for a mining companies.

There would be say India engineers India limited does it, … does it, so there are many agencies you know which you have to appoint as a consultant and who would carry out say suppose you are thinking of opening up a mine at a certain place or a you are going to establish a plant at a certain place you have to appoint all these, all these organizations, some of these organizations to carry out the work for you and finally they would give a report on what they access likely to be the impacts if the project comes through or if the plant is set up or the mine is set up and then this would has to be supplied this has to be given to the ministry of environmental forest state government for permission to carry out the industrial work okay not before that you cannot get through, you will not be would not be surprised that many organizations you know in many mining organizations the work is, the expansion is being stored because of non-clearance of this kind of a materials like you know Kudre Muk is stopped as a mining organization you might be knowing. There may be any other, many other organizations like many other organizations in India say you know various constructions projects are held up or they are not given permission

just because there are not fulfilling this. If a government or a state government understands that the impact is going to be very heavy, it might disallow a company to carry out the project work I mean the construction work. So, this is what is the components of EIA.

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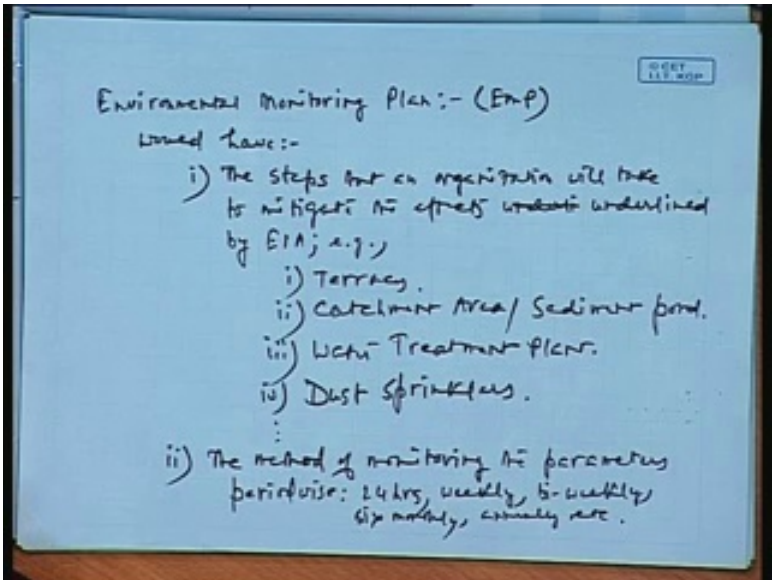

Having done the EIA, the next the company would do this environmental, environmental, environmental monitoring plan which we know as EMP. This also has to be supplied and with these two things have to be supplied to ministry of coal, ministry of environmental forest, ministry of industries ministry of sometimes ministry of commerce might also ask for it. So, there may be you know various state agency is that they would ask for say what would be, we now know by EIA that these are the likely impacts going to take place.

Now, how we are going to reduce or minimize the damage that is the, what is your environmental monitoring plan. So, you would, the environmental monitoring plan would, would have, environmental monitoring plan would have number one the steps will take to mitigate the effects underlined, effects underlined by EIA, EIA. Say for example what it would try to do is for example what are the things say you know something like as you know say if it is, it would form terraces, it would form it says that you know I will found a catchment, catchment area or I will create a sediment pond, I will create a water treatment plant, water treatment plant I would use dust sprinklers, dust sprinklers.

So, you know all etcetera so you can see you can think of whatever kind of things you know that are required say you know water treatment plant, different types of water treatment primary, secondary, tertiary water treatment plants that we have known off. So, all this you know they may the mine, the project the mine, the corporate, the organization would ensure that they would form, they would make this is the first step in EMP. Next step is this, the next step it says is the method, the method of monitoring, the method of monitoring the parameters, the method of monitoring the parameters, the method of monitoring the parameters say period wise say something 24 hours say weekly, bi- weekly, 6 monthly, annually etc. The method of monitoring

the parameters period wise, what is the method of monitoring so you know something like what it would monitor is say, say the for example, for example what it would make is SPM then RPM then TSS, TDS in water, TDS in water then then say vibration PPV right POA and SOA as you know, so this is in vibration, the noise in the decibels.

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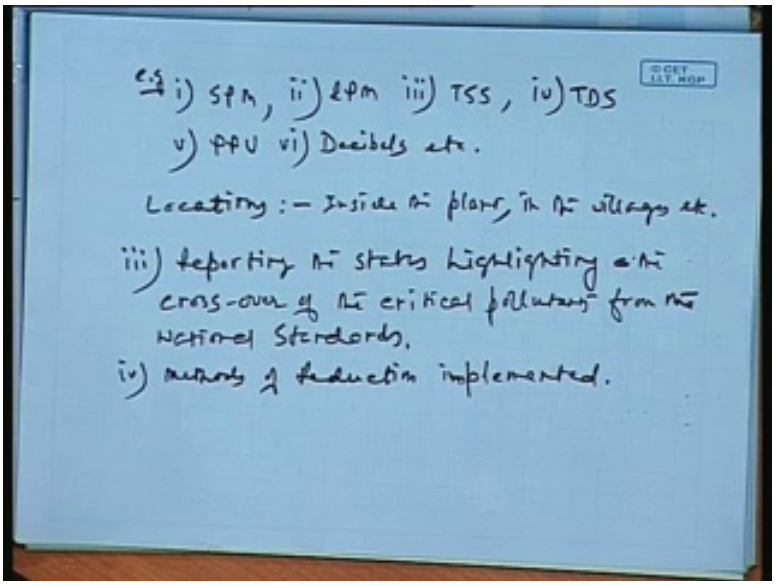

So, all these you know this would in a particular plant and as also it would also say the method of monitoring another important thing is the locations, locations. The locations would be, the locations would be the inside, inside the plant in the villages, etc, locations inside the plant in the villages, all those thing and finally the method of monitoring and also report, reporting the status highlighting, highlighting the, highlighting the crossover of the critical pollutants from, from the national standards, from the national standards, reporting the stators, highlighting the crossover of the critical pollutants from the national standards that it has to mention this is what is EMP. Essentially, this is what is EMP.

EMP carries out this thing. The basic things are typical I mean 24 hours whether it is 8 hourly 24 hours or say once a say twice, once in 2 days or once in a week, once in a year some all this thing are, all these things have to be reported and also wherever there is a, there the status highlighting the crossover of the critical pollutants from the standard, national standards, national standards and finally the methods of reduction, methods of reduction implemented, methods of reduction implemented, methods of reduction implemented. What are the methods of implementation? You have methods of reduction. What are the methods of reduction you have done? So, this has to be how it has been implemented that has to be said say if a particular if a say mixer or you say dozer or heavy earth machineries causing a tremendous amount of noise so how you are reducing the noise, what is the method you have applied all this primarily all this things has to be documented so it's about that. So, I have this is EMP so you know basically there are two when this EMP is generally given to the government, the company says how it is going to do the EMP. If there is you know how I am going to measure the say the peak particle velocity I have going to measure per blast or for every two blast or things like that that it would mention that I am going to follow

a certain standard like this and I am going to stick to this rule right. These are very, very important things. So, anyway I mean whether a particular company follows the EMP in true sense later on is a different question but there are monitoring agency to judge whether they do it or not but they have to in writing they have to assert they have to say that we are going to do this, this, this, this things. If we are, if we, if it's producing water of say very poor quality it would has to say that I am going to bring down the say BOD, say the BOD from the 10,000 milligram per liter to 1000 milligram per liter that it has to mention in the EMP itself and then finally the EMP has to be implemented. EMP is a standard regular day to day exercise that the mine generally carries out okay.

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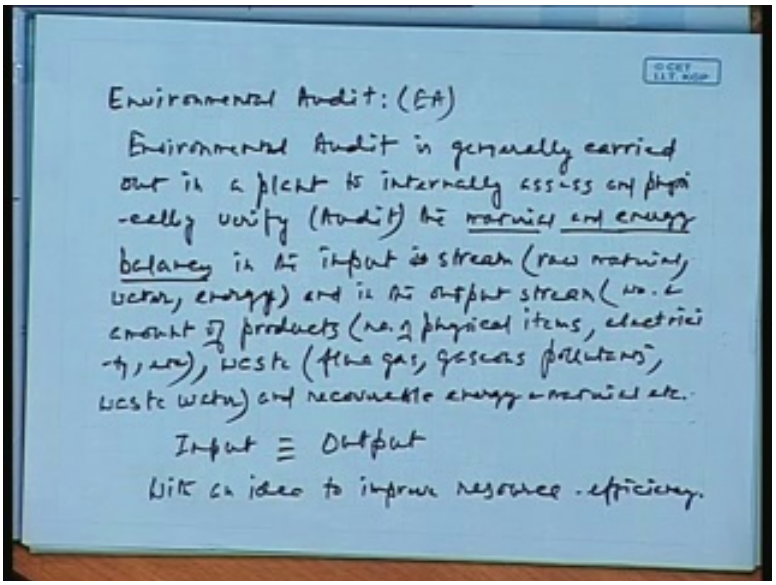

And the final this, the topic that we of the course is environmental audit, environmental audit. Environmental audit or else known as EA that is environmental, environmental audit in a plant to internally assess, this may not this environmental audit may not be a statutory requirement, it's not necessary, is not necessary that it has to be a statutory audit. Environmental audit is generally carried out in a plant to internally, to internally assess and physically, physically and physically verify that is audit, internally assess and physically verify the energy, the material and energy balances in the input stream, in the input stream, raw material, water, energy okay. This three raw material, water and energy say or you even say in a pneumatic power whatever energy as you can, as you have discussed, the material the to verify the or the audit, the material and energy balances and energy material and energy balances in the input stream, in the input stream and in the output stream, in the output stream that is number of number and amount products, products say you know if it is say products can be number of, number of physical items, electricity etc products number, number and amount of products and number of physical items electrical electricity etc waste, waste like you know say flue gas or say and recoverable energy and material.

So, what it is trying to energy material. So, if you just see this sentence again environmental audit is generally carried out in a plant to internally assess and physically verify that is auditing

the material and energy balances that is you know input and output remaining same as is you know the thermodynamically there should be same, isn't it. So, what is input should be also be output. So, you say a conservation of a mass and energy. So, this material energy in the outputs, in the inputs stream, raw material, water, energy and in the output stream number of number and amount of products, number of physical items electricity, etc, waste flue gas, gaseous pollutants and waste water and recoverable energy material etc, energy and material etc. So, this is, this the balances that we generally do. So, the input should be equal to output, output.

So, if this whether, whether anything is recoverable or not, anything is recoverable or not whether this can be reused or not this is what is with all these with the idea to with an you just write that with an idea to improve, improve resource efficiency with an idea to improve resource efficiency, how an organization can use its resources efficiently without wasting them, where are the scopes of improving. So, the first few things you know as I have said you know if you are just trying to observe that EIA is the assessment part. How much go and damage it is going to make? EMP is considering that the damage will be made, what are the methods and practices we should use to measure the damage and also to contain the damage.

Then the third one is EA which would say internally whether there are check and balance whether, whether the input and output streams are balanced or not, whether they are you know that the conservation of energy and material is practiced or not I mean how way this can be, if it is having to seen the having to see that having observed that there is a scope for improvement say increasing the energy efficiency, increasing the material efficiency is the idea finally. So, in the environment, in the environmental audit part we just look for there more efficient means by which the energy, the material can be used okay. So, this is, these are the three perspectives of EIA, EMP and EA okay any question. No, no it's like this, generally EMP they can make some cases they are certainly EMP an organization itself would provide but sometimes it takes the help of an outside consultant. Sir, whether it is necessary to get approval from government of India. Yes so that, yes absolutely necessary. There are say central authority is you know if it is say projects which need central clearances which needs central clearances this would be provided by the particular ministry under which it comes say ministry of infrastructure, ministry of energy, ministry of steel and mines, ministry of say ministry of other things and like you known say related to any other textiles or whatever agriculture and MOEF ministry of environmental forest.

So, this is for central projects in the, where the states are allowed to I mean permit some projects, small projects of certain size whether the states can themselves allow, the states can themselves allow their the state government they it has to be done with the, with the officials from the state government or state bodies say MOEF might have an office in say, say if it is Bihar might have an office in Patna. So, MOEF Patna would look into the aspects of the state government as well as state governments within, within itself it has pollution control board PCV's, the PCV's are also allowed to interval.

Now, in situations when there can be a case where say a state with the project is under state but a people or public in general believes that the states, the center should interval in such cases, in such cases MOEF can be directly involved. MOEF would directly say that MOEF has the authority to intervene though it does not intervene in state things generally but in exceptional cases MOEF has all the power to intervene in state matters. So, in such cases it would be referred

back to, referred to MOEF again. These things continue you know it's a majority, most of the industrial projects today in India in countries like India and many other developed countries it is extremely difficult to get environmental clearances. Many projects are held up because of that unless an organization comes up with say EMP, I forgot to mention one thing in the EMP is that afforestation is also a part of the activity of EMP. This is which in most of the projects you know construction projects, mining projects which talk about compensatory forest which means whatever forest area or whatever vegetative area you have disclosed or displaced, equivalent area has to be developed in some other area either within the project or outside the project at the cost of the company, at the cost of the corporate.

So, this is a, this is also a part of the EMP that it has to show and generally it is becoming a must now and another important thing is particularly for critical industries like chemical industries, mining industry say then power plant you see in a very recently you might be knowing there are lot of say uranium mining. This is a very strong protest which being done carried out against uranium mining. The things are the mostly you know you will find that the ministry of environmental forest has not cleared those projects but again the compromises that you need energy also, you cannot help you need energy to develop I mean a country like ours need required it to develop but at the same time it might go against the development, it might goes against the environmental aspects. So, this is the conflict, this is the conflict that would remain, that would remain for an it would be, it would intensify over the years it will be more intensifying because you know you will find more and more troubles coming up due to that because now the situation is the public is getting directly affected, public is getting directly effected because it's see in many cases you know the cities.

If you just see in last 5 to 10 years' time, the number of vehicles have increased by about 100% in almost also all cities and these has say direct correlationship with rise in the breathing order problems, breathing problems of a children and the adults. So, when the public is getting seriously affected so there would be a backlash also, there would be a certain thing the companies as a result of that are going for stringent environmental norms. So, this things would carry on, this things would keep on happening. I think you know with this we come to the end of the all lecture series, I think you know about this environmental pollution control is complete for all practical purposes I think I have covered a large part of this subject, okay.