Health, Safety and Environmental Management in Offshore and Petroleum Engineering

Prof. Srinivasan Chandrasekaran
Department of Ocean engineering
Indian Institute of Technology, Madras

Module – 02
Operational Safety
Lecture – 20
Hazard Control

Welcome friends, to the online course title Health Safety and Environmental Practices in offshore and Petroleum Engineering. We are continuing the lectures on module 2; module 2 of course, is focusing on operational safety.

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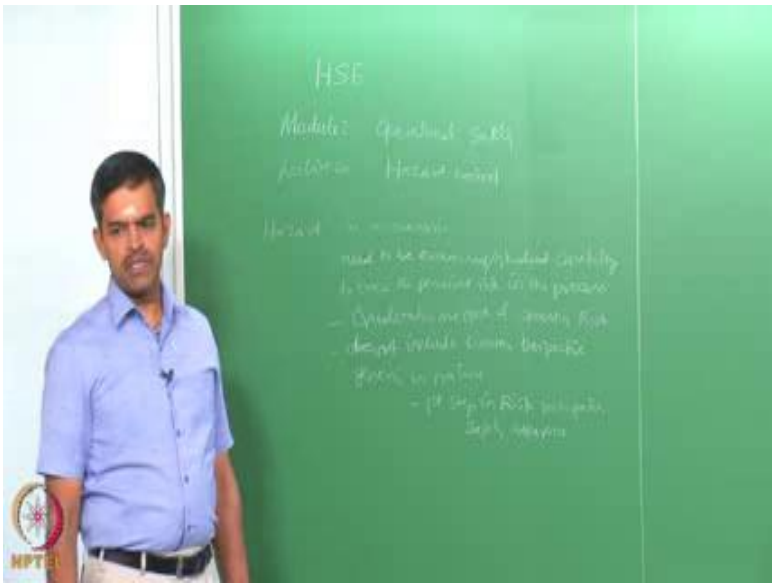

Today we will discuss about the 20th lecture in module 2 which will focus on measures related to hazard control. In this lecture we will also solve some exercise problems and objective and its subjective questions for a better understanding and summarizing the second module hazard control. As we said hazard is a important essentially is a scenario need to be examined carefully or let us say study carefully to trace the perceived risk in the process system this is one of the qualitative method of assessing risk hazard evaluation does not essentially include economic perceptive. It is more generic in nature

and essentially it is the first step towards risk mitigation or in general towards safety assurance of any operating plant.

Now, hazards are inevitably present in a given system because hazard actually arises from main many scenarios.

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It can arise at the design stage which of course, we can correct without much serious difficulties, but if it is seen during the process or production stage then it can definitely cost something hazop is one the very interesting method by which we can always find out the deviations occurring in the process flow line because of the presence of hazard scenarios. So, hazop actually thoroughly analyses the cause the consequence arising from such hazard scenarios it accounts for the safeguards present in the system then, it gives recommendations towards risk control or risk mitigation.

In the whole exercise if we are only focusing on hazard evaluation, let us say if the focus is only towards hazard evaluation then it is very clear that risk cannot be mitigated because, you are always looking forward for the presence of hazard in terms of evaluation then what one should do if we really want to get rid of risk from the root cause itself one has to do for hazard control.

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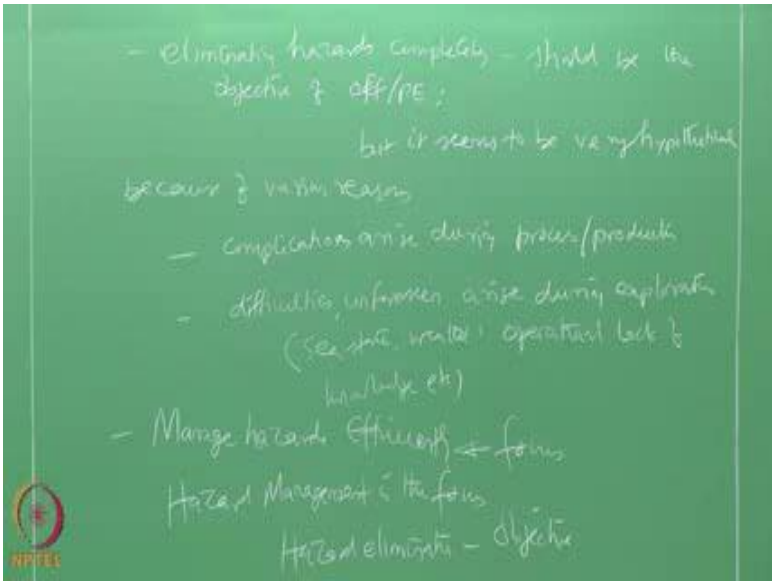

One has to go for hazard control we all do agree at this stage of understanding in this lectures that eliminating hazard completely should be a goal of course, I do not deny that should be the objective of offshore and petroleum engineers, but it seems to be very hypothetical. So, you will not be able to eliminate hazard in the oil and gas industries because the process because of various reasons, because of various reasons you can list many of them complications arise during process or production difficulties unforeseen arise during exploration due to sea state due to weather due to operational lack of knowledge etcetera which includes lack of training as well.

So, there are various valid reasons by which an offshore engineer has to definitely agree upon a fact that eliminating hazard completely from a process industry like offshore industry is practically hypothetical it is not possible then what you do you can manage hazards. So, one has to focus on this. So, hazard management is a focus hazard elimination can be an objective, but its rather very difficult in the yester years people have realized that this cannot be achieve hundred percent it means offshore production cannot be hundred percent risk free. Therefore, they have concluded and accepted a minimum level of risk what we call as risk acceptance level which is generally predeclared before the start of any production of any industry especially in particular oil and gas industries.

Now, to manage hazards efficiently there are many steps followed, let us see them now.

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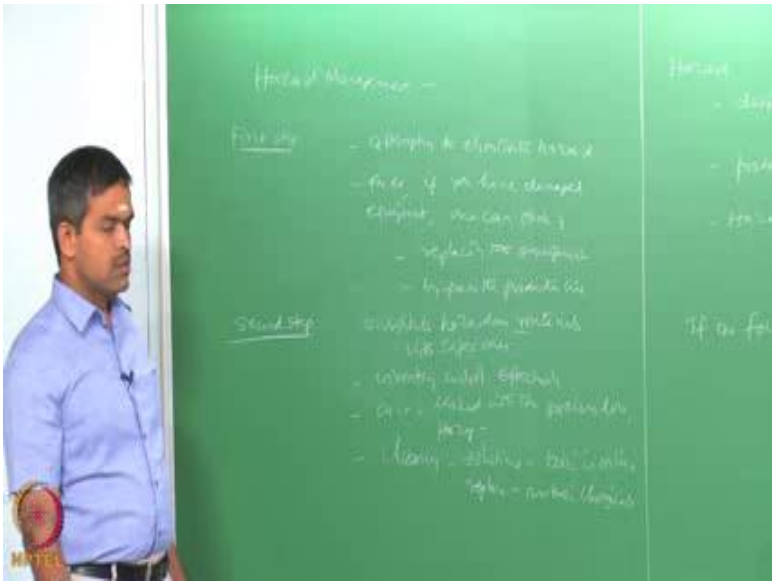

So, I am now focusing on hazard management because hazard management is a way towards hazard control. So, there are various steps involved in this first step attempting to eliminate hazard by some means practically this is possible not completely, but at least partially for example, if you have a damaged equipment which is malfunctioned one can think of either replacing it or bypass the line which houses this malfunctioning equipment. So, at the first step itself during a hazard evaluation stages if you are able to identify certain set of equipments tools and plants which are obsolete which are creating repetitive problems either get it replaced or bypass that line. So, that can be the first step which may not eliminate hazard completely, but certainly at to at least to a greater partial level.

Second step is to substitute hazardous materials with safe ones because in most of the cases as you have seen and realized and understood in the example case studies what we discussed in these lectures of 1 and 2 module notice that presence of hazardous material in terms of inventory storage etcetera, has been always a problem accelerated the consequences to a very high order.

So, one should think of inventory control effectively that could be the first stage and we all agree that inventory control is linked with the process line as it is linked with the process line hazop can be used because hazop can also be done at the inventory control level you can always perceive the danger perceive the risk because of stocking of specific kind of chemical or explosive or detonators or inhibitors etcetera, which are very commonly used in the process industry and production industry in oil and gas sector. So, how to store them where to store them what should be upper limit of inventory control one has got to plan them in advance. So, that the process line is not affected and at the same time the inventory is also controlled. So, that could be the second case.

For example, once can replace a cleaning solution that gives a toxic fume by a non toxic alternative, people generally go for cleaning which is done by some solutions usually they are toxic in nature you can replace these with non toxic chemicals by this way you will reducing the exposure level of hazard to the personnel working on board or working on the industry.

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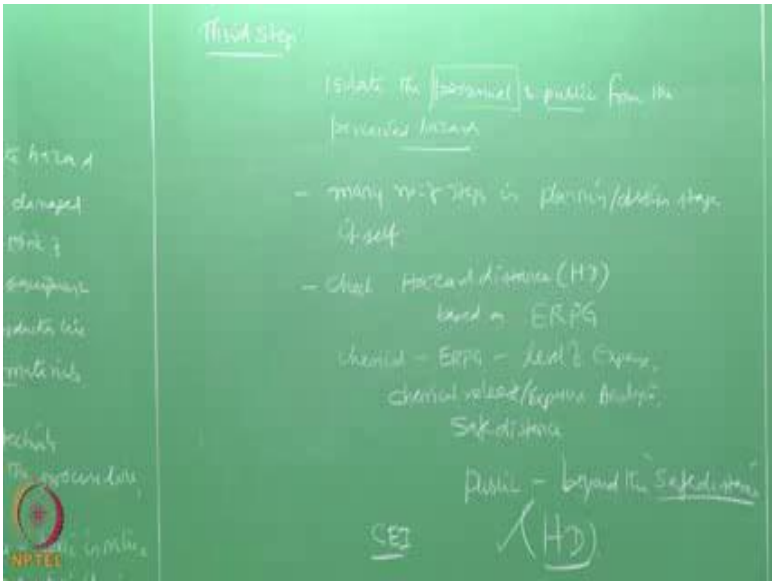

Third step could be isolate the personnel and public from the perceived hazards personnel are your employee who are working in the industry. So, there limited number of exposure of hours is to be controlled depending upon the threshold value as suggested

by the international regulatory agencies. However, we should also take care of the societal risk which is perceived because of the hazardous process carried out by the in terms of release of chemicals oil pollution oil spills etcetera which can be definitely controlled, which can bring down the hazard to the public to a greater level. So, one should isolate the public and personnel what do we need in case you are expecting or perceiving the hazard to spread out to the nearest area of the vicinity of the plant you must take enough control measures in the planning and construction stage itself. So, that if at all any chemical is released even by mistake the spread of the chemical within the vicinity of the plant should be controlled within hours of the accident.

So, in this case you can do a variety of steps one can take many number of steps in the planning and the design stage itself I will give you a very classical example which you can quote later as a numeric example if you really want to plan a process industry in a given locality where people will be thickly populated you have got to always check what we call the hazard distance which is based on ERPG guidelines environmental regulatory planning guidelines. So, for each chemical there is an ERPG value available for a specific level of exposure by doing a chemical release or exposure analysis. One can find out the safe distance up to which if at all the chemical is released will spread. So, try to house the public beyond the safe distance. So, technically call this as hazard distance. So, one can estimate this mathematically for every type of chemical perceiving that the chemical would release in the air it can be a liquid it can be gas as well as in any state.

So, we are having mathematical equations which we will also find out from chemical exposure index problems in the next module we will do couple of numeric examples to understand this. So, one can always locate the hazard distance beyond which a township or a colony or a society can be developed which will feed the manpower or the employment to the industry. So, you must always keep the public very well away and isolate from the hazardous situation you cannot mix the public and the personnel there is a very valid reason and important value attached to this statement one can ask me a question why public and personnel should not be mixed within the safe distance the basic reason could be the personnel working in a industry are trained safety professionals I believe that oil and gas industry and process industries rather in general impart basic training to all employees who are hired by them to work in the process industry against

basic safety norms.

So, in case of any exigencies any emergency or any release of a chemical since the personnel on board are trained they would be able to escape from this kind of scenario whereas, the public who are not aware of such safety training procedures will be actually a victim for this kind of problems therefore, international regulations clearly state that, for every chemical industry perceiving the danger of exposure of chemical in different ways through air through water etcetera you should be able to locate the public beyond a safe hazard distance which is computed mathematically from chemical exposure index analysis which we will do mathematically later in the next module. So, one should be able to apply these concepts very simply to locate the public from that of the personnel.

So, the third step in hazard control essentially or the management is going to be isolate the personnel and public even at the planning stage itself similarly whenever you are having the personnel exposure during the process keep the exposed personnel as minimum as possible probably you will also know you would have heard and read in the papers and the press that there are many unmanned platforms ladies and gentleman which explores oil and produces oil I mean the basic minimum crew rests on board and they start doing production.

So, there are unmanned platforms as well many offshore platforms are completely unmanned. So, people are going for this kind of isolated operative facilities which avoids risk to humankind by total order. So, one should be able to do that kind of analysis in design stage itself and try to keep the exposed personnel number in the process line which is hazardous as minimum as possible. So, you have got to do this at the planning stage and the design stage itself, so that this could be one of the interesting and important step towards hazard control.

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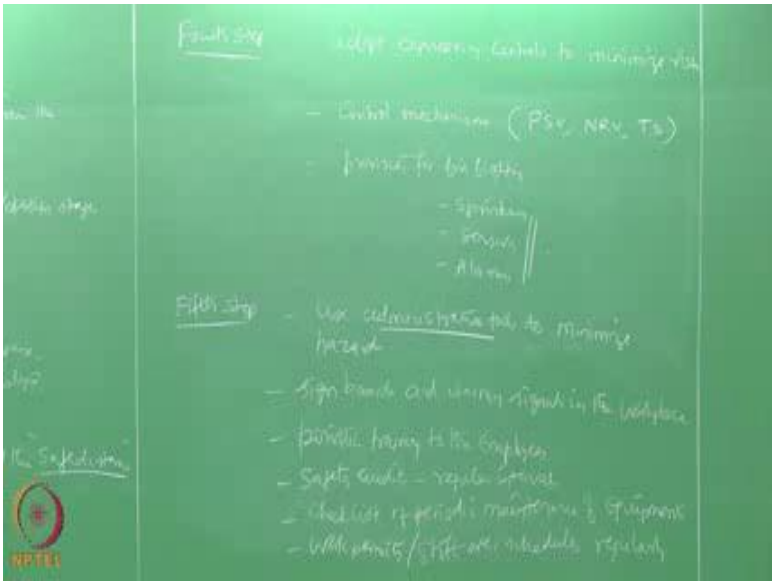

Fourth step is adopting engineering controls to minimize the risk. So, one should go for proper control algorithms networking of sensors and alarms and buses firefighting systems both dry wet and deluge. So, one can go for control mechanisms. For example, pressure safety valve non return valve temperature sensors and all these are kind of control mechanism which are controlled and connected to the central controlled console from there you will able to modify monitor control them their operations and you will actually able to effectively control the process line and make it less hazardous the second could be good provision of or provision for firefighting sprinklers sensors alarms etcetera. So, all should be effectively planned. So, that engineering controls or tools of engineering control are used widely and effectively to bring down the hazard scenario as minimum as possible.

Fifth step could be to use administrative tools to minimize hazards. So, using administrative tools one can always create lot of signboards and warning signals in the workplace, one should impart periodic training to the personnel or to the employee one should conduct safety audits at regular intervals, one should conduct checklist of periodic maintenance of equipments, one should verify the work permits and shift over schedules regularly. So, all these can be administrative tools and most importantly use or include safety.

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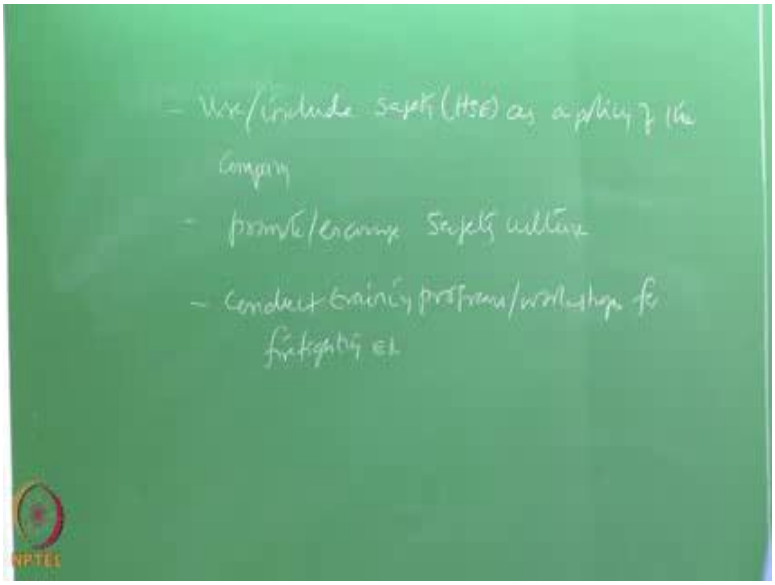

That is HSE as a policy of the company promote encourage safety culture conduct training programs and workshops for firefighting etcetera. So, one should be able to control the hazard to effective manner even by using administrative tools as listed on the blackboard here.

If all the five steps fail then one can use the last step what we call protective equipments or clothing.

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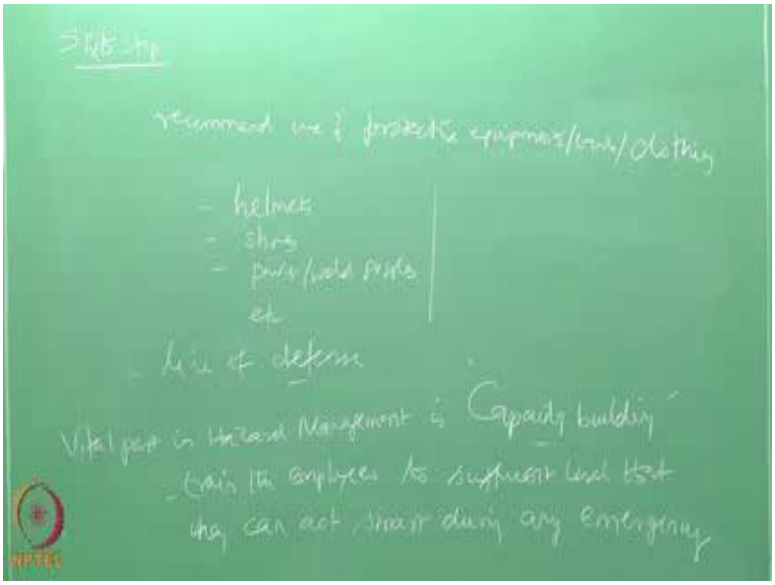

Recommend use of protective equipments tools clothing for example, helmets shoes cover goggles or let us say weld goggles etcetera. So, one can start using fireproof or explosion proof equipments clothing train people to use them etcetera and make it as a line of defense, if nothing works at least the person will not be injured with serious trouble. So, that these are some of the important points which I wanted to highlight which will also be included as a very important concept in hazard control there are 6 steps essentially five steps. Sixth one is of course, the ultimatum which essentially manages hazard.

As we all agree and understand now the most vital part in hazard management is capacity building. So, the most vital part in hazard management is actually the capacity building you have to train the workers to sufficient level that they can act smart during any emergency as we have seen in many cases accidents occurred because of human negligence or let us say the oversight. So, one cannot avoid this. So, to do this there is a mathematical way or there is a regulatory measure by which this can be done.

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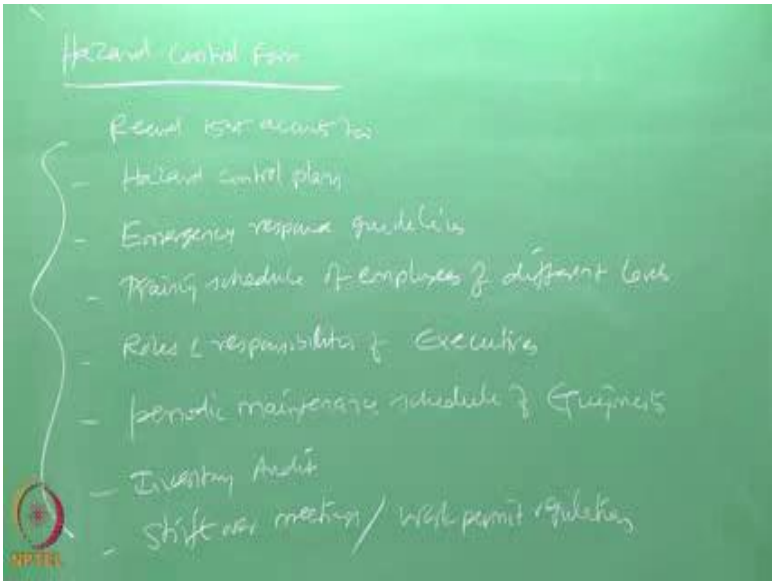

One can do this using hazard control form which is actually a sheet of record which accounts for which accounts for hazard control planning the emergency response guidelines training schedule of employees of different level because all employees need not be trained for all levels of safety. So, there can be different levels of training roles and responsibilities of executives periodic maintenance schedule of equipments inventory audit shift over meetings work permit regulations all become actually the part of the record which is all compiled and kept at one place what we call as hazard control form.

So, the hazard control form explains the roles and responsibilities of various executives of the company of each team of each duty manager how to manage the hazards who is will be responsible for what kind of hazard situation under any unforeseen emergency what could be the action plan both mechanical physical and chemical what should be the threshold value beyond which the plant should be shut down immediately all has got to be trained to everybody on board. So, that risk is avoided at all possible angles what we call essentially as hazard control or hazard management

Now, to do this you need to also monitor this continuously. So, hazard monitoring.

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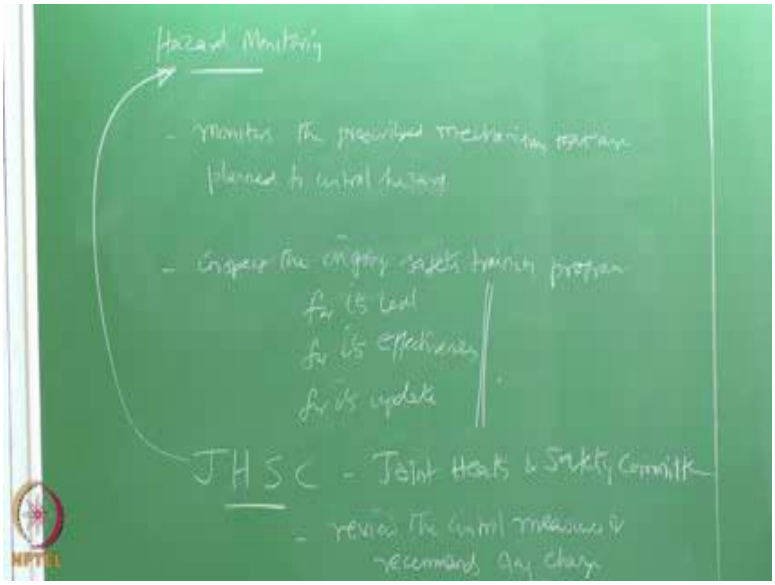

Hazard monitoring deals with recommended prescription mechanisms to control hazards, this actually monitors the prescribed mechanisms that are planned to control hazard, I can give an example to you if you say your employee should undergo a periodic training maybe once in a fortnight or once in a month. So, a monitoring system can be generated in such a manner in administrative setup that do the employee really undergo training what is the level of training they have undergone and are they updating the knowledge during training. So, all can be checked and monitored continuously. So, that the training imparted to them are effective and appropriate.

It should also inspect the ongoing safety training programs for its level for its effectiveness and for its update generally in a given system or a company or an organization there is a committee which is called joint health and safety committee which will look after the monitoring of hazard management automatically. So, that is the purview of this committee this will review the control measures and recommends any change when you do actually a monitoring of this there are certain points which can be easily seen which can give very good insight about the whole control mechanisms available in the given system. So, let us see what are they.

Let us say answers to the following questions can improve the monitoring.

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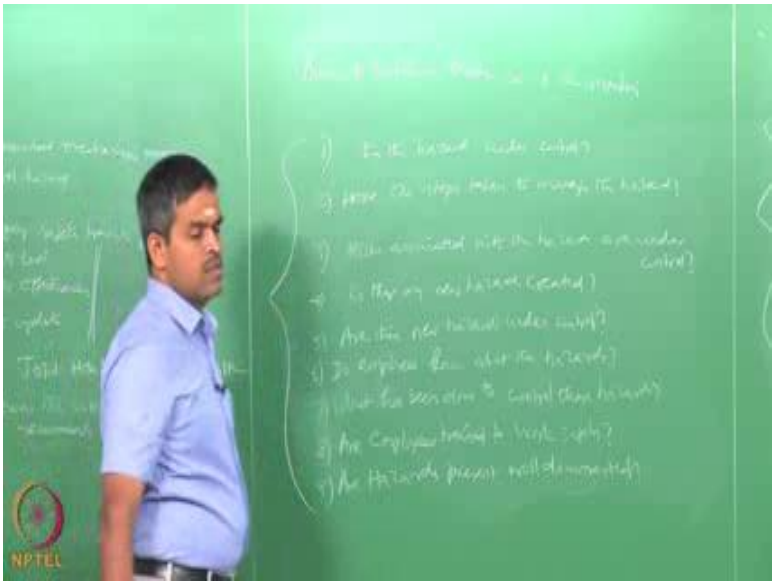

First is the hazard under control we all know hazard is present, but we are not ask a question answers through the committees response is the hazard under control have the steps taken to manage the hazard check, whether risks associated with the hazard are under control look for is there any new hazard created the new hazard can be because of introduction of a new equipment because of relaying on the existing process line because of introducing a bypass line because of shutting down a specific line due to maintenance etcetera and because in many cases during accidents as we saw in the case studies in most of the cases the problem arise because there was no information transferred from one shift to another shift during the maintenance part of it.

So, one has got to really see is there any new hazard created because of this if it is. So, are these new hazards under control do employees or do employees know about the hazards they should be educated completely about the hazard scenario if. So, what has been done to control them are employees trained to work safely I mean all questions will lead to a summary of answers which can actually form a record of monitoring of hazards are hazards present well documented.

So, one can have series of questions like this in based on the experience and the expertise of the joint health and safety committee members and keep on asking questions which

would lead to series of answers which can actually become a written document in terms of explaining the hazard monitoring situations. So, friends in this particular lecture we talked about hazard management to be very precise about hazard control and monitoring what are various steps in hazard management how it can be made more effective how at various levels hazard, can be addressed at managerial level at employee level at societal level even at planning stage at construction stage design stage process stage how hazards can be addressed. We have seen with various examples in this module.

I hope you would understand and revisit these lectures back again to have a clear idea about the hazard management and hazard control issues ladies and gentleman this course is also identified as one of the important tool towards capacity building of oil and gas industries. So, I sincerely request all the viewers that you must take this course in lessons in a very serious manner and try to share this knowledge with all your colleagues and friends in the workplace. So, that let us create a safe atmosphere in terms of work culture which is very very safe at least in the target industry what we are focusing which is oil and gas sector.

In this lecture we discussed about the hazard control and management. In the next lecture we will talk about the failure mode effect analysis and we will also look into some of the excise problems and excise. let us say questions which will be useful for the examination point of view at the end of the semester we will also try to answer them here in the blackboard. So, one can really understand from where to pick the answers how to refer them how to answer precisely what is actually being asked where can we look for these answers in the lecture notes etcetera all will be trained in the class room.

Thank you very much, looking forward for the next lecture.