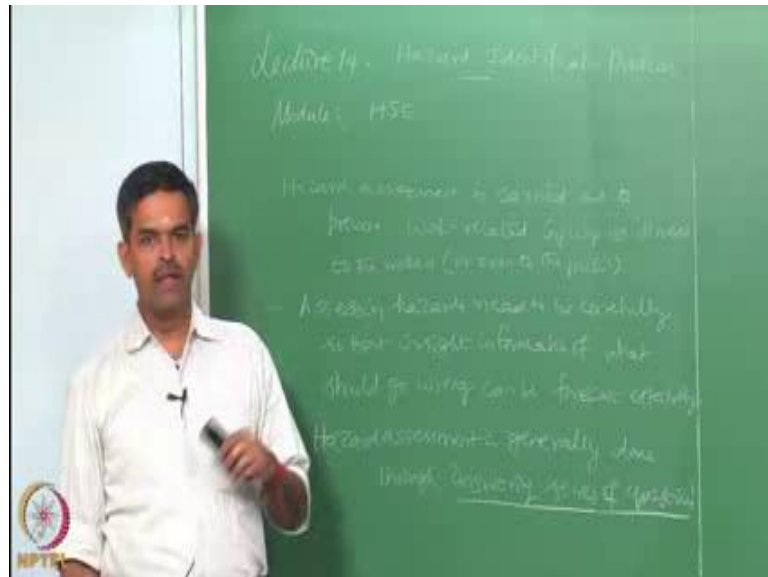


**Health, Safety and Environmental Management in Offshore and Petroleum  
Engineering**  
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**Module – 03**  
**Accident modeling, risk assessment and management**  
**Lecture – 14**  
**Hazard identification practices**

Friends, welcome to 14th lecture in module-3 in HSE practices.

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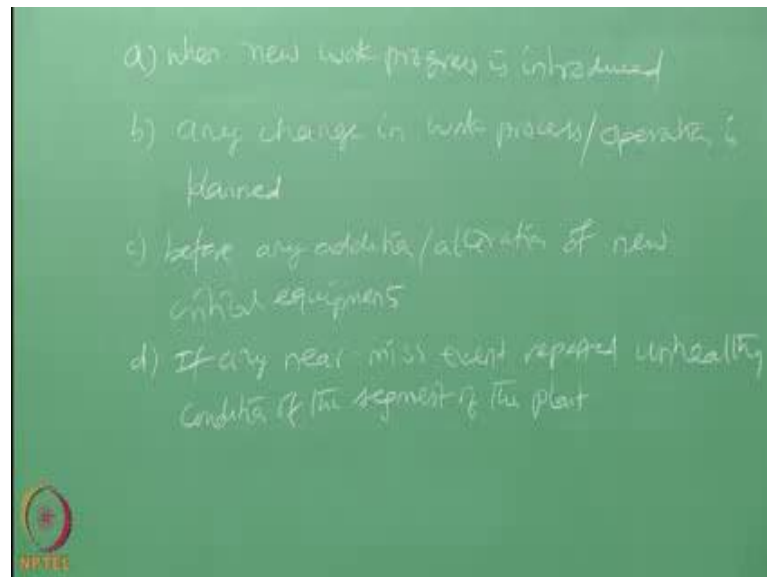


In this lecture we will talk about hazard identification practices which are commonly used in offshore industry; this is lecture in module 3 in HSE course online by NPTEL IIT madras. When we talk about hazard assessment which is the first step in any risk assessment and management hazard assessment actually is carried out with an objective which we already know hazard assessment is actually carried out to prevent work related injury or illness to the worker or to the public. Therefore, assessing of the hazards is important step need to be done carefully.

So, that in spite of situation what could go wrong should be assessed in the beginning of

what should go wrong can be forecast effectively. Therefore, hazard assessment is done through series of questions that is very important step let see what are the questions and how what do they mean? Let see the first question asked could be.

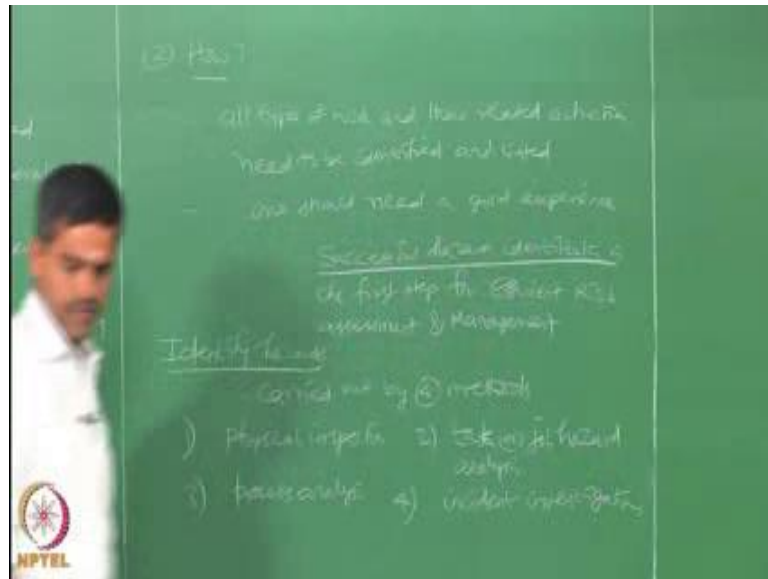
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When hazard assessment is done in the plant, when a new work progress is introduced you can do it. When new work progress is introduced or any change in work progress is planned or operation is planned you can also do it before any addition or alteration of new critical equipments d. If any near miss event reported unhealthy condition of the segment of the plant then also one could do hazard assessment.

The next question comes how do you do it.

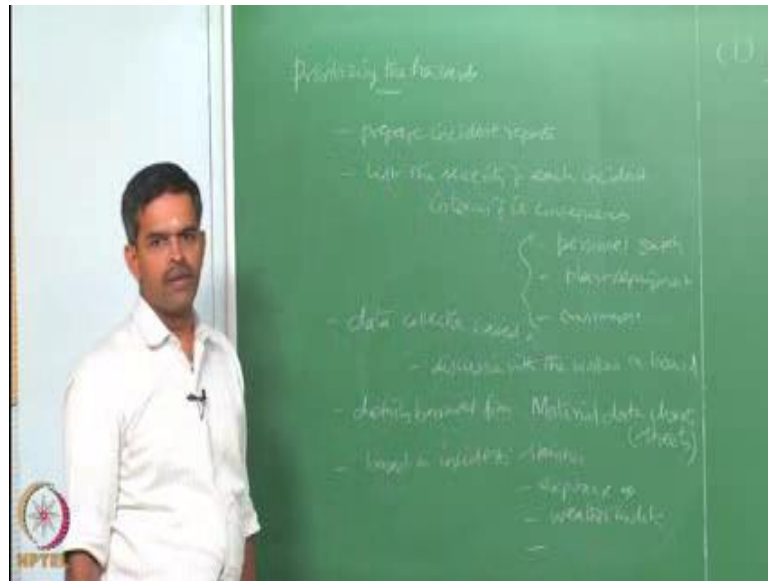
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All types of work and the related activities need to be first identified and listed while hazard assessment starts from this step identifying hazard activities among this, the list of operations being carried out needs a sound backing of experience. So, to do this one should need a good experience because successful hazard identification is the first step for efficient risk assessment and management. So, that is important. So, identification should be done in a proper manner. Therefore, let us say how do we identify hazards identifying hazards for each of the work related activity is carried by 4 methods this is carried out by 4 methods one physical inspection two task or job hazard analysis three process analysis and lastly incident investigations.

So, once you do this then, you need to arrange them in an order because it is better that you also list them in a specific order then, the next step followed after identification is prioritizing the hazards prioritizing the hazards.

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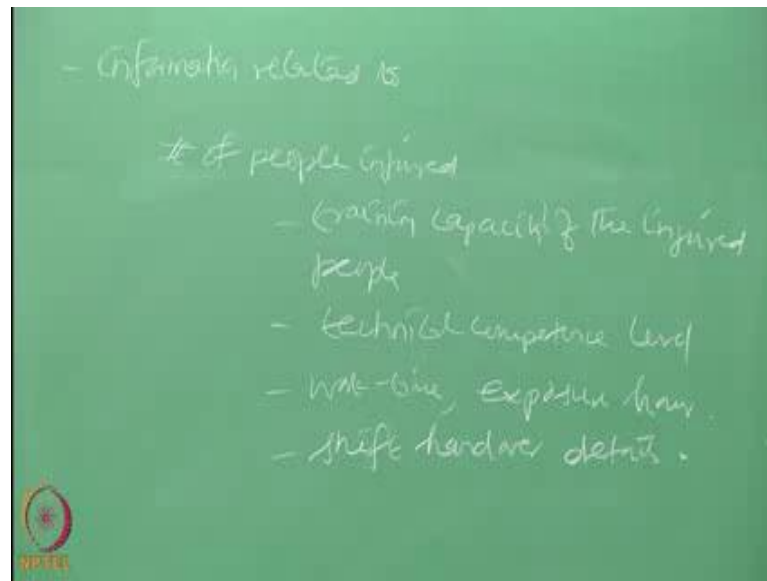
Hazards of higher order should be identified. So, that they can be prioritized this includes actually preparation of incident reports. So, prepare incident reports list the severity of the incidents in terms of it is consequences applicable to personal safety plant and equipment environment etcetera. So, try to collect the data based on this data collection based on discussion with the workers on board details borrowed from material data chart or let say sheets also based on incident statistics that is number of people exposed weather conditions etcetera. Then prepare a report and summarize this report in the form of safety audit.

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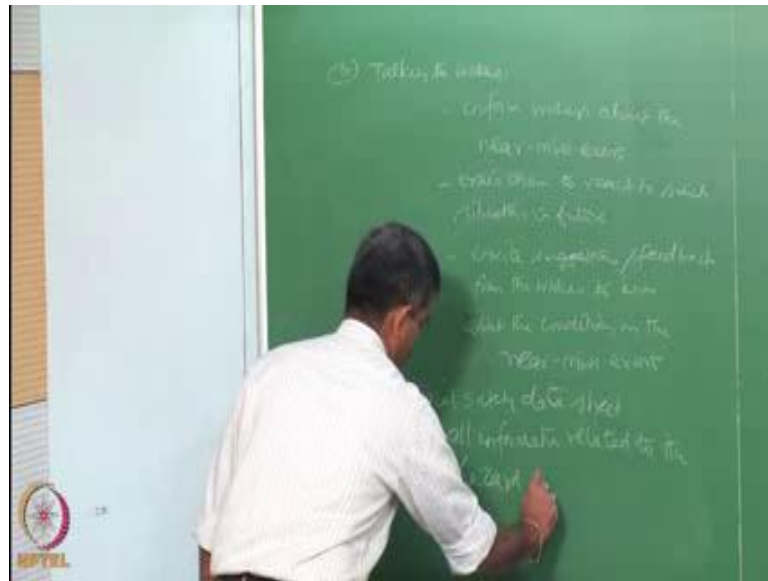
Now, the movement we say reports may be summarized let us talk about how we call certain definitions of certain events. let say what do you mean by incident report incident report actually deals with the work activities deals or reports work activities related to near miss events. So, you need to document the conditions that the responsible for near miss events and diagnose the control measures which are effectively in place to avoid the accident. So, all need to be reported we call that as incident report the second could be I want to access the severity of this accident. How do we do that it is a report which talks about work activities related to summary of work activities that resulted in serious injury or fatality.

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This report should have information related to number of people injured, what is the training capacity of this people training capacity of the injured people. What is the technical competency of this people? What is the work time? What is the exposure are? What is the shift handovers details etcetera. So, you need to look into all related information which are summarized in what we call severity of the incident the next stage, which has got very important application in hazard assessment is talking to workers this deals with informing workers who should be aware of the unreported near miss events.

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So, you should inform workers about the near miss events you should train them, react to such situations in future one should also invite suggestions and feedback from the workers to know about the conditions on the near miss events the next could be an important idea of collecting material safety data sheet. This contains all information related to the hazard substances involved in the process plant this could contain information about the state of presence of the substance.

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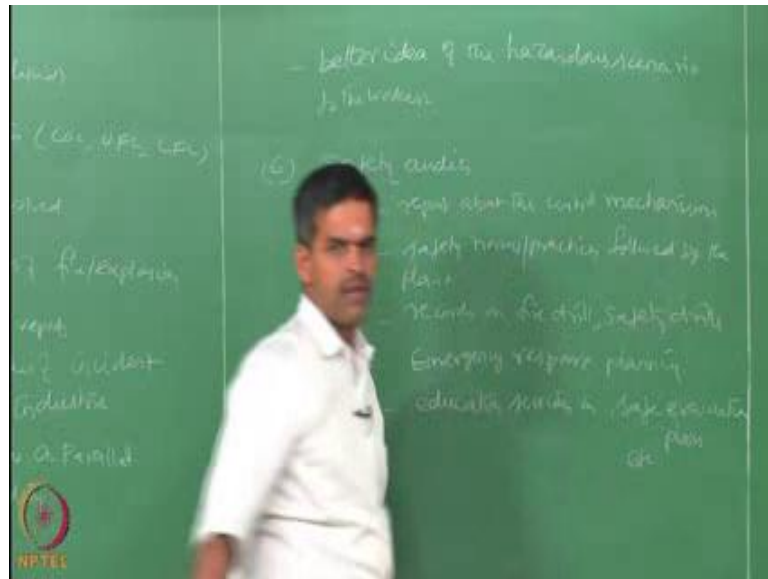


That is it, solid is it, liquid gas etcetera, you should also information about flammability characteristics of the material limiting of oxygen concentration upper flammability lower flammability etcetera.

You should also in know about the quantity of the material involved you should also know the potential hazard in terms of fire and explosion characteristics of the material etcetera. The next could be industry incident or accident reports it is important that every industry should compile a statistics report and circulate it of let us say similar industries not necessarily the same industry, industry circulate the report for a parallel capacity building. So, that this gives a better idea of the hazardous scenario to the workers on board.



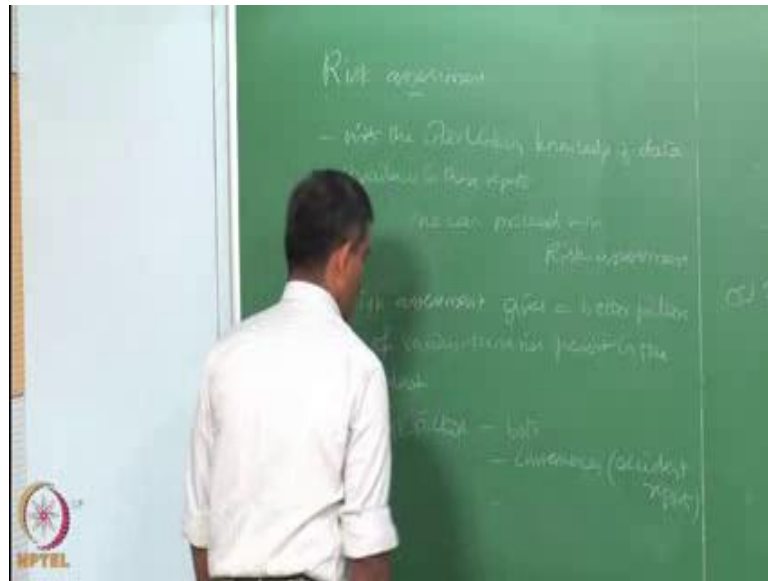
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Next could be reports of safety audits this could contain knowledge this should contain report about the control mechanisms the safety norms and practices followed by the company. It should also have records on fire drill safety drill etcetera it should have record on emergency response planning it should have education sessions on safe evacuation plans etcetera.

So, once we have this report in form of hazard assessment or identification then using this data very strongly in inter linking knowledge between these reports one can proceed with what we call risk assessment.

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So, with the inter linking knowledge of data available in this report one can proceed with risk assessment risk assessment actually gives a better picture of various scenarios in the plant because, this not only talks about the causes, but also the consequences. So, the risk picture talks about both the consequences which you see from the accident studies, but also the probability of this which can be seen as causes.

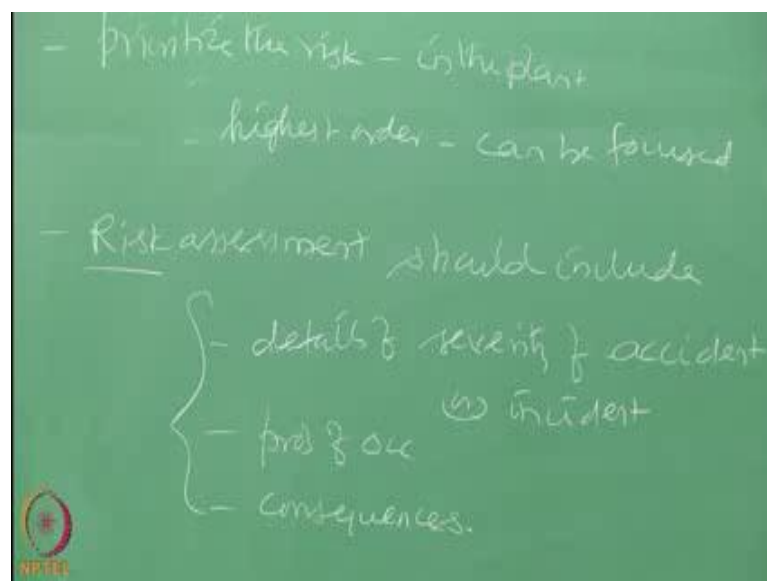
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Once you have the number of incidents including the near miss including a near miss events reported in the audit then this the number of incidents can be divided per annum or over a period of one year to find probability of occurrence of incident, if one has details about the losses on each incident losses can be personal property environmental public etcetera. Then one can also find the consequences in economic perspective to find risk.

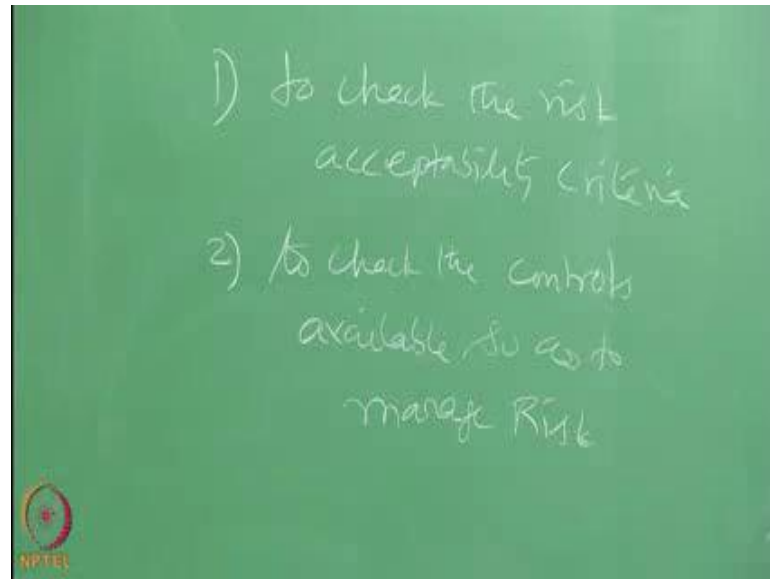
If you know the consequences e n scientific perspective then one can find reliability, based on the risk report now as the risk picture now one can now prioritize the risk in the given plant.

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Then the risk which has the highest order can be focused to improve safety of the plant therefore, focus can be directed towards the events which are responsible for the highest risk present in the plant and therefore, friends risk assessment includes details about severity of the accident. So, risk assessment should include details of severity of the accident or incident. What are may be the case does not matter probability of occurrence which we found out from here and consequence which we can found out either in this angle or in this angle. So, put together will give me risk assessment of that particular incident or accident once I know this I should take it forward for two dimensions.

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So, once risk assessment is made let say once it is made then takes it forward for one to check. The risk acceptability criteria or risk tolerance levels two to check the controls available, as to manage risk. Therefore, now comes implementation of hazard controls.

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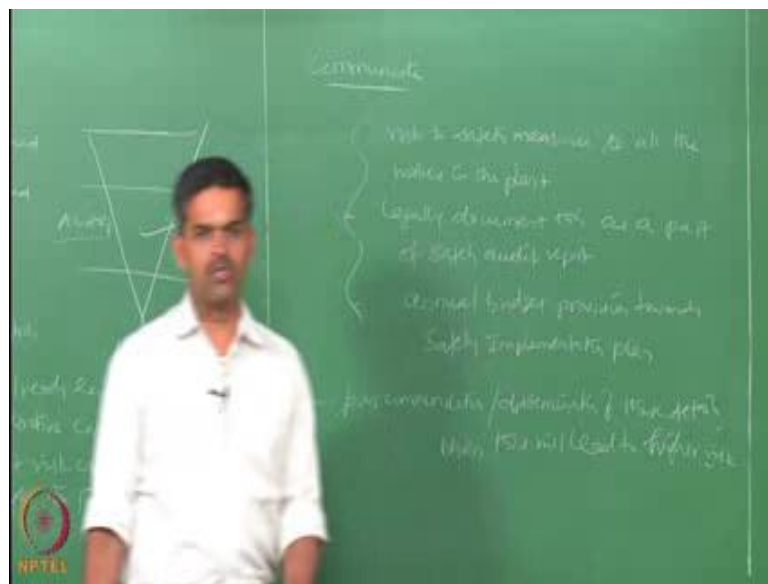
So, risk acceptability is well defined by statutes we have already seen in the previous

lectures about the ALARP triangle. So, the boundaries for the tolerable region of risk are defined by various international agencies.

So, it is predefined it is very important it is well defined it is predefined. So, based upon the assessed value what you got can compare that with this and say is it or not. So, that is a mathematical comparison, but the second problem of risk management is much more complicated. We need to also identify the hazard controls present in the system. One need to identify those already exists in the plant and proposes new or alternative controls to the plant. So, that in both cases risk can be modified and brought to the level of tolerable region that is this region.

Once you do the assessment and try to do the management the most important step follows you need to communicate this.

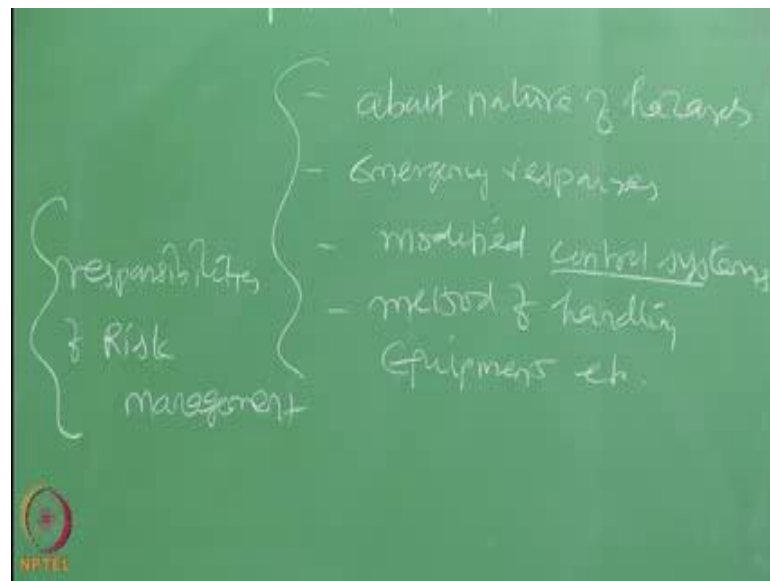
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Now, communicate to whom you need to communicate the information about the risk and safety measures communicate information about risk and safety measures to all the workers in the plant you have to also legally document this as a part of safety audit report.

You need to also look into this in detail for annual budget provision towards safety implementation plan because; ignorance of this or omittance of this will have highest potential of risk in the future. So, if you try to lead with poor communication or poor discrimination of these details. Then this will lead to higher risk further in the future, proper training to be planned.

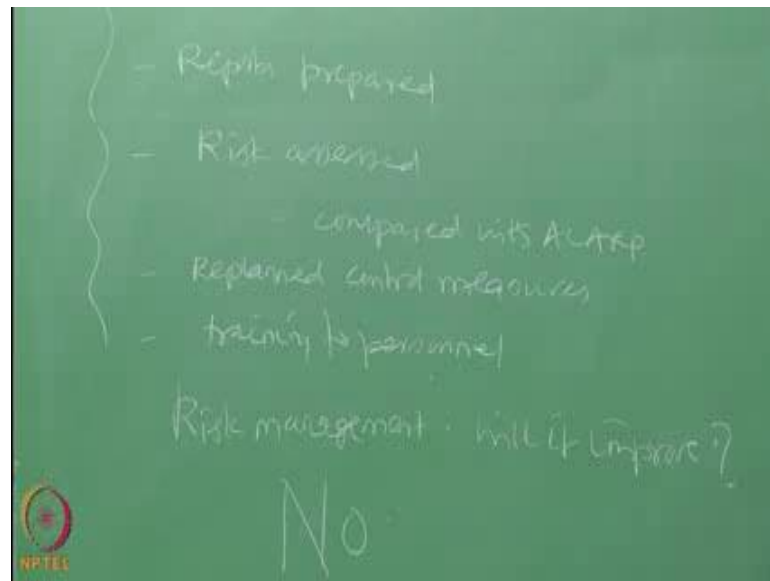
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Proper training should be planned and imparted to all personal about nature of hazards about emergency responses about modified control systems about method of handling equipments etcetera.

So, this will try to reduce the probability of occurrence of those hazards or risk present in the system. It will reduce the cost implications it will also improve on effective working of the possible controls I am not saying possible control are not there you do not have to operate them, effective working of possible control mechanisms which will all lead to reducing the consequences even though the hazard may lead to an incident or accident this what we call as responsibilities of risk management.

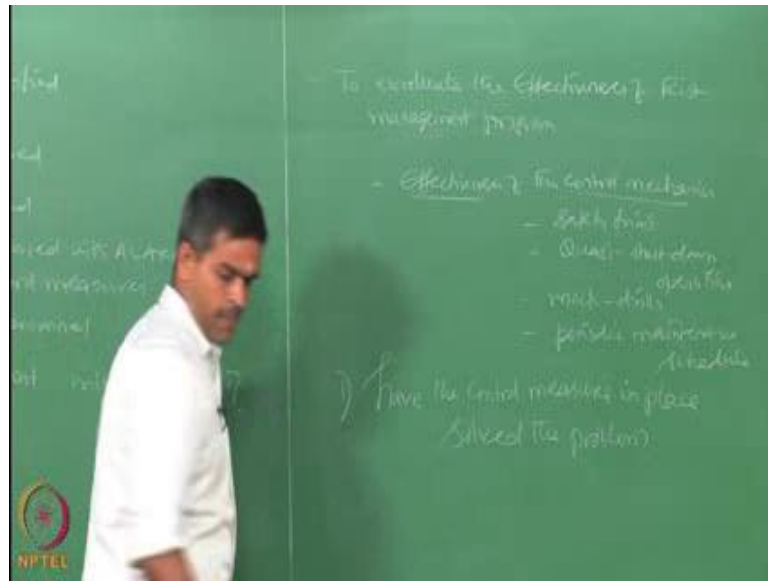
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Interestingly you have identified hazards you have prepared enough reports you have assessed risk you have a compared with ALARP for acceptability, you have revisited or re planned control measures you have imparted training to personal do you think all this will improve risk management will it improve the answer is big, nor the answer is big, no there is one more important step to ensure that the risk management is successful what is that.

So, the most important step or stage to see that the risk management is successful is to evaluate the effectiveness of the risk management program.

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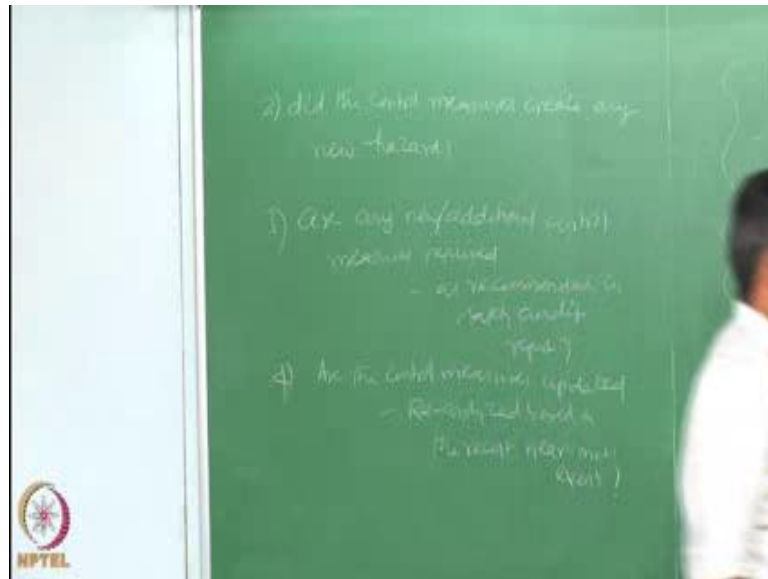


We need to evaluate this. So, while doing that one should also look at the effectiveness of the control mechanism how can you do that you can conduct safety trials you can conduct quasi shut down operations you can conduct mock drills you can revisit the periodic maintenance schedule of the control equipments etcetera.

So, with all that one can revisit and check the effectiveness of control mechanisms or machines and equipments. So, one can ask series of questions which can be answered in this particular context have the control measures solved the problem available in place solve the problem the second question could be did the control measures created any new hazard.



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Because sometimes this may also happen third could be are any new control measures required any new additional control measures required as recommended.

In safety audit report one has got to check this lastly very important are the control measures updated any recent modification to be done or they updated are they re-analyzed based on that recent near miss events. So, all these questions become very interestingly answers for evaluating effectiveness of the control mechanism which ultimately lead to how effective a risk management is actually functioning subsequently the identified hazards will get prioritized according to the critical hazards points what are gained in the whole understanding.

Hazard controls are then implemented to prevent major accidents. So, therefore, friends effectiveness of these control measures need to be evaluated on periodic basis for better safe working environment which is considered as an important step in safety practices in HSE in oil gas industries, what we get reported in inspection and safety audit reports which is conducted periodically may be once in 6 months which contains all the plus and minus of the whole incidents happening and all answers to such questions which deals with only on evaluating the respectiveness of the risk management program adopted oil industry or by the company.

So, in this lecture we talked about some interesting HSE practices which deals with hazard and risk assessment and risk evaluation and some important reports which gives interesting information to the hazard analysis and identification which becomes a backbone information for conducting effective risk assessment and of course, leading towards risk management program ultimately, we know that a risk management program is considered to be successful only when the evaluation says that the effectiveness of the control mechanisms are implemented based upon and they are re assessed re analyzed based upon very recent near miss events.

So, it is a constant and continuous iterative scheme of HSE practices in industry which is to be done on a continuous basis. So, that it is not an intermittent training program that safety program is given once in 6 months no safety audit rather is a day to day routine business you have got to inspect this on day to day basis keep on documenting them of course, we can summarize them once in six months once in three months and discriminate this knowledge to all the workers on board, so that all are equally and parallel educated about the risk management program what the company follows.

Thank you very much.