NPTEL

NPTEL ONLINE CERTIFICATION COURSE

Health, Safety & Environmental Management in Offshore and Petroleum engineering (HSE)

Module 1
Safety assurance and assessment
Lecture 5
Safety in Operations

Welcome to the 5th lecture on health safety and environmental management in offshore and petroleum engineering we have already covered basic introduction to safety in the previous four lectures we have understood the necessity why safety is important why safety assurance is essential for an hydrocarbon industry like oil and gas industry in this lecture in module 1 which encompasses on safety assurance and assessment. We will talk about safety in operations this particular topic has many dimensions when this topic is applicable to process industry people call this segmental area as process safety management briefly as PSM.

We will try to touch the concepts of process safety management as applicable to oil and gas industries so we rename this area as safety in operations as applicable to oil and gas industries. Let us quickly look at the project life cycle of any process industry. Now oil and gas industry is now way exempted from a conventional process industry because of simple reason that after hydrocarbons are exploded they need to be processed before they enter into a commercial retail market. So let us now look very briefly what are those studies which are important for a project life cycle, a project life cycle essentially has three domains.

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Of interest one is what we call design and engineering stage, the second is erection and commissioning stage the third one is operational stage. Now safety assessment is important in terms of all the three stages let us see how do we intervene safety in different stages of a project life cycle. If you look at the design and engineering stage of any project of an offshore platform project health safety and environmental review which we briefly call as PHSCR is generally a part of design and engineering stage of any new proposed project.

To understand what are the difficulties during operations we also conduct what is called HOSZOP which is called hazard and operability studies. Since hydrocarbons operate on high temperature high pressure modules we also study something on design of fire protection systems. Ladies and gentleman it is important that safety can be implemented at the process stage it can be also implemented at the design stage. So this is one important area where one can talk about safety implementation in the design stage that is design of fire protection systems.

We also do quantitative risk assessment in the last lecture we touched upon three interesting examples, how safety or risk assessment or risk management in general has been encompassed by an economical feature. We have taken three examples to explain how Morgan's rule, frank

rules can be applied to actually assess the economical loss which is encountered because of any risk occurring in any production or process plants. We also conduct functional safety assessment, we also do design of fire and gas detection systems that is also a part of safety in operations we also conduct very importantly environmental impact assessment studies that is called EIA studies, of course we have lot of discharge getting into the sea after the crude oil explore.

So we conduct waste water consulting and design of zero liquid discharge plants we also do design of lightening protection systems because that is a very important area as offshore platforms are located in an open sea lightening is a very important area which can affect the electro processing of many equipments which are placed on boat and offshore platform. So in design and engineering stage many studies related to safety are generally initiated, parallely during erection or commissioning stage also safety studies are definitely inherent part of this, construction risk assessment are carried out, development of EHS system.

Third part is support during the construction face of the project also carry out lot of risk assessment studies pre-commissioning audits, contractor safety ratings because you cannot deploy a contractor or cannot give him a hot work permit. If the safety ratings of a contractor is not on a satisfactory mark the contractor cannot be employed by an organization. Specialized construction techniques, safety trainings for all the people on boat including the people from the management side and including the people from the contractor side.

Accident investigations that is very important because accidents do occur especially during the erection and commission stages so one as got the conduct periodically and whenever it is demanded and accident investigation fire protection system commissioning because here is the design and here is the commissioning part of it. So we do conduct lot safety assessments studies and risk assessment studies even during erection and commissioning stage. Finally during the operational stage as we saw safety in process.

It is very important that we do conduct lot of safety studies especially when operation is being carried out, process safety consulting like QRA/HAZOP and SIL studies we talk about very quickly the SIL studies in this lecture of course, I have got dedicated lectures on HAZOP studies

with detail examples as applied to oil and gas industries. One has to also conduct fire risk assessment and electrical risk assessment because, you know electricity or electric short circuit is one of the important reason for many major fire accidents happen in offshore platforms.

We also importantly conduct comprehensive safety audits for operation stage platforms of course waste water audits and energy audits, adequacy check of fire protection systems, safety culture surveys, lightening protection risk assessment, thermal imaging, scanning, that is called thermograph surveys and people also conduct logistic risk management solutions. So ladies and gentleman in three different stages of a project life cycle as applicable to any process industry nevertheless applicable to oil and gas industries also in design.

And engineering stage, in construction or commissioning stage and in operational stage people do conduct mandatorily many types of safety assessment risk assessments studies which are all very important as listed here. Of course, most of them will try to cover in different modules in this program, but some of them are intrinsically vertically very important where one as to acquire a special training in conducting these kind of reports or surveys or assessments. Let us ask a question are we prepared for an emergency plan.

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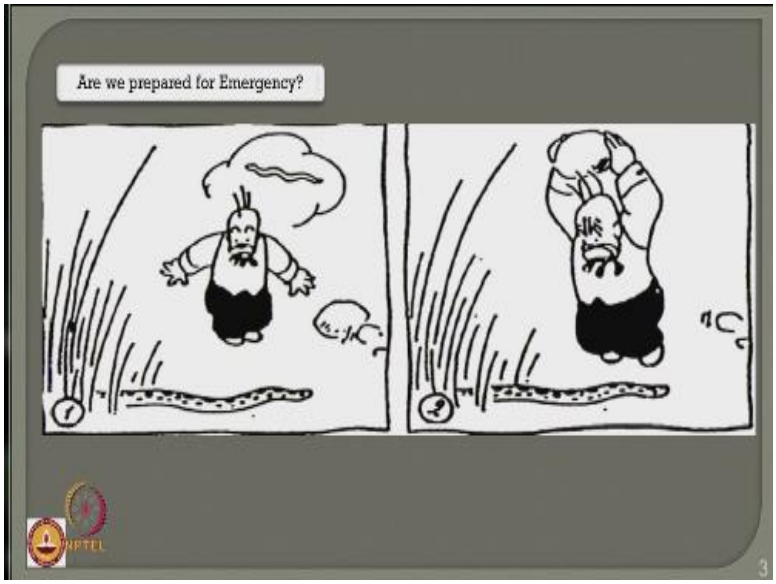

Now this slide is very important to understand that if you do not know the consequences of a risk is then you end up in taking a very bad decision your alertness, your smartness, your understanding, and your update on training becomes very important as an individual if you really wont implement good safety review programs in your management. Let us take a look at this cartoon where this man is actually thinking how to take care of this particular tail it may be a snake, it can be by other animal, it can be even a rope so he is confused how to tackle this particular problem. He tries to hit it thinking that this is as small or as enough long as he could handle.

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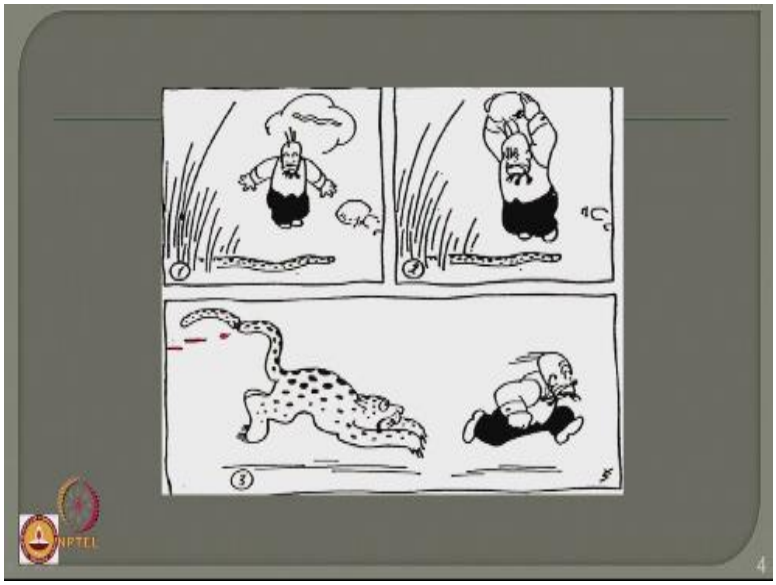

But ultimately if you look at the next part of the figure you will notice that that is actually not a snake or rope it was tail of a tiger and tiger start chasing him. So if you are not prepared to tackle any emergency satiation in case of risk management, risk management will become a giant which will start chasing you very badly.

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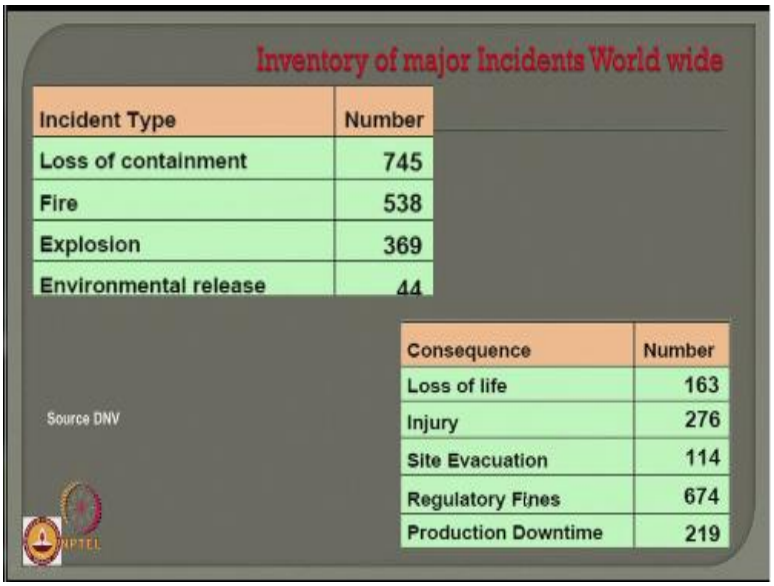

Here is a statistics prepared on one survey conducted by DNV where I am trying to show this for a better understanding of inventory of major incidents worldwide. In the last lecture ladies and gentleman if you understand the terminologies we clearly define the difference between incident and an accident, all incidents do not ripen to become an accident, incident along with the environmental and atmospheric and the given situation converts them, promotes them, or intuits them to become an accident.

So let us talk about inventory of major incidence which occurred worldwide if you look at this table here the loss of containment was very high in terms of the major incidents followed by which fire is consider to be one of the important incident type which resulted in major catastrophic accidents. Of course, fire and explosion are inherently connected and depended to each other. If fire is there it could be always followed by an exploration on the other hand if it explodes it can set up an fire as well.

And obviously when such two incidences happen consecutively it will result in release of lot of environmental chemicals which is called environmental release and the number of incidences where the environmental release seems to be the lowest and the loss of containment seems to be

the maximum. If we look at the consequences of these kind of incidents because incidents frequencies one part of the risk management, consequence assessment is a second part of risk management if you look at the consequence of these incidents the loss of why it is reported is about 163.

Whereas the regulatory fine is imposed on these companies are management for violating safety norms is 674. On the other hand this study in summary very clearly shows wherever such incidents, major incidents happen worldwide there has been stringent regulations imposed on these companies so that they should not be repeated even then as you understand accidents do occur because accidents are not created they are caused because of various factors as we have seen earlier slides and we will also see the due course of this program.

So most importantly the fundamental consequence which generally occurs as a major one is a regulatory fine just to become a corrective measure, second thing to that is the injury. Now put together injury and loss of life which is called challenge to a personal safety can be considered to be the major one as equivalent to that regulatory fine. It means if a company encounters an accident in his production plant there are two major catastrophic damages happening to the company.

One is a financial loss because there are regulatory fines imposed on the company, the second is insurance claims because personal safety is challenged because is a loss of life and is injury to people. In addition these two there are other consequences parallely happening with the production down time because your company or your plan or your production unit is shut down for some time until it is recovered back for production further.

So the production down time is one of the great economic loss a company can face if they are not able to foresee or in this age any damage expected because of safety violations. In addition to this site evacuation is one important consequence which generally occur measure a lot of chemical releases happening in the atmosphere. This comparison clearly shows you that what are the large losses happened in petro chemical industry.

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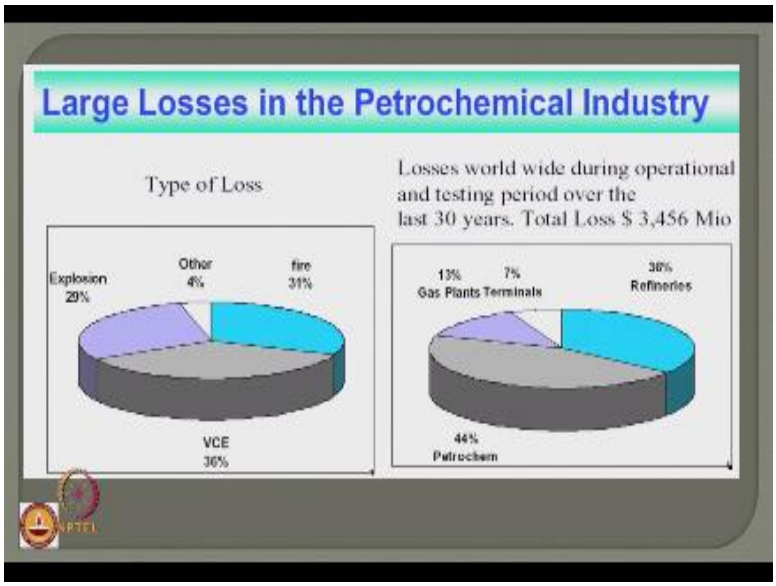

If you look at the type of loss generally reported in the last 30 years in any process industry the major loss about 36% is due to vapor cloud explosion, followed by which major or two fire and explosion, if you look at all of them put together so they are the three primary reasons why many losses have been incurred in any process industry, receiver side if you look at the different kinds of industries which has encountered accidence and loss in the last 30 years.

Which the total loss amount after very high value as shown here, the major loss which has been reported and seen the literature is when the petro chemical industries followed by that is a refinery industry. If we include the refinery and the petro chemical as a process industry which helps the oil and gas production systems to reach the commercial market then these two put together becomes a major source of reporting of accidents in the society were major losses have been reported.

So it is very important for us to understand ladies and gentlemen being a safety executive being an employee of an oil and gas industry safety becomes primary important to us because this kind of safety violation leads or challenges the major economic loss of the company. As well as they also disturb the our initiate societal risk because fire explosion and vapor cloud explosion put

together will result in lot of chemical release in the environment which can affect and cause serious impact to help the people living and surrounding your plant.

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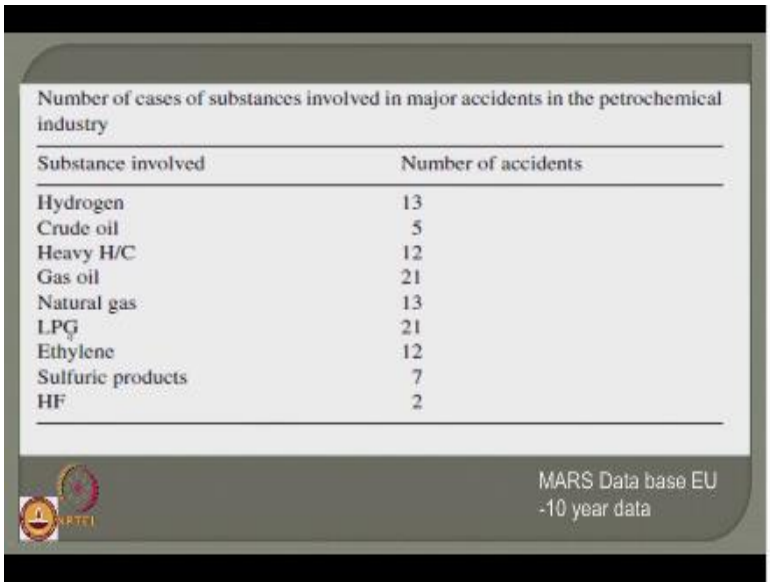

Let us quickly look at another data prepared by mass data base European Union which summarize the 10 year data, this data is interesting because this data tells me what are the substances involved in major accidence in petro chemical industries? If you look at the list of substances the major substance reported to participate in the major accident is the LPG as well as gas oil.

So hydrogen, crude oil, heavy hydro carbons, gas oil, natural gas, LPG, ethylene, sulphuric products and HF which includes a very nominal number the major contribution essentially comes from the LPG or it also comes from gas oil. So these are the two segments which are contributing as a substance involvement in major accidence in petro chemical industry. So both of them will include.

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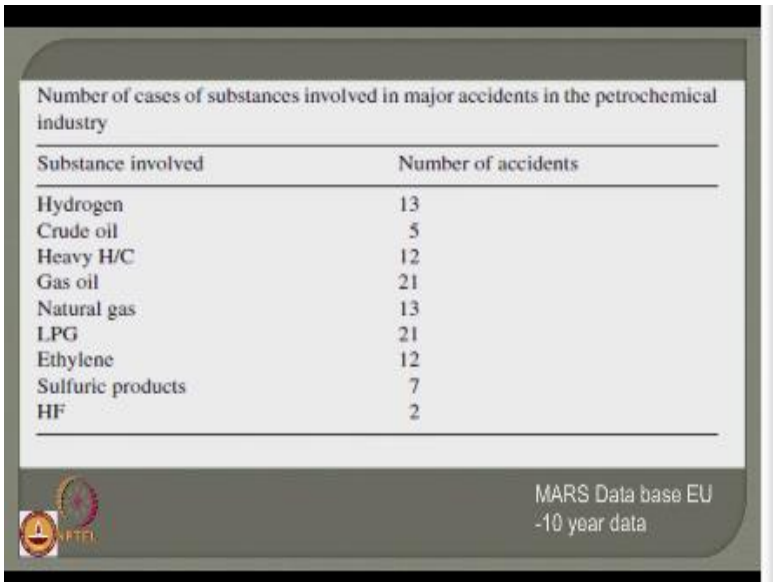

Interestingly a dispersion of chemical release in the atmosphere which can cause a serious damage to the society or to the people living around or can even damage the adjacent neighborhood properties as well.

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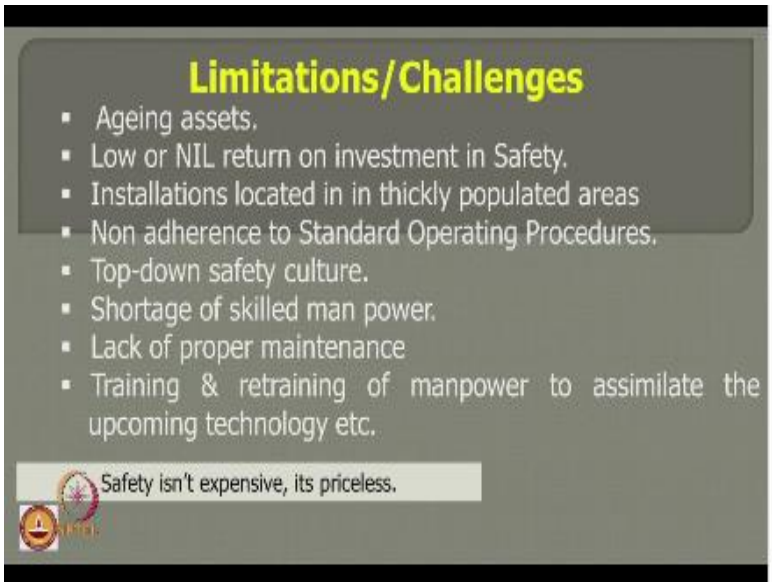

Now let us ask a question ourselves, if safety is that important in process what are those limitations are what are those challenges this particular industry in terms of safety apply to operation is being faced upon. Now the major factors or the challenges which are foreseeing which prevents successful implementation of process safety for the following.

Ageing assets because many assets once commissioned are not updated for their printing capacity. Low or zero return on investment and safety because the management does not see what is the commercial benefit of the profit of return what are they invested on towards safety, there is essentially very low return on any expenditure.

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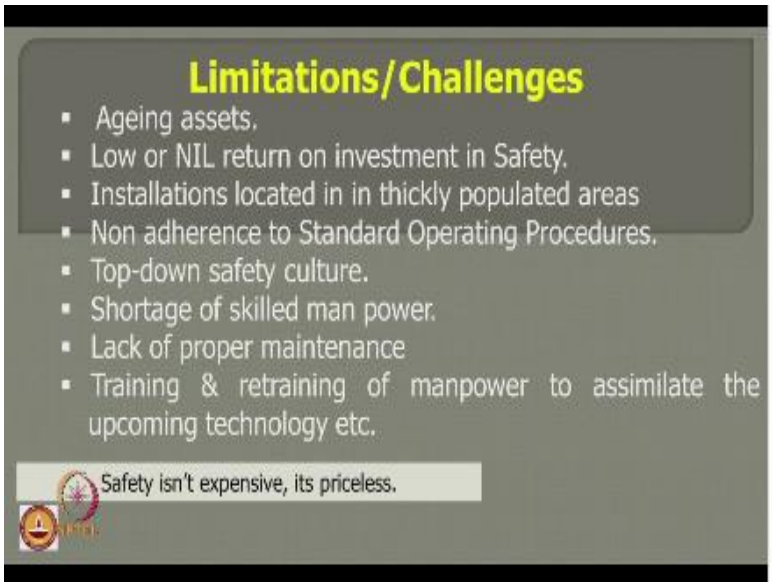

Goes towards safety or practically there is no return, the third issue which is very important is installations of oil and gas industry especially the process plants not the production unit, the process plants are essentially located in a thickly populated areas, it is because of the reason that the commercial market of this or the transportation coat of the processed chemical is to be made as minimum as possible.

So that they are generally located in the thickly populated area, on the other hand when such industries are formed obviously colonies are developed in around these industry because these industry give lot of employment opportunities. So it is very important for us to also know and realize that non adherence to standard operating procedure.

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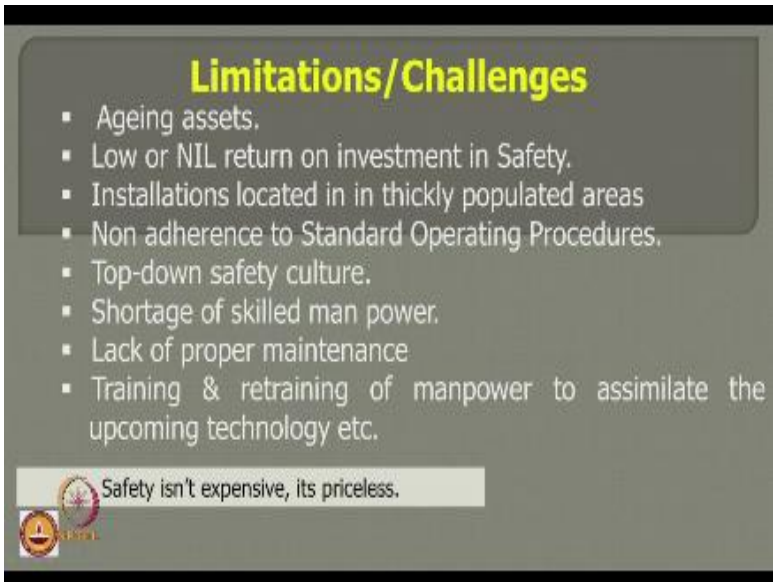

Is also one of the important challenges what this company of this industry is facing? Top down safety culture for example the safety is always taken as a priority of a person working on board but it is not applied to a blue-collar person in the top management industry, shortage of skilled man power therefore, the man power is over exercised, lack of proper maintenance scheduling most importantly training and retraining of man power to assimilate the upcoming technology is not practiced in many of the industries has a continuous process.

So safety regulations, safety training, safety education, risk management, hazard studies, educations on hazardous substances is very important for every personal working in oil and gas industry and this is got to be done on a periodic bases, remember ladies and gentlemen safety is not expensive it is actually priceless.

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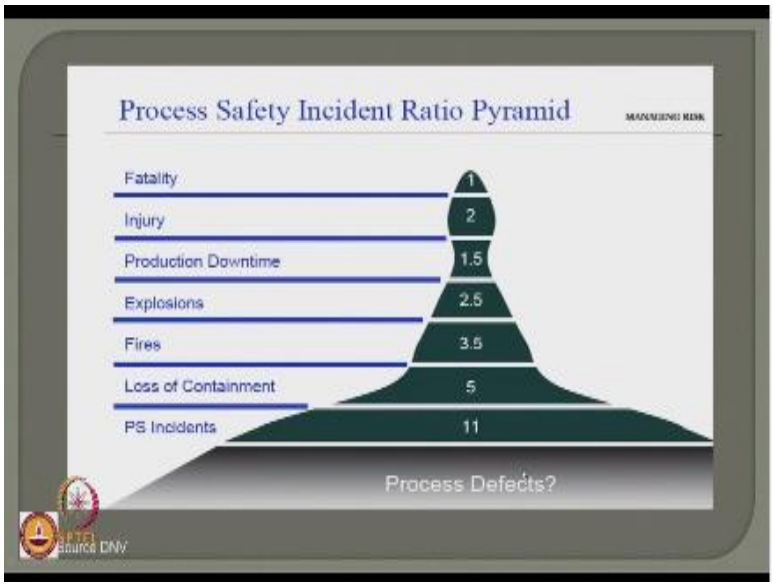

Let us ask a question about how to manage risk? The moment I asks this question of managing risk what you get in your mind is a process safety incident ratio pyramid. If you look at the construction of this pyramid the base of the pyramid is very wide as well as the apex of the pyramid is very narrow the narrow portion which is the apex of the pyramid is only addressing the fatality part of the process safety incidents.

Whereas the base of the pyramid which is very, very large is formed essentially because of the defects in the process. On the other hand ladies and gentlemen safety methods in process becomes very essential if really want to control the occurrences or mitigate occurrence of accidence completely in any process industry as applicable to oil and gas industry as well, because the majority safety incident ratio pyramid shows that the base of the pyramid essentially grows from deficiencies in the process systems followed by which process safety incidents, loss of containment.

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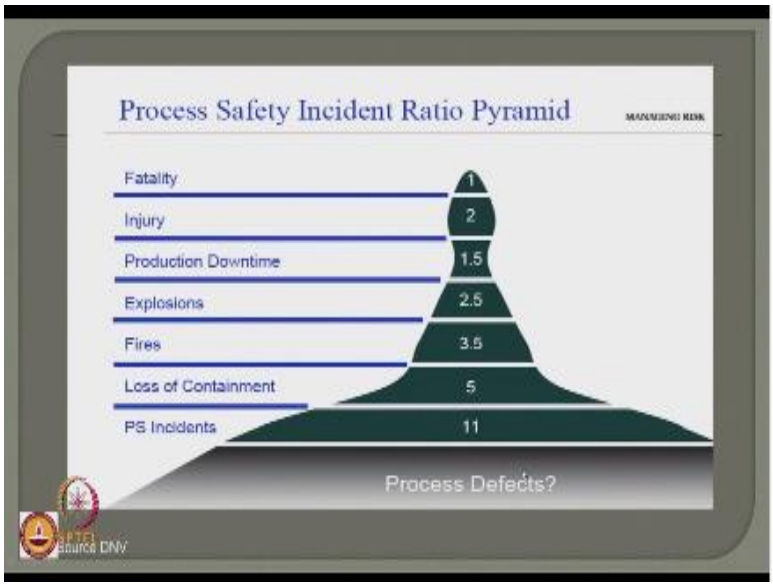

Then occurrence of fire and explosion of course the production down time and followed by which injury and fatality which are actually challenging to personal safety. So safety in terms of incident ratio pyramid of personal safety is only a very low margin compared to that of deficiencies in the process itself. So there is a very interesting demand of understanding safety in operations itself so every process and every mechanism in the process should be thoroughly ascertain and tested and checked and examined periodically for its safety review mandatorily.

So therefore we now understand the importance of learning process safety management however I am not going to introduce you PSM in detail but I am going to touch up on very briefly how process safety can be examined and studied and understood in simple terms as applicable to oil and gas industry as a part of HSC program.

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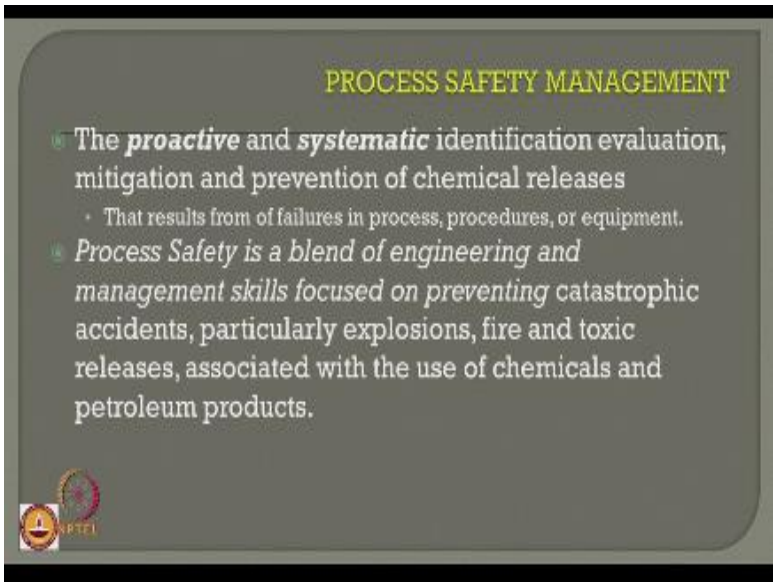

Process safety management is a proactive and systematic identification, evaluation, mitigation and prevention of chemical releases. So this is essentially related to process only it is not related to manufacturing or production or mechanism or any machines at all, so it is a proactive and systematic identification, evaluation, mitigation and prevention of chemical releases which result from failure in process, procedures or equipments. Process safety is therefore a blend of engineering and management skills which are focused on preventing catastrophic accidents particularly explosions, fire and toxic releases that are associated with the use of chemicals and petroleum products.

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Process safety management is briefly referred as PSM. It is the application a management systems to identify, understand and control process hazards to prevent process related injuries and incidents. Now the fundamental objective of any successful process safety management is to minimize the process incidents by evaluating the whole process. So understanding the process becomes very vital if you really wanted to know how this process could result in anticipated catastrophic damages.

So understanding the process being a process personal also understanding safety regulations and more importantly willing to practice safety as a program and assurance to the management is important to have successful implementation of process safety management in a given system.

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Essentially OSHA Standard 29CFR 1910.119 which addresses Process Safety Management of Highly Hazardous Chemicals in 1992 has become a basic standard a practicing process safety management as applicable to oil and gas industries.

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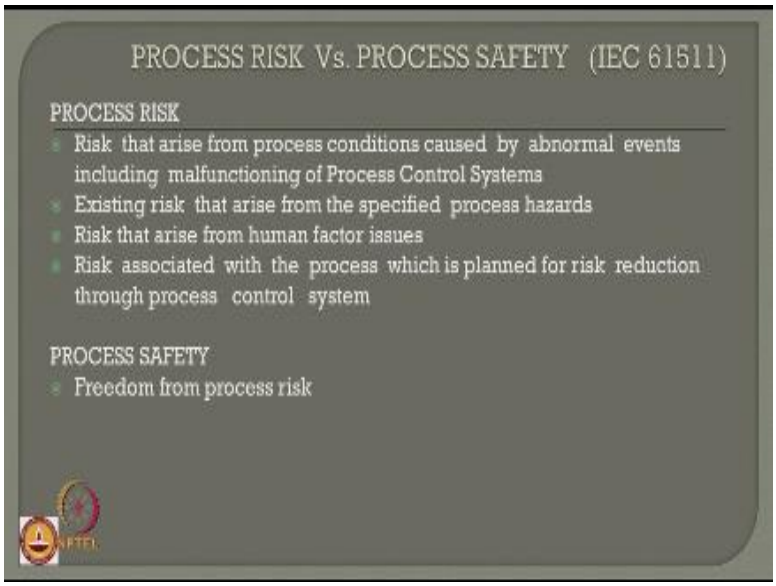

Now let us ask a question which is very, very confusing but it is a very overlapping answer. What is the difference between process risk and process safety they have already seen in the last lecture what is the difference between risk and safety. Because they are contemporary to each other safety is a quantitative domain whereas risk is a quantitative domain.

Now let us here understand process risk versus process safety as explained by IEC 61511. Process risk is the risk that arise from process conditions caused by abnormal events including malfunctioning a process control systems, existing risk that arise from specific process hazards are also a part of process risk, risk that arise from human factor issues is also a part of process risk, risk associated with the process which is planned for risk reduction though a process control mechanism is also in place is also a part of risk which is coming from the process.

Sometimes ladies gentlemen the risk reduction mechanisms will also instigate risk associative with the process. So all these becomes a part of process risk whereas process safety is actually freedom from the process risk. So you do not want any risk occurring from the process you call that as process safety whereas process risk is addressing many areas which arise from the existing.

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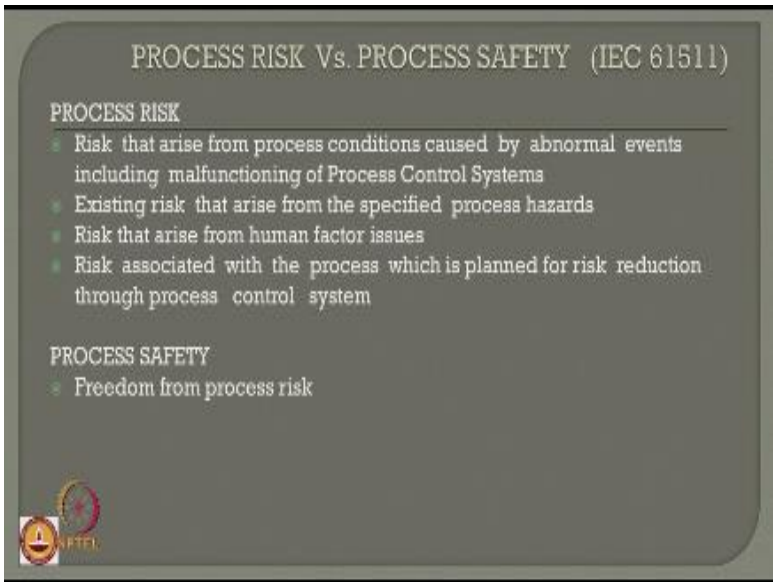

Conditions of normal events, malfunctioning of equipments human factors and risk arise from specified process hazards.

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Now let us ask a question what are the differences between process safety and personal safety where already seen that safety is not only applied and adapted to a personal safety we are also important in reducing laws prevention okay, that is very important have a process safety is a safety hazards which are initiated so for major or from major accidents this results in release of chemicals, fire, explosion it is a high consequence low frequency phenomena where as if you talk about personal safety this gives raise to incidents such as injuries and fatalities examples could be falls trips crushing in electrocution these events are low consequence but high frequency.

So risk is the product of consequence and frequency therefore both of them are important however causes safety because much more important because though the frequency is very low the occurrence the interval of occurrence fractions are very low the consequence of very severe therefore process safety generally over rules, generally over rights on personal safety in a given successful management system because if your process is safe enough.

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Your personal safety will be more or less taken care of automatically.

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Now the question comes what are those indicators through which I understand whether personal safety or process safety is practice satisfactory. The personal safety factors could be first aid injuries how was last to injuries recorded incidents that could have resulted in personal injury exposure due to improper use of personal protection equipments, they generally these indicator should capture the efficacy of the personal safety programs employed by the company where as the indicators of process safety for example could be the number of failure of critical equipments during the process of production system.

Incidents of laws of containments fire exposure cost way process failures actually these indicators measure the ability of the process to be within control and not allow any undesired incident to happen. So process safety indicators are related qualitatively to the ability of the process itself whereas personal safety indicators are quantified using these kind of measurements like counting the number of injuries happened, counting the number of fatalities happens etc, or counting the number of recorded incidents to the lost resulted in personal injury etc.

So there are two different indicators set of indicators for this which will access the personal and process safety practiced by the organization.

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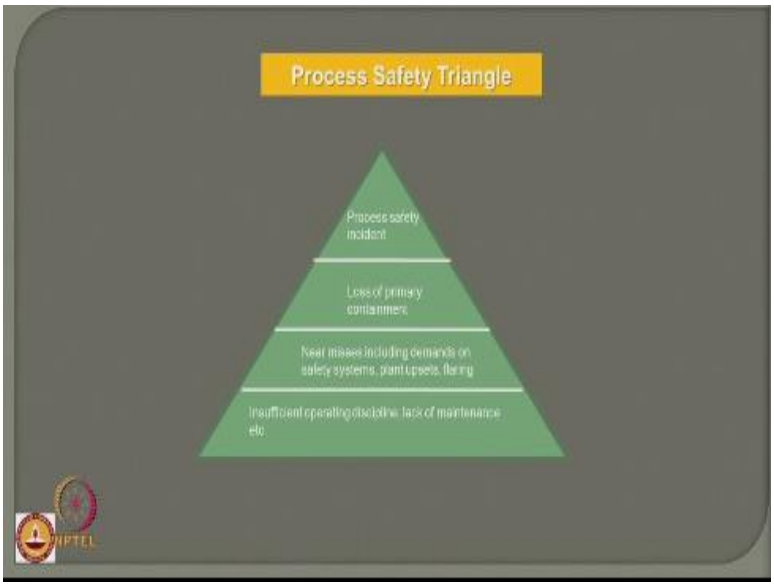

If we look at the process safety triangle it is very interesting that the base in the triangle actually grows from in sufficient operating discipline if you are able to inculcate an operating discipline or work culture and if a maintain a schedule is perfectly placed in order your pyramid will not have any base which are as wide as shown here followed by which if your operational discipline is not proper it is in sufficient, if you are maintaining schedule is not updated then near misses could have been large in number which includes demand of safety systems, plant upsets, flaring etc.

So when they are over rule that will result in what is called laws of primary containment when these three occur by enlarge obviously the process safety incident will result in which will affect both economical laws to the company or management as well as challenge of personal safety the people working on board. So process safety triangle as an apex of process safety incident whereas the base in the triangle essentially comes from the lethargic more of the king safety or practice and safety in an organization.

That is why he will see that most of the organizations are always focusing on implementing safety standards, safety practices, safety training programs very stringently so that they do not

the even a word of or coming in sufficient operating discipline a work culture in the organization. Now what are the elements of process safety, we talked about process safety what are the elements? There are different participating factors on process safety employee participation, process safety information, process hazard analysis, operating procedures, training.

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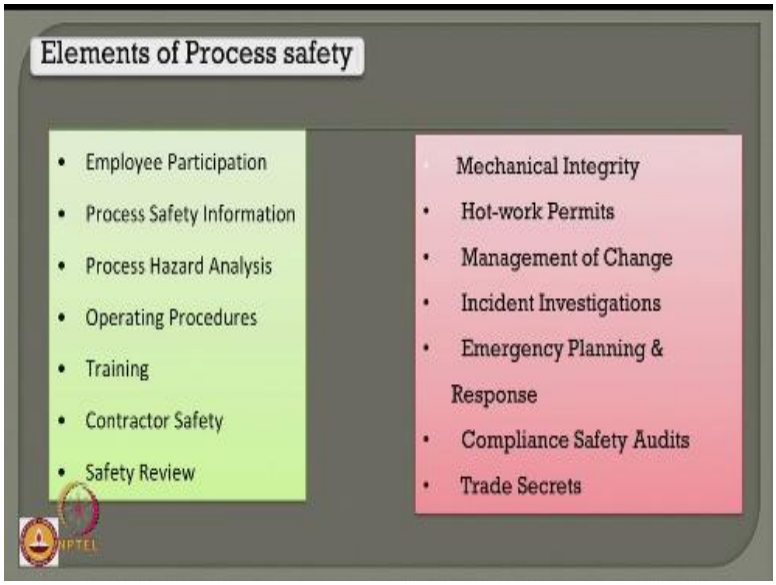

Contractor safety, safety review methodologies, mechanical integrity, hot-work permits, management of change, incident investigations, emergency response planning, compliance safety audits, and trade secrets, these are different elements which are very important vital of a process safety program.

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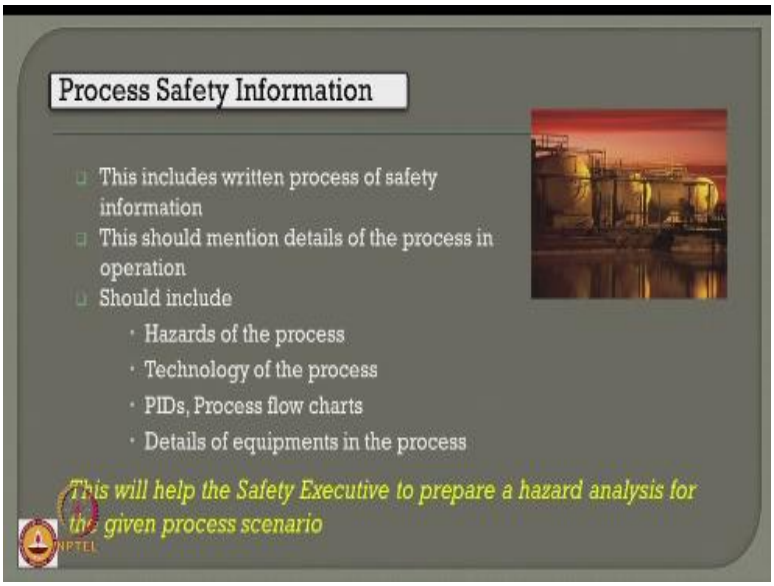

If you look at a process safety information which is a written document which process the safety information of the entire process system they should mention the details of the process in operation, it should include hazards of the process, technology of the process, process instrumentation diagrams which we call as PID's, process flow charts it should also show details of the equipments involved in the process, most importantly ladies and gentlemen they are nicely well documented process safety information will actually help the safety executive to prepared an hazard analysis for a given process scenario.

Now when you asking a question what is the use are what are the advantages of preparing an hazard analysis much in advance hazard analysis is a report which is prepared based on anticipated failure of a process safety or unsuccessful process safety, even before the progress is or the plant is commission analysis is made anticipating the failure or post related failures.

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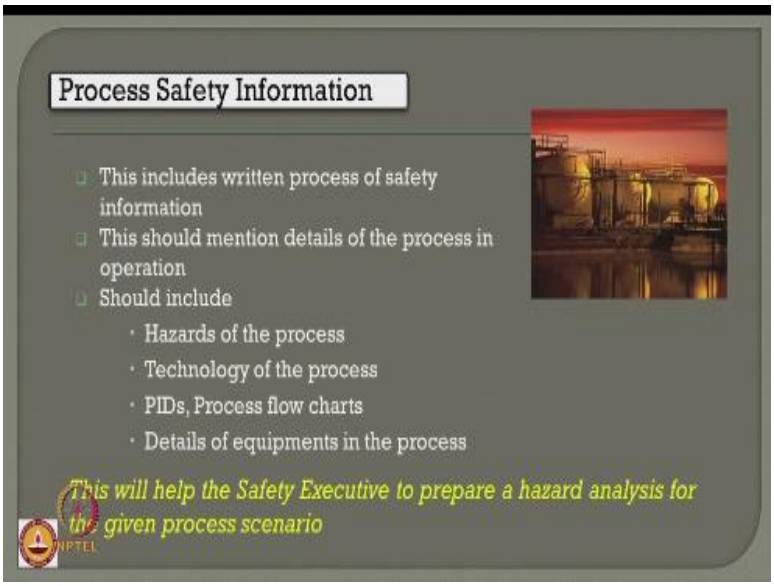

So if the process management system or the process safety information is available in detail documented manner it becomes easy for an HSE executive to easily prepare and hazard analysis report which can be then documented and studied in detail and implemented so that majority of the accidents in terms of process safety violations can at least be avoided or can be easily mitigated. One should also have very interestingly.

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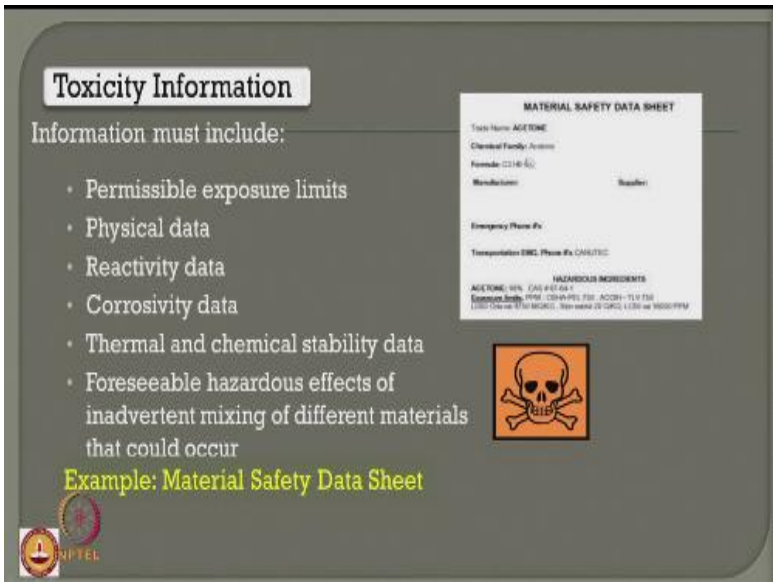

The toxicity information above the chemicals involved in the process that is very important, this information must contain permissible exposure limits of the toxi-chemical, physical data, reactivity data, corrosivity data, thermal and chemicals stability data, foreseeable hazards effects of the inadvertent mixing of different material that could occur during the process. One interesting tool which could give most of the information which is available in production unit or manufacturing units or material safety data sheet.

The typical material data sheet will look like this which contains all most of the information rated to toxicity. For example, the trade them can be acetone, it can be a powerhouse form, the chemical formation is given, it can be the temperature maintenance can be given and hazardous ingredients which is given in terms of percentage also written. So that based on this one can find out the exposure limits of this chemical then based on this one can take care of the primitive measures will in advanced.

So many cases material safety data sheet itself will give information on toxicity. Let us talk about process hazard analysis as a brief introduction in process safety management. Process

hazard evaluation or analysis must be performed using one of the following methods it can be what if preparation of check list hazard and operability studies.

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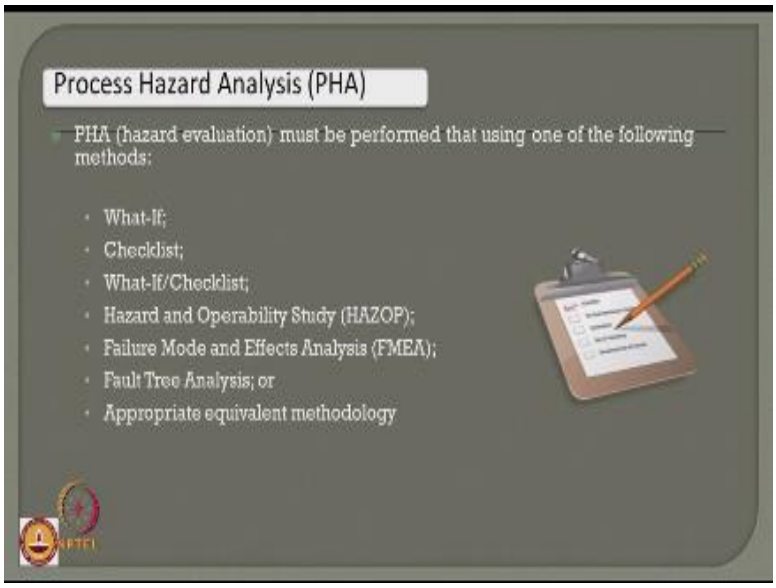

Failure mode and effect analysis, fault tree analysis and or appropriate equivalent methodology. There are many methods based on which you can do probabilistic hazard evaluation. As we showed you in the previous slides safety integrity level studies.

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What we call SIL studies are important.

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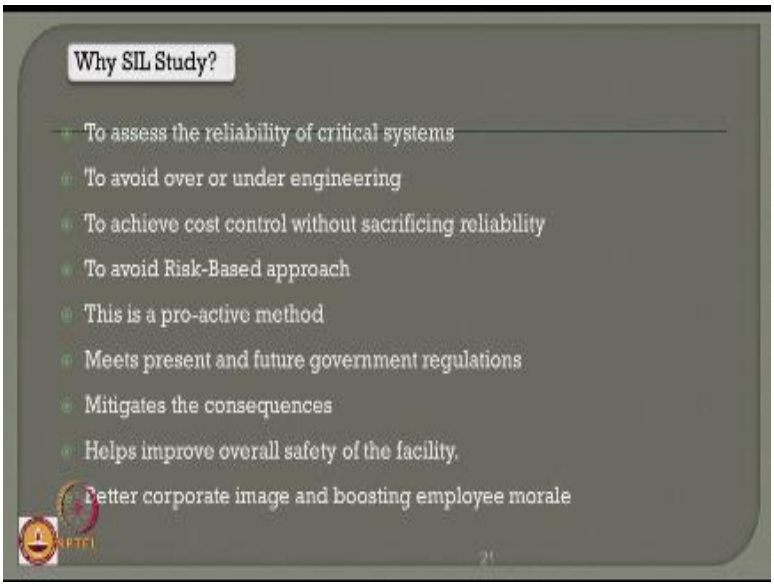

Why SIL study is important? SIL studies will give you a tool to access reliability of critical systems. It will help you to avoid over or under engineering, it will enable you to achieve cost control without sacrificing reliability, it will help you to avoid risk based approach, this is a proactive method, meets present and future government regulations in most of the countries, it helps you to mitigate the consequences, it helps to improve overall safety of the production facility, it better corporate image and boosting employee morale working in the industry.

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What are the different safety standards practiced in different industries. IEC 61511 is the safety standard applicable to process industry, IEC 61513 is applicable in nuclear industry, IEC 62061 a safety about the equipments in machinery there are many more further standard is available in this line we are interested mostly on the basic standard IEC 61508 which is applicable to all industries and IEC 61511 which is purely applicable to process industries like oil and gas production industries.

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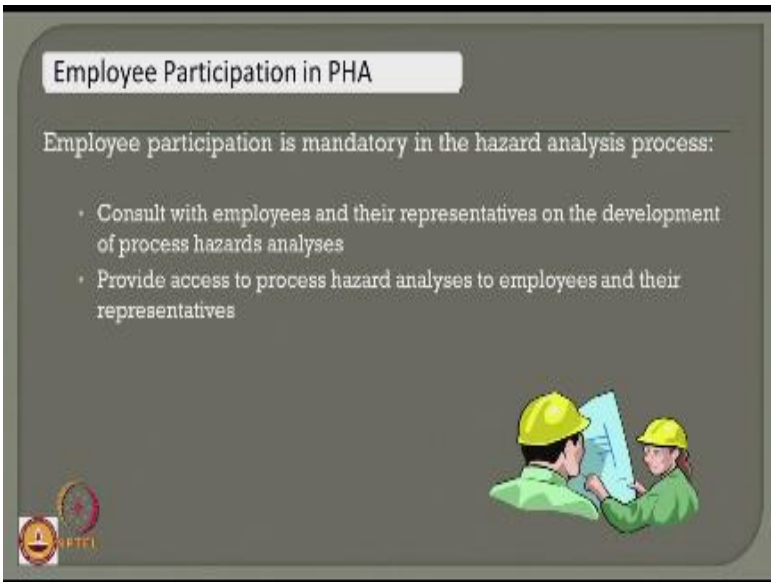

Let us ask a question, what is the employee participation in process hazard analysis? Employee participation is mandatory if you really wanted to conduct a successful hazard analysis process. You must consult with your employees and their representatives on the development of process hazards analyses. It provides access to process hazard analyses to employees and their representatives.

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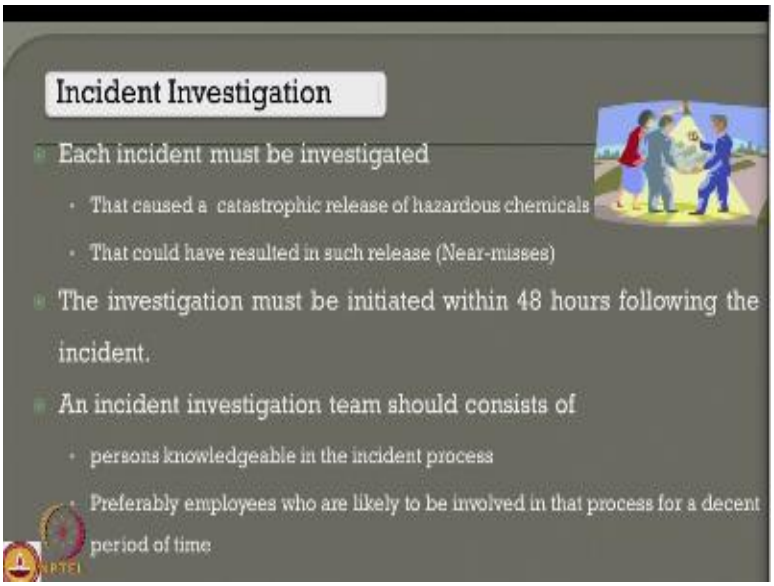

Incident investigation is a very important item in process safety each incident must be investigated, the incidents that cause a catastrophic release of hazardous chemicals or that could have resulted in such releases technically this is what we call as near misses. The investigation must be initiated within 48 hours following the incident, an incident investigation team should consist of persons knowledgeable in the incident process, preferably employees who are likely involved in that process for a decent period of time, because they will try to provide you the first hand information and possible reasons causes for such accidents which has been initiated.

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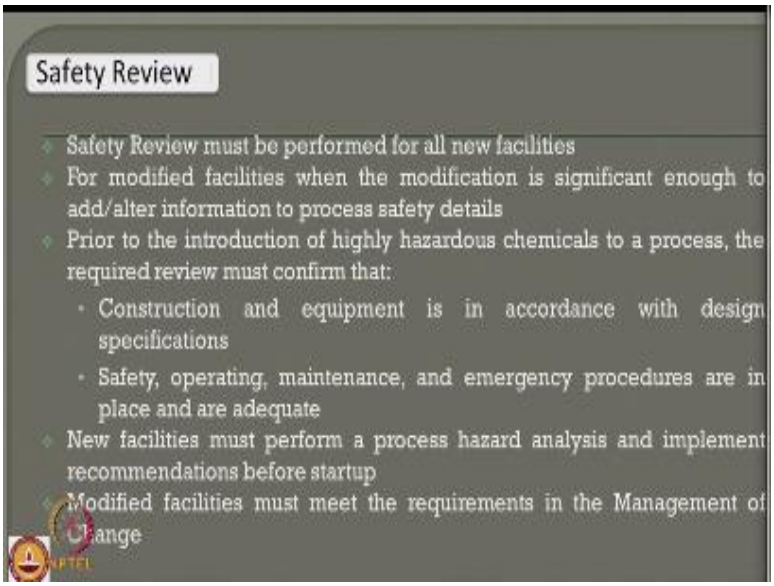

A thorough safety review program is also very important, safety review must be performed to all new facilities, it should also perform for modified facilities when the modification and significant enough to add or alter information to process safety details, prior to introduction of highly hazardous chemical to a process safety review program must be implemented and this should conform the construction and equipment is in accordance with the design specifications safety, operating, maintenance, and emergency procedures are in place and they are found to be adequate.

New facilities of course must perform a process hazard analysis and implement recommendations before start of any new project, modifying facilities must be the requirement in the management of change.

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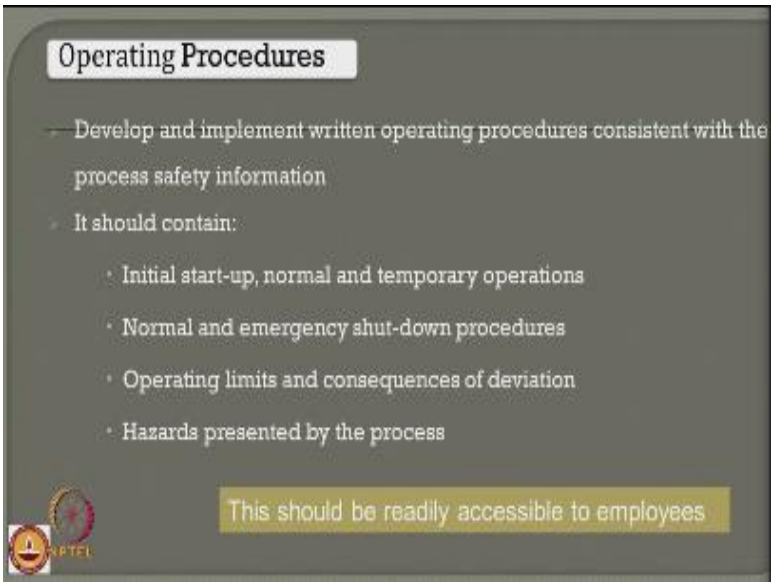

When we talk about process safety operating procedures becomes very important in critical to have a successful process safety implementation. Develop and implement return operating procedures consistent with the process safety information, this information or the data should contain initial start up, normal, and temporary operations of any equipment machinery, normal and emergency shutdown procedures are applicable to that machinery, operating limitations and consequences of deviation, hazards present by the process.

These are all to be a well documented and most importantly ladies and gentlemen try to circulate this document and make it readily accessible to all employees of our organization not necessarily only safety executives, every employee of our company should be aware of this operating procedure of every plant and equipment involved in the company.

The major flaw which generally foresee in such kind of accidents in oil and gas industry is work permit violations. Let us talk about hot work permit, hot work permit is a very important terminology used is oil and gas industry let us see what is that, the employer must issue hot work permit for a hot work operations conducted on or near.

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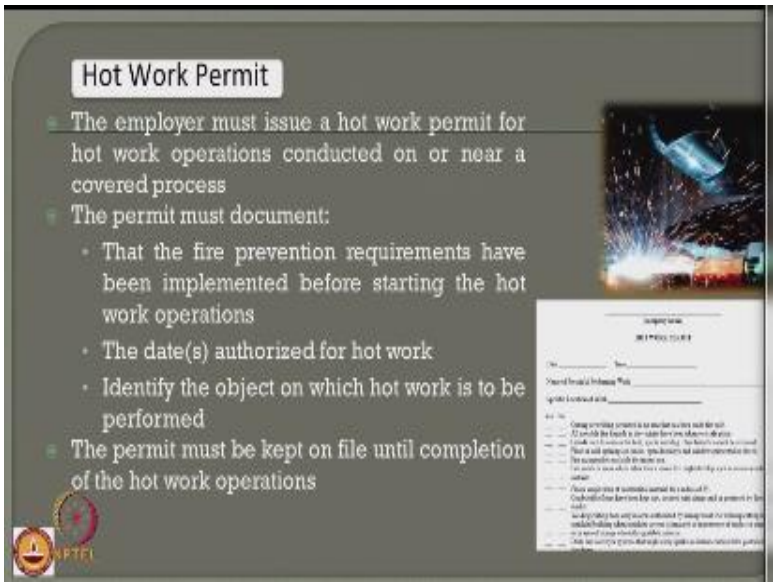

Any covered process so for doing any hot work you must get a return permission what we call hot work permit a typical hot work permit sheet is shown on the right side of you slide. The permit must contain that the fire prevention requirements have been implemented before starting the hot work operations, the dates authorized to hot work or mention very deliberately or in the report or in the permit. And it identifies object on which hot work is to be carried out categorically. The permit must be kept on file until completion of hot work operations you should not misplays the record.

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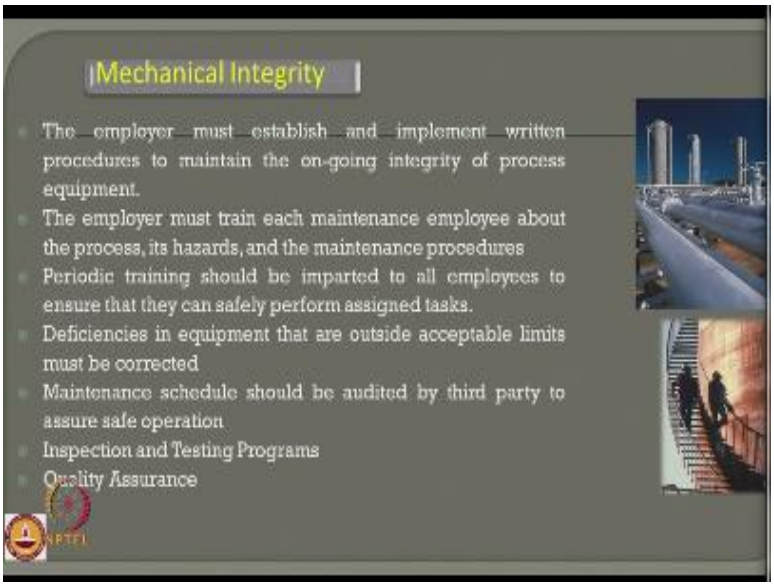

The success problem which generally comes or which challenges process safety is mechanical integrity that is integrity hot dependency of machinery when they are required to perform, the employers must establish an implement written procedures to maintain the ongoing integrity of any process equipment, the employer must train each maintenance employee about the process, its hazard, and the maintenance procedures of every equipment involved in the process.

Periodic training should be implemented to all employees to ensure that they can safely perform the same tasks related to man machine interface, deficiencies and equipment that are outside acceptable limits must be corrected immediately, maintenance schedule should be audited by a third party to assure safe operation, inspection and testing program is very mandatory because these programs will try to bring out the Lacuna in terms of improper maintenance of every equipment practice in the process industry.

Of course quality assurance is very important because you have got adored to the quality maintenance program if you really wanted to maintain your quality standards instead of safety as well as industries standard as applicable to oil and gas industries.

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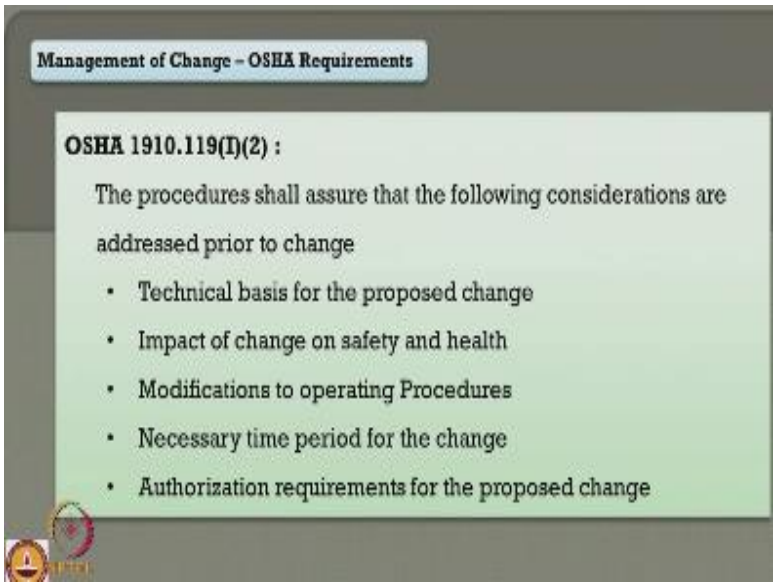

Once are standard we talks about management of change is OSHA, OSHA 1910, 119(1)(2) talks about the procedures that shall assure the following considerations or addressed prior to change. Before you adapting any change management you must understand the following, what is the technical basis for the propose change, what is the impact of the change on safety and health, what are the modifications which results from this to the operating procedures, what is the necessary time period for the change and authorization requirements for the proposed change.

So you cannot simply change a management from one to another set of people unless or otherwise these questions are thoroughly answered deliberated and accepted by the high level management as well as the employee working in the industry. Followed by which is EPR which is emergency planning and response requirements and emergency action plan must be available it should be developed to ensure safe evacuation of employees.

Plan must address all foreseeable emergency situations like fire, weather, chemical release etc, it should include the action plan.

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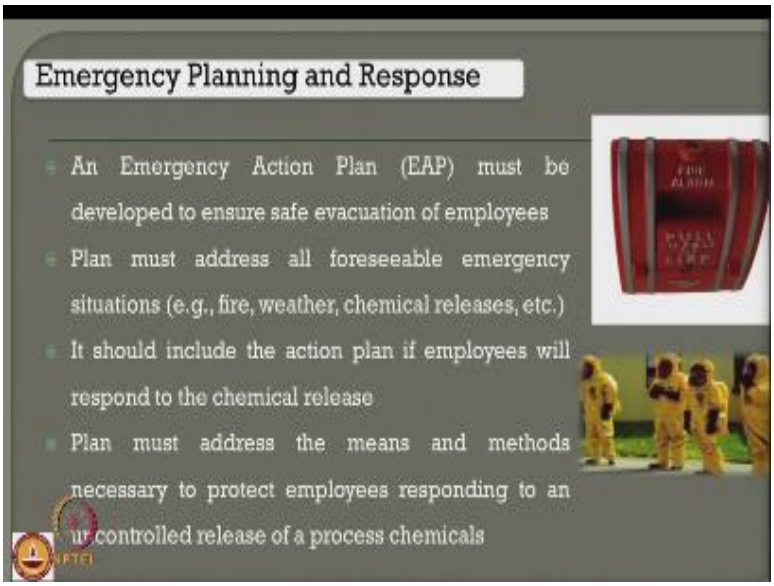

If employees will response to a sudden chemical release, plan must address the means and methods that are necessary to protect the employees responding to an uncontrolled release of process chemicals.

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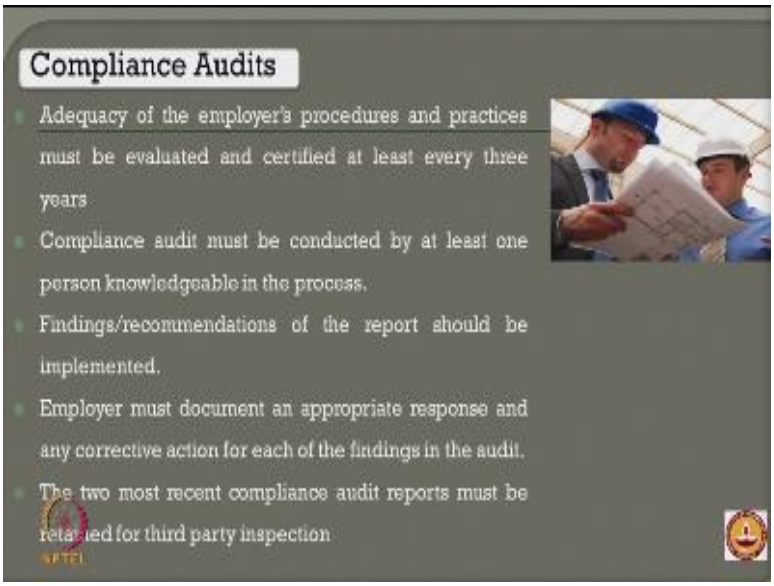

More importantly though your company practiced safety regulations in the process as well as design one have got to be audited for its compliance. Let us see what are compliance audits adequacy of the employers procedure and practices must be evaluated and instructed it should be certified with the third party at every three years period interval, compliance audit must be conducted by at least one person knowledgeable in the process.

Findings and recommendation of this report should be implemented instantaneously, employer therefore must document and appropriate response on any corrective action taken by the employer or the employer based on the findings of this audit, two most reason compliance audit reports must be retain for third party inspection as in when demanded.

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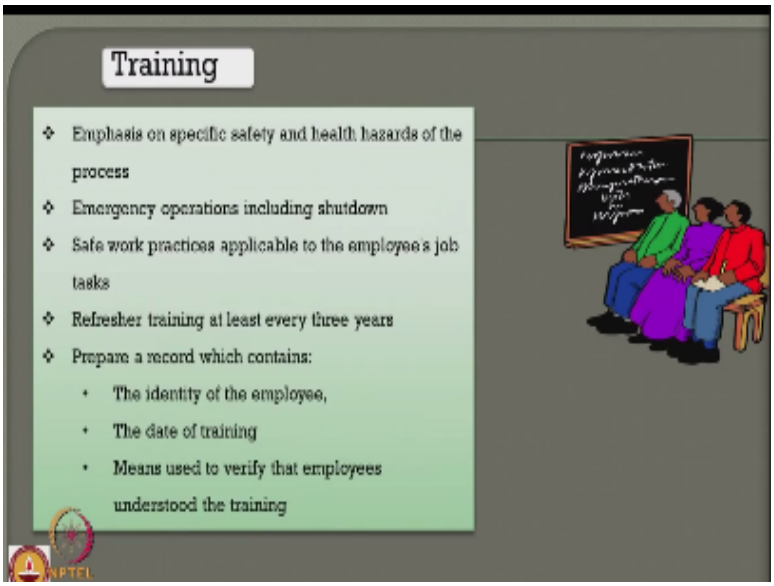

As we understand personal safety is an inherent part of process safety training becomes a key word for personal safety success the emphasis on specific safety and health hazards of the process should be implemented in any training program, emergency operations including shutdown should be talk to the people, safe work practices applicable to the employees job tasks should be educated, refresh a training at least every three years must be conducted.

You have to prepare a record which contains the identity of the employee, the date of training, the means used to verify that employee has understood a training this very important part of the training program. Most of the companies do recruit people for training, send them for training third party places but they fail to understand the implement of mechanism by which they can that ascertain that the employees have understood a training capsule completely and they are acquired the sufficient knowledge requested and demanded for them or demanded from them for the work culture where the production is being involved.

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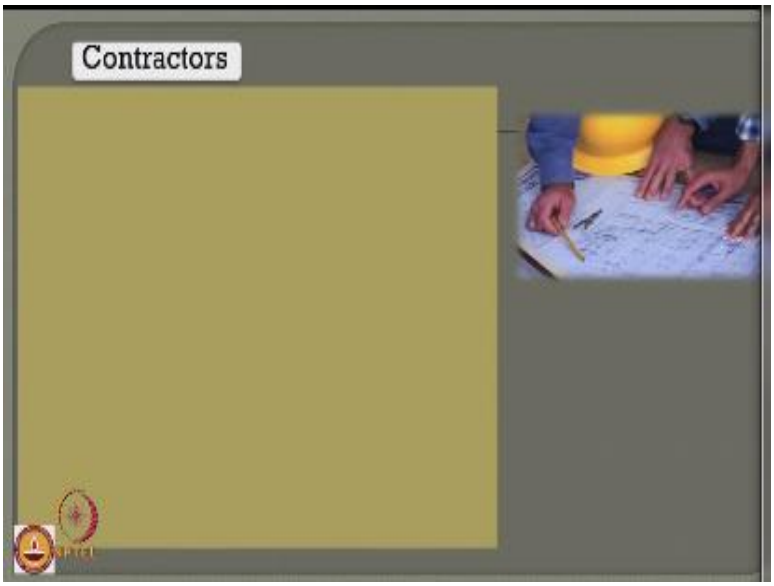

The major emphasis is now given on contractors because contractors are third party people who are not employee of the company but hired by the company for executing specialize kind of jobs. So now let us see how process safety can be applicable to contractors.

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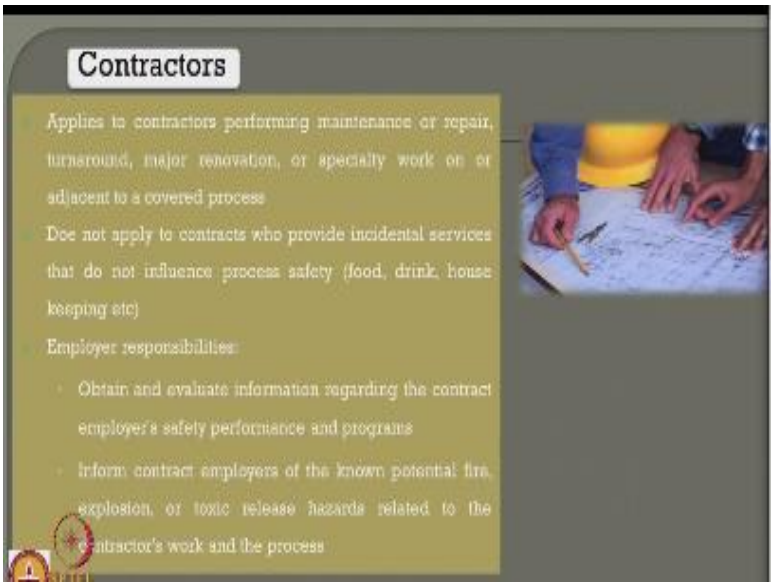

It applies to contractors performing maintenance or repair, turn around major renovation or specialty works on or adjacent are covered process. However, it does not apply to contractor who provides instant of services like water supply, food, drink, housekeeping, etc. The employers responsibilities are the following one has got to obtain and evaluate information regarding the contract employers safety performance and programs.

You cannot employ a contractor just like that you must ascertain the safety programs followed by the contractor before he is being deployed, inform the contract employers of the known potential fire, explosion toxic release hazards related to the contractors work and the process much in advance. So do not try to employ a contractor personal without intimating him what are hazard substances which he is working with. Very importantly trade secrets people generally think the trade secrets highly pretended.

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They should not be exchange or they should not be made available in public domain. There is a small difference of opinion here let us try what is the trade secret, employers must make trade secret information available to the person responsible to whom not all of them but the person who compiles the process safety information should be available to know the trade secret information developing process hazard analysis and operating procedures, the person or the team responsible to conduct incident investigations emergency planning and response operations and who follows the complaints audits.

These personal or these set of people or these team of people should be made available to understand the trade secret information of the company thoroughly. However, confidentially agreements can be permitted, so that the trade secret is not leaked of to the third party which can damage the repetition of the organization.

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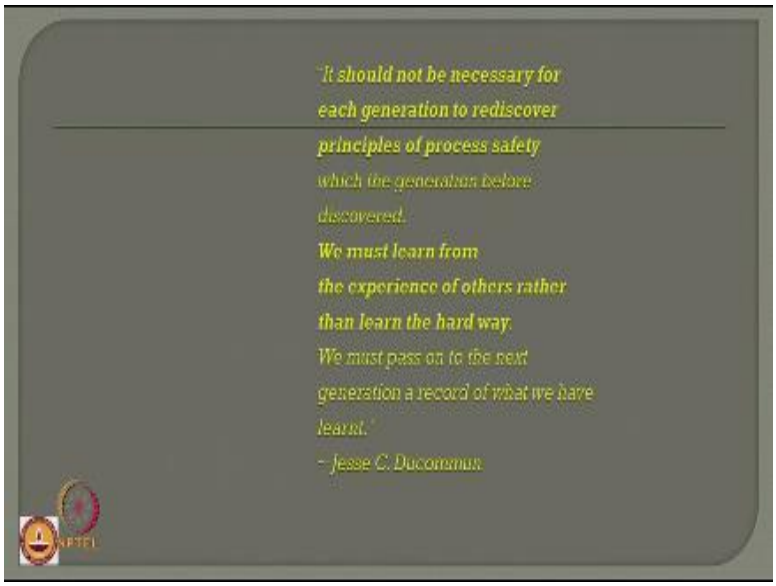

Ladies and gentlemen it is very important to understand they seeing it should not be necessary for any generation to rediscover principles of process safety which the generation before has already discovered. We must learn from the experience of others rather than learning at the hard way. Of course, we must pass on this to the next generation in the form of a record what we have learnt. Thank you very much.

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