Health, Safety and Environmental Management in Offshore and Petroleum Engineering

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Module – 03
Accident Modeling, Risk Assessment and Management
Lecture – 20
Safety Practices for Confined Spaces – II

Welcome friends to the twentieth lecture in module three, where we will continue to discuss the safety practices for confined spaces – for confined spaces.

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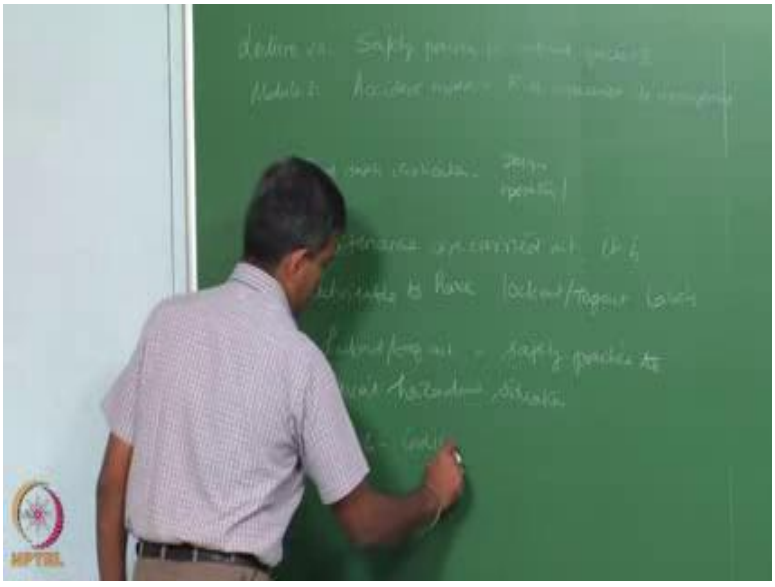

This is the twentieth lecture in module three. In module three, we are focusing on accident modeling, risk assessment and management. In the last lecture, we discussed about some important tag points, which are essentially necessary for good safety implication in terms of design and in terms of operation.

Now, we will continue to discuss this further. When you start doing some maintenance operations; maintenance operations are done or carried out essentially in process plants in the hot line. It is a good practice always to have something called lockout or tagout.

Now what is a lockout or a tagout. Actually lockout or a tagout is a system or a scheme, which is generally practiced to avoid hazardous situations. It is a safety practice to avoid hazardous situations. What do you do in case of a lockout or a tagout? They are actually labels, which are indicative for personnel to warn that.

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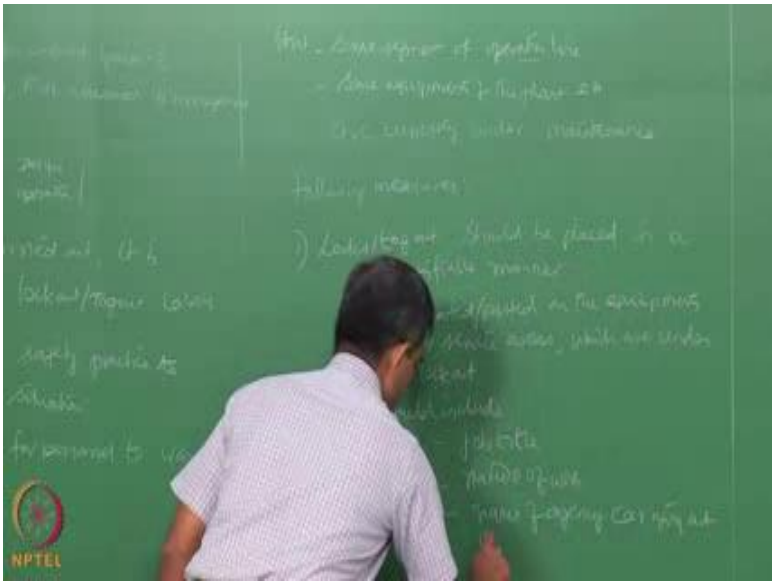

Some segment of operation line, are some equipments of the plant, etcetera are out of service and then maintained. Now, it is very important the rest of the personnel, who are working on board should also be thoroughly informed about the lock out program, because any process or operational line is branched out and connected to many other part of the process line.

By mistake, if the process line is charged or discharged or electrified or unelectrified, pressurized or depressurized while lockout or tagout is happening; then, it can cause a very serious kind of accidents, which are not uncommon in any process industry. Then, what do we do? What are the following measures? So, following measures are important. One – the locks and tagouts should be placed in an identifiable manner – should be placed in an identifiable manner; should be located or pasted on the equipments or service areas, which are under lockout. Now, these tags should include job title; I mean, what is the nature of work going on; name of the agency carrying out.

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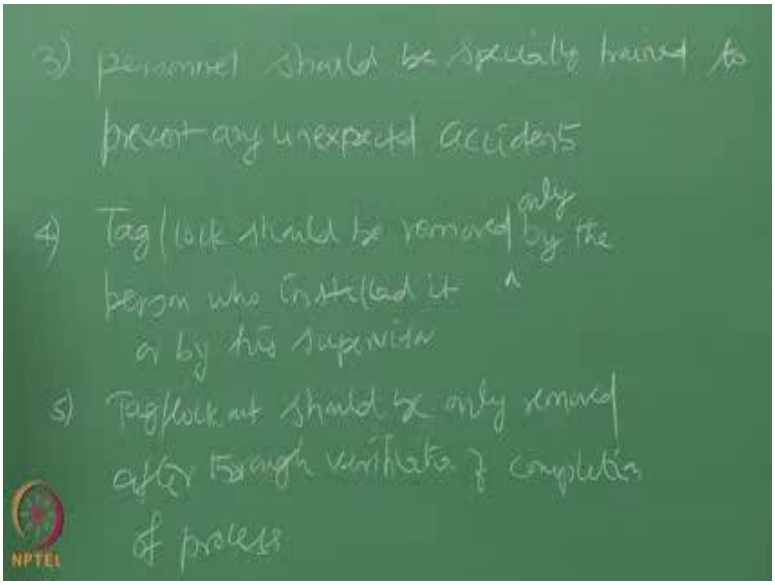

Name and details of the person responsible; and, emergency numbers, etcetera. All these information should be placed on the tags, which are located at the site itself. Most importantly, personnel should be trained to work on tag areas; should be specially trained to prevent any unexpected accidents. More importantly, the lock or the tag should be removed by the person, who installed it. In fact, we should say only by the person, who installed it; nobody else is authorized to remove it or maybe supervisor. Tag should be only removed after thorough verification of completion of process.

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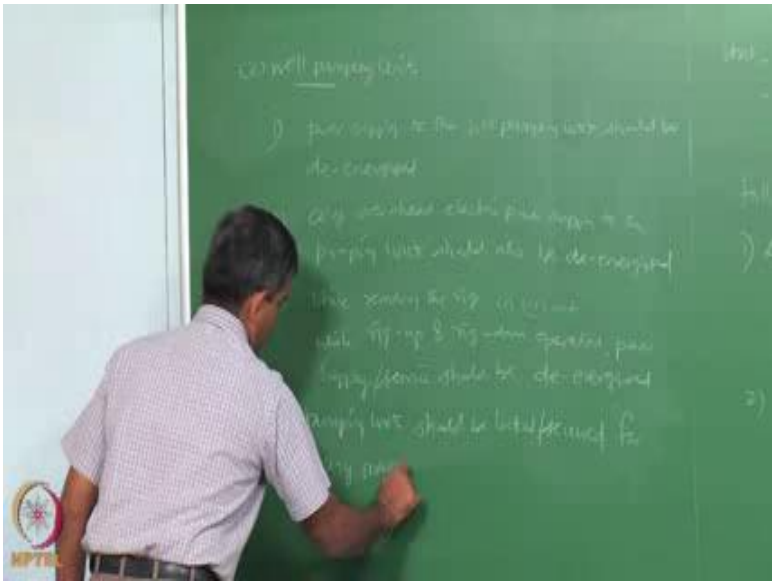

The next area in a confined space, where accidents are very common – it should be avoided as a good safety practices – well pumping units. Interestingly, the power supply to the well pumping units should be de-energized and locked and tagged out to eliminate potential hazards. So, the first option for safety practice could be power supply to the well pumping units should be de-energized in case of lockout. If you have any overhead electric power, it should be also de-energized any overhead electric power supply to the pumping units; should also be de-energized; power service should be de-energized while removing the rig in or out. So, while removing the rig – drilling rig in or out, while rig up and rig down operation, power supply or power service should be de-energized. During well serving operation, pumping units should be secured to prevent unintended movement; that is important.

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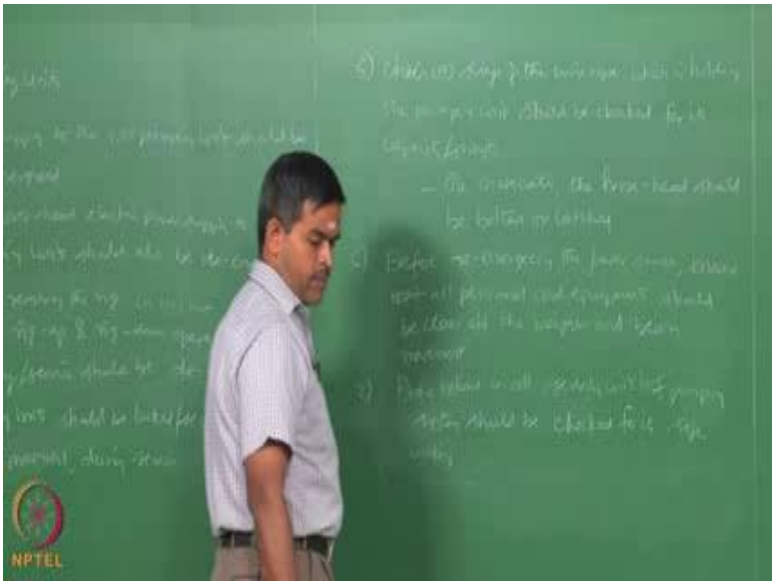

Pumping units should be locked or let us say secured for any movement during servicing chain or slings of the wire rope, which is holding the pumping unit should be checked for its capacity, that is, strength, so that the sling or the chain should not be cut. Further, it should also be used to handle the horse-head if removal or the installation operations are necessary.

On installation, the horse-head should be bolted or latched properly according to the manufacture's specification. Most important thing before re-energizing the power source, maybe after the repair work is completed, one should ensure that, all personnel who have been deployed for the repair work and equipments, which have been used for the repair work should be clear off the weight and the beam movement. Brake systems on all pumping units in service should be properly maintained; should be checked for its safe working. After completing the well service operation, all pumping unit guards and enclosed guards should be re-installed prior to the startup of the well.

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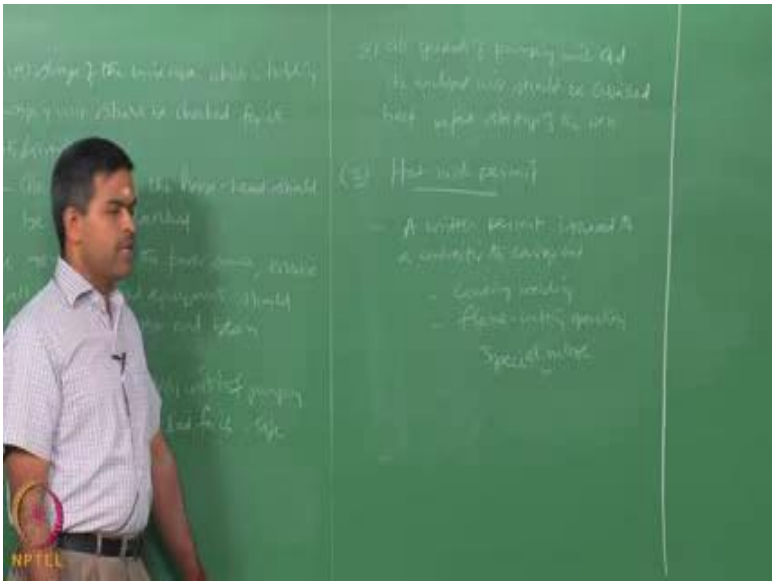

So, all guards of pumping unit and the enclosing units should be installed back before startup of the well. The third issue, which is also going to be important in terms of safe practices, is hot work permit. Let us try to understand what do we mean by hot work permit. It is actually a written document or written permit, which is issued to a contractor to carry out covering welding, flame cutting operations, etcetera as special kind of jobs of special nature. In general, if one needs to actually issue a hot work permit, it should be issued by an authorized person along with the following documents.

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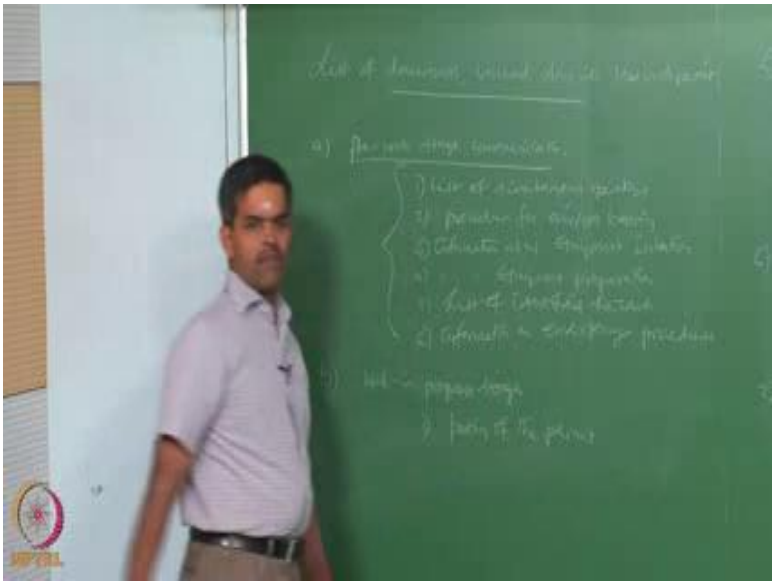

So, let us put a list of documents required to be issued along with hot work permit. So, list of documents generally issued along with hot work permit a – something called pre-work stage communication; it should address the following; it should address the list of simultaneous operations – operations. It should also in include the procedure for air gas testing. It should have information about equipment isolation. It should have (Refer Time: 18:34) information about equipment preparation. It should also have list of identified hazards during operation. Of course, it should have information on emergency procedures. So, all should be included as a part of the work – hot work permit, which we call as pre-work stage communication. Having said this, the next stage could be work in progress stage. In this stage, one should give information about the posting of the permit; again procedure about detail procedure on air and gas testing.

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Details about personal protection devices and systems; details about the fire watch; and of course, details about special procedures and precautions, which are essentially to be followed during the hot work stage. Once the hot work is completed, obviously, the next stage could be return to service stage. So, interestingly, at this stage, the supervisor should hold a pre-job meeting in which with the crew of course – with the crew in which he will explain or he will review the responsibilities of the crew for the operation to be performed. Interestingly, during the written to service stage, welding and flame cutting shall not be permitted closed to flammable liquids; no welding cutting at locations closer to flammable liquids, accumulation of crude oil. These are the locations, which you should avoid the hot work permit escaping gas vents.

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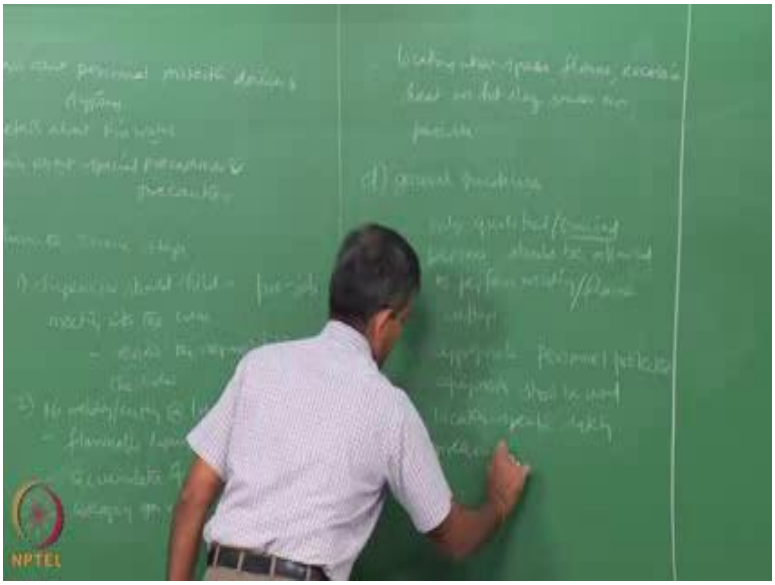

Locations where sparks, flame, excessive heat or hot slag sources are possible. So, these points one should not use the hot work operations at all; one should be very careful in doing them. General guidelines in case of issue of hot work permit. Interestingly, only qualified and trained persons should be allowed to perform welding or flame cutting – both are very serious issues, because many near-miss events having reported in many process industries because of negligence of proper training imparted to people who do this operation especially on hot lines.

Especially when you are trying to do this kind of welding on pipelines or equipments, where hydrocarbon and hazardous materials are contained; then you have got to be very very careful. One should also use appropriate personal protective equipments shall be used. If the object to be cut or welded cannot readily be moved; then, all moveable pre-hazards in the near vicinity shall be then isolated to a separate place. If they cannot be taken to a separate safe place, then guards should be used to confine the heat, spark and the slag to protect the spread of these immoveable pre-hazards to other locations. So, location specific safety measures need to be followed.

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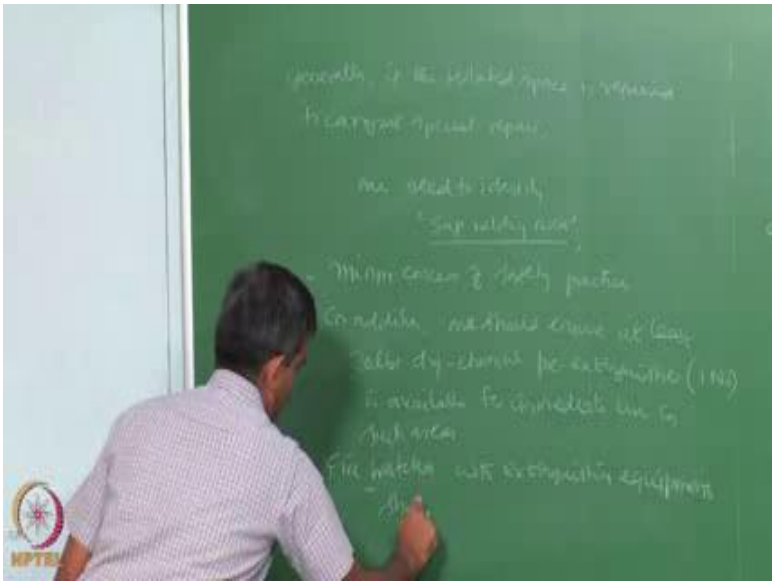

In case of this kind of situation, one needs to declare what we call self welding area. So, generally, if the isolated space is required to carry out let us say special operations – special repair; then, one need to identify what we call safe welding area. And, these areas should be away from all those constraints of presence of flammable liquid, accumulation of crude oil, escape vents of gases and location such as flames, sparks should be avoided completely.

So, therefore, in such areas welding and flame cutting operations can be conducted with minimal concern. So, if you are able to declare a safe welding area; then, there will be a minimum concern of safety violation or let us say safety practices. So, that becomes comfortable for a person to carryout any operations like welding, flame cutting, etcetera, because ignition source for flammable hydrocarbons or combustible material may be highly or most probably absent in such declared welding areas. In addition to that one should ensure at least 30 pound dry chemical pre-extinguisher – at least one number is available for immediate use in such areas. That has to be ensured. Fire watches with extinguishing equipments shall be required whenever welding or cutting operation is performed in locations other than safe welding area being declared. A pre-watch shall be maintained for at least one hour after the completion of welding.

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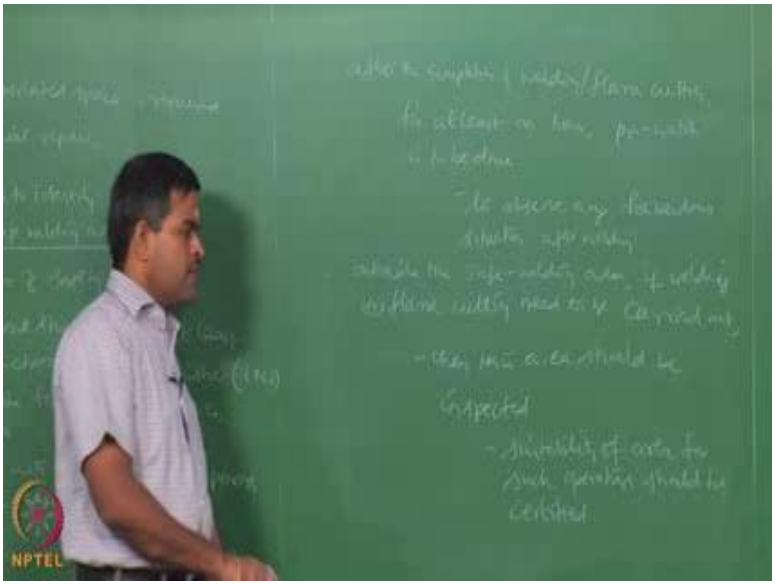

After the completion of welding or let us say flame cutting for at least an hour here pre-watch is to be carried out to observe any hazardous situation after welding. That is what we call pre-watch inspection. Before cutting a welding is permitted on a hot line in areas outside a designated safe welding area; the area should be inspected outside the safe welding areas if welding or flame cutting need to be carried out. Then, this area should be inspected.

And, suitability of the area for such operation should be certified by of course, authorized personnel. One should also list the precautions to be followed while granting such authorizations for carrying out welding or flame cutting in areas, which are not designated as safe welding areas. So, very importantly, one has got to stringently follow the safety practices especially in confined work spaces if you really want to avoid a hazardous situation in oil and industry. You know most of these practices what we are discussing now are only a training, are only a basic level knowledge, which is to be imparted to people working on both.

Interestingly and unfortunately friends, we all agree and we know accidents do happen when such minor points or minor instructions are over sighted. People work on slightly an improved level of degree of confidence, which is a thing that over sighting will not

harm them. So, therefore, especially in offshore industry, these practices are documented and written very well, so that any authorized personnel, who issues such permits or declares work areas as safe for welding, etcetera follows these procedures as a check list very thoroughly; inspect the place with this team.

Then, authorize a specific operation to be carried out in the designated areas, because accident generally are reported or by and large near-miss events are reported only when such minor issues are violated or over sighted by the employee or the personnel, who is performing the operation. It does not mean that he is not trained, he is not qualified; it may be a work fatigue, which enforces him to violate such regulations; it may be a time-bound work, which is has to complete before a given schedule of time, so that the operation may not be sustained for a longer time. It may be due to climate and weather conditions, which is also compelling him to avoid or to skip certain instructions or certain guidelines offered to him before the work has to be started.

And friends, very interestingly, under my experience, I have observed this – in case of post inspection when the work is being completed before the system is re-energized for commissioning back into service, lot of violations are over sighted and that creates lot of near-miss or even accident sometime, which are very catastrophic. People generally mistake this as an error during the service time or during the maintenance; it is not so.

Actually, it is violation of post inspection of the serviced area, which is to be thoroughly investigated and checked for any hazards presence in the given area before the system is clear or the area is cleared for a back to service operation. People generally rule it out or they do it very fast or they over sighted certain important points, which results in a very dangerous situation at the end of the operation. So, one has got to be very careful in following all these safety practices, which are actually very well written and documented especially and very stringently followed fortunately in oil and gas industry sector. So, cutting and welding should not be permitted in following situations.

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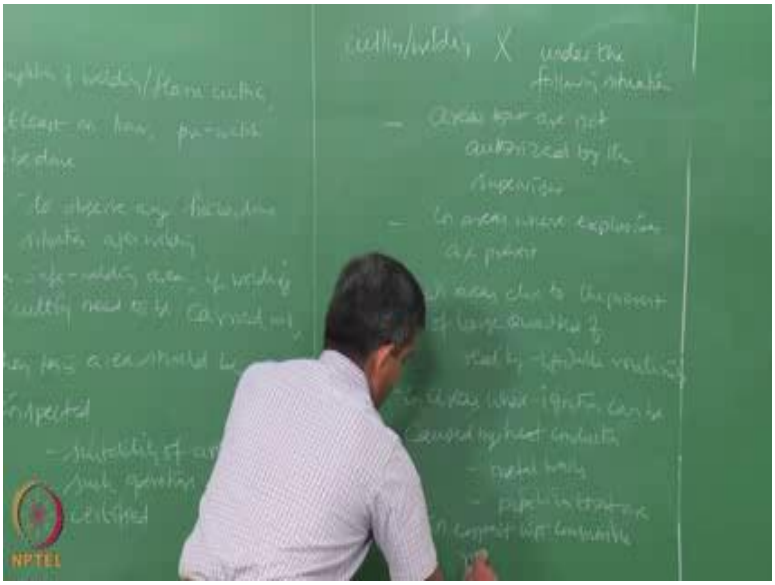

Let us see what are these areas – should not be permitted under the following conditions; areas that are not authorized by the supervisor. In the presence of explosives, you should not do welding and cutting – in areas where explosives are present; in areas near to storage of large quantities of exposed readily ignitable materials – in areas close to the presence of large quantities of readily ignitable materials, one should not perform welding and flame cutting. Areas where ignition can be caused by heat conduction – where ignition can be caused by heat conduction; for example, metal walls, pipelines that are in contact with combustible material in the other side; pipelines that are in contact with combustible material in the other side. Interestingly, one needs to also exercise control on welding fumes and ventilation.

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So, during welding operation, toxicity depends on the composition and concentration of the fumes, and concentration of the fumes. Also interestingly, one need to identify set of critical equipments. Now, the question comes – what are called critical equipments? Critical equipments is defined as one of that is essential in preventing the occurrence or consequence of an uncontrolled event. Critical equipments are those, which are useful or which are essential to prevent or even mitigate – mitigate the occurrence of undesired event. Examples, for critical equipments, pressure vessels, pressure relief valves, compressors, alarms, interlocks and emergency shutdown systems.

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Now, critical equipments should be periodically inspected and tested. All critical equipments should be periodically inspected and tested for its design capacity; that is very very important. Testing does not mean simply service them and do not test them while operating them; it should be tested on operating conditions; very very important. When a critical equipment is removed – when a critical equipment is removed let us say for servicing or replacement; whatever may be the reason, why you want to remove this, a program should be in place indicating what are the equivalent protection system available, period of removal and person responsible. This detail should be available when you especially remove critical equipment from the service area.

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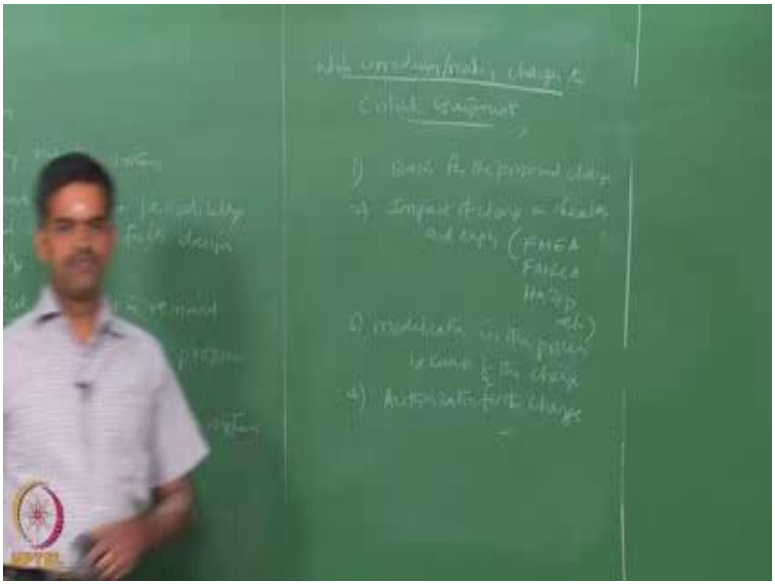

Now, you want to change the critical equipment, for example, you want to implement some changes to this; then? While introducing or making changes to critical equipments, following should be thoroughly followed. One – you should provide information on basis for the proposed change. Why do you want to change? Two – impact of change on health and safety. How can you do this? You can conduct an F M E A and F M E C A and HAZOP, etcetera. What would be the modification in the process because of the changing equipment should be highlighted. What should be the authorization, who has authorized it, should be informed.

So, friends, in this lecture, we discussed about safety practices both in design and essentially more on operational practices, which are essentially followed as guidelines in oil and gas sector, so that even an hazardous situation, which can arise because of over sighting, because of work load fatigue, because of negligence, because of improper training imparted to people, lack of knowledge, lack of experience, lack of emergency handling capacity. It can be avoided if you really follow all these procedures; they are very well documented in international practices, which are stringently followed in oil and gas sector.

Friends, we all know a maximum of few may be aware of a few of them; but, it is very interesting for us to document them, once again understand them; then, inculcate the habit of this reading to all the people on board. So, every individual working on board on oil and gas sector knows about all the safety practices, which are essentially tips and guidelines for a better and safe operation in all oil and gas sector.

Thank you very much.