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NPTEL ONLINE CERTIFICATION COURSE

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

Module 1 Safety assurance and assessment

This is the second lecture on health safety and environmental management applied to offshore and petroleum engineering HSE program. We are talking about lectures on module 1. Module 1 is focusing on safety assurance and assessment, we are talking about lecture 2 where I am going to continue introduction to safety as we discussed in the last lecture. I hope you have followed the last lecture there is continue task of question what do we understand by safety the perspective of oil and gas industries.

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An offshore safety engineer needs to understand

- Hazard nature of offshore environment
- Study on safety observation systems
- Risk assessment methods
- Tasks that require Permit to Work
- Personnel responsibilities in Asset integrity
- Controlling use of hazard substances offshore
- Knowledge and practice of working at height
- Mechanical lifting activities
- Emergency Response methods

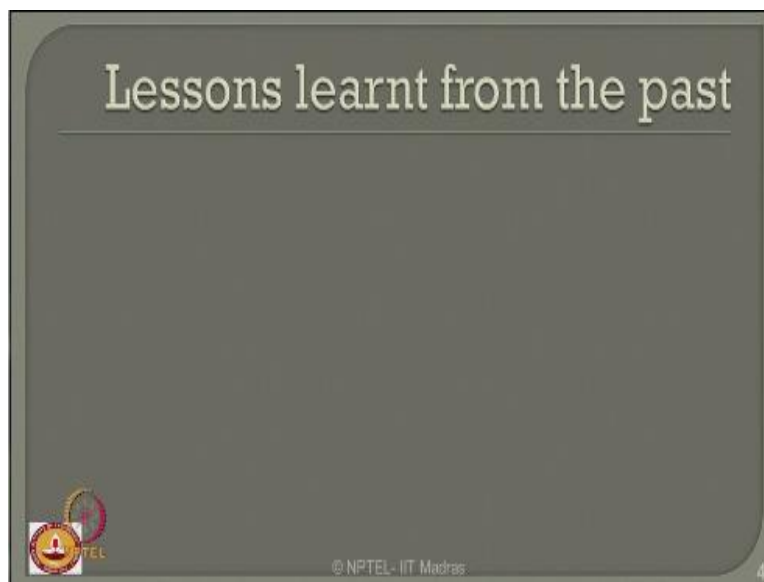
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Let us continue introduction to safety we always understood that an offshore safety engineer needs to understand the following. The work environment what is he working is hazardous in nature he needs to study on safety observation systems carefully, he must understand risk

assessment methods and models, he must perform tasks that require permit to work and he must do personal responsibilities in asset integrity with enthusiasm.

He must participate in controlling user hazards substances offshore because they can result in catastrophic accidents, he must possess a very good knowledge and practice a working at height towards cranes of different capacity and different boom lengths are being deploy in offshore industry, he must understand very carefully the mechanical lifting devices their limitations etc, and he must undergo thoroughly the emergency response mechanisms and methods available onshore so that he can practice them in case of emergency.

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Now more interestingly in safety perspective generally the education of safety is given to people as based on the lessons learnt from the past, every accident which is created cost happened are situation created all are unfortunate, but we learn lot of lessons from these kinds of accidents. Let us quickly see what are the lessons we learnt from the past.

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- 6th July 1988
- Piper Alpha. North Sea
- 167 Killed
- Fire




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On 6th July 1988 we have seen there is a piper alpha disaster happen in North Sea, 167 people killed and they essentially resulted in large fire.

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- 27th Mar 1980
- Alexander Kielland, Scotland/Norway
- All 123 killed
- Bracing Collapsed



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The second accident which could recollect is on 27th March 1980 which happened in Alexander Kielland, Scotland/Norway about 123 people all of them working on boat were killed and the bracing essentially collapsed it is a structural failure.

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The slide features a dark grey background with a white border. On the left, there is a bulleted list of text. The first three items are in white, and the last two are in red. To the right of the text is a photograph of an offshore oil rig in a stormy sea. In the bottom left corner, there is a small circular logo with a lamp and the word 'NPTEL'. In the bottom center, there is a copyright notice, and in the bottom right corner, there is a small number '7'.

- ◉ 14th Feb 1982
- ◉ Ocean Ranger
- ◉ All 84 killed
- ◉ Waves > 20m

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The third accident which comes to mind is on 14th February 1982 it is on Ocean Ranger all 84 people working on boat were killed and the result was essentially cost by the waves exceeding phenomenal height of about 20m. So it is a natural reason or environmental causes which resulted in this accident.

(Refer Slide Time: 03:32)

- ◉ 20th March 2001
- ◉ Patrobras, Brazil
- ◉ 10 Killed
- ◉ Powerful blast and sinking



The photograph shows the Patrobras offshore oil platform, a large, complex structure with multiple levels and a tall derrick. The platform is surrounded by a large amount of debris, including twisted metal and other structural components, indicating a major disaster. The platform is situated in the middle of the ocean, with a small boat visible in the distance. The sky is clear and blue.

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The other accident is interestingly happened on 20th March 2001 Patrobras, Brazil 10 people killed on boat and the powerful blast and sinking happened which you see in the photograph.

(Refer Slide Time: 03:50)

- ◉ July 2004
- ◉ Temsah Platform, Egypt
- ◉ All 150 saved
- ◉ Fire

The next accidents occur on July 2004 Temsah Platform, in Egypt all 150 people were saved very importantly please note that this is a very classical example where accidents could occur but people can save their lives. So there has been some emergency response planning which has been done carefully and executed successfully when people of 150 in volume can save their lives successfully. But of course, the platform resulted in fire now one can ask a specific question about this specific case study.

Do you think that this case study is successful because people have been saved if the answer is yes, it is unfortunate you do not associate any value for the asset which has been setup blast, safety is not only addressing personal safety, safety should also address safety of the equipments plans and machineries, because all these equipments plans and machineries involved in product are unique custom design and they are very, very expensive.

So when I talk about safety I do not emphasize safety only for the personal, but also for the plans and machineries and equipments involved in production, because I am bothered about not only the people working on boat, but also about the image of the industry in finance market, in commercial viability, and also image in the public domain. So this accident is also dangerous

because the platform is set to braes though people are been saved, interestingly there is cap size which happened on 11th July 2005.

(Refer Slide Time: 05:31)



11th July 2005
Thunder Horse
Full crew saved
Thunder storm Hurricane Dennis



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The slide features a dark grey background with a white border. On the left side, there is a vertical list of four items, each preceded by a small circular icon. The first item is '11th July 2005', the second is 'Thunder Horse', the third is 'Full crew saved' (with 'Full crew' in green and 'saved' in red), and the fourth is 'Thunder storm Hurricane Dennis' (with 'Thunder storm' in red and 'Hurricane Dennis' in red). To the right of this list is a photograph of the Thunder Horse offshore platform, a large steel structure with red legs, situated in the ocean. In the bottom left corner of the slide, there is a small circular logo with a lamp and the letters 'NPTEL'. In the bottom right corner, there is a small number '10'.

The famous thunder horse platform full crew working on boat was completely saved, but unfortunately the thunder storm hurricane Dennis collapse the platform totally made it not reusable.

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- ◉ 15th July 2005
- ◉ Parker Rig 57/ New Orleans
- ◉ Full crew saved
- ◉ Ran aground and overturned



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11

Interestingly this a very important accident happened on 15th July 2005 Parker Rig which was meant for drilling rig 57 in New Orleans, full crew was saved but the rig ran aground and completely overturned. So the operational feasibility of the rig was challenged completely subsequent to this accident.

(Refer Slide Time: 06:10)

- ◉ August 2009
- ◉ Montara wellhead platform
- ◉ North of Australia
- ◉ **FIRE**



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There is a again a fire accident you could see in the photograph happened on August 2009 Montara wellhead platform, North of Australia resulted in complete ablaze of the platform there is no report of people working on boat on this accident.

(Refer Slide Time: 06:27)





Interestingly again fire set on 25th April 2010 you could remember this disaster this was proclaimed very famous disaster in Gulf of Mexico which is called the famous BP disaster, we undergo these accident studies only with one pathetic information that we learn from these accidents. These are not simple pictures and films which is showing you how many people die, which industry was resulted in laws etc...

Please ignore these facts, try to understand that these are lessons what I want to derive there are important readings, lessons, targets which we can achieve by learning mistakes from these accidents. This happened in transition rig in Gulf of Mexico 11 people killed on boat and there was a complete blow of disaster because the blow preventer failed and there is on the set blazed to the platform. Interestingly in India we had a chemical release happened on Bhopal gas tragedy.

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- Bhopal Gas Tragedy, India
- Dec 2nd, 1984
- Leak of methyl isocyanate gas
- Exothermic reaction
 - increased temperature to 200 °C
 - Raised pressure
 - Resulted in gas leak



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On December 2nd, 1984 the leak of methyl and Isocyanate gas caused an exothermic reaction it is increase in the temperature of the container to a very high value of 200°C which raise the pressure and ultimately resulted in fissures where the gas was leaked. Interestingly ladies and gentleman there is a portrait developed by a painter or a sculpture in this scenario where the lady is not able to even feed the child without closing her nose. So that is a very pathetic information on this kind of process industries accidents happened on land but since it is related to the gas industry this example is quoted in this presentation.

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No interesting question comes if you look at this summary interestingly.

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- 6-Jul-88: Piper Alpha North Sea -Fire. **167 killed**
- 27-Mar-80: Alexander Kielland, Scotland/ Norway Bracing Collapse **All 123 Killed**
- 14-Feb-82: Ocean Ranger, Grand banks, Canada - Waves of > 20 m. **All 84 killed**
- 20-Mar-01: Petrobras, Brazil -Powerful blast & sinking. **10 killed**

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July 6th 1988 Piper Alpha North sea fire was set once 167 people killed, followed by which 27th March 1980 on the list please understands these accidents are not resulted or not recorded chronologically but there are some interesting information we derive from this accidents when we do risk analysis in the subsequence lectures. So the second extend what we are interested is the 27th March 1980 Alexander Kielland, Scotland/Norway the bracing collapsed structural failure all 123 people killed.

The next accident is followed by which is 14th February, 1982 the Ocean Ranger, Grand banks, Canada waves of very phenomenal height more than 20m was reported all 84 people working on boat were killed. 20th March 2001, Petrobras, Brazil powerful blast and sinking of the platform 10 people working on boat were killed.

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• Jul 2004: Tamsah Platform, Egypt - Fire. All 150 saved

• 11-Jul-05: Thunder Horse. Thunder storm Hurricane Dennis. Full crew saved

• 15-Jul-05. Parker Rig 57, New Orleans. Ran aground & overturned

• Aug-09: Timor sea Australia - Rig / Well Fire

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July 2004 Tamsah platform, Egypt it was set fire but all 150 people working on boat were saved. 11 July 2005 Thunder Horse, thunder storm and hurricane Dennis damage the platform but full crew was saved. 15th July 2005 Parker Rig 57, New Orleans the drilling rig ran aground and overturned and found to be completely irreparable but there was no report of loss of life. August 2009 Timor sea Australia Rig was set to fire.

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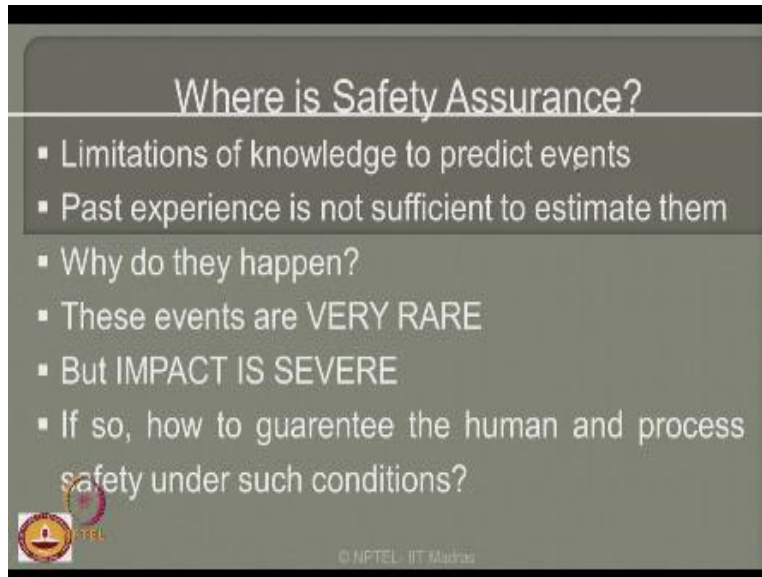


- 25-Oct-83: Glomar Java Sea Drillship, South China Sea-Typhoon Lex. **81 Killed**
- 25-Nov-79: Bohai-2, Gulf of Bohai, China-Storm while towing **72 Killed**
- 30-Jun-64: CP Baker Drilling Barge, GoM -Shallow Gas Blowout. **22 killed**
- 27-Jul-05: BHN Mumbai High -Vessel Collision. **11 Killed, 11 Missing**
- 23-Oct-07: Usumacinta, GoM-Storm cum Blowout. **22 Killed**

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25th October 1983 Glomar Java Sea drillship, South China Sea typhoon Lex 81 people killed. 25th November 79 Bohai-2 Gulf of Bohai, china storm while towing 72 people killed. 30th June 1964 CP Baker Drilling Barge, Gulf of Mexico shallow gas blowout 22 people killed. 27th July 2005 BHN Bombay High vessel collision 11 people killed, 11 people found missing my dear ladies and gentleman please note we are talking about missing of people which are, who are very highly skilled professionals. 23-Oct-2007, Usumacinta, Gulf of Mexico storm cum Blowout 22 people killed.

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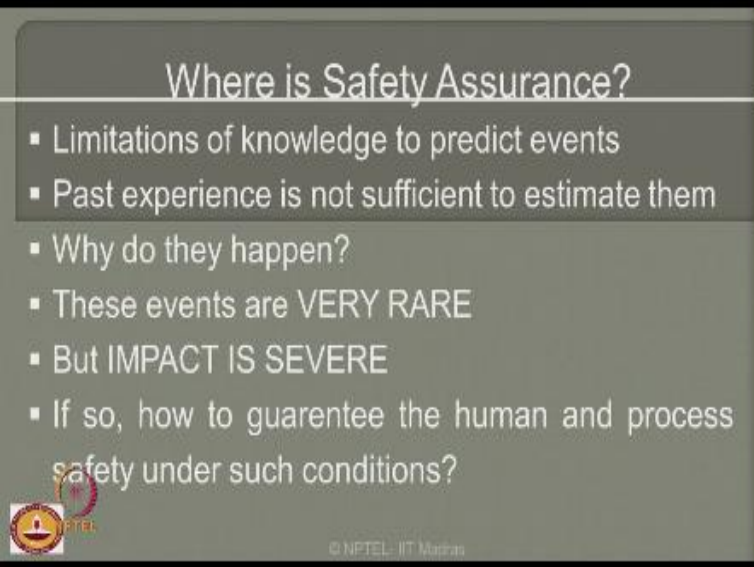
Where is Safety Assurance?

- Limitations of knowledge to predict events
- Past experience is not sufficient to estimate them
- Why do they happen?
- These events are VERY RARE
- But IMPACT IS SEVERE
- If so, how to guarantee the human and process safety under such conditions?

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Now the question comes, when you look at these accidents, where is the safety assurance? Why safety was not implemented as attaining program which could have prevented these accidents? The answers are very interesting there are extreme limitations of knowledge to predict this events because these events were not planed, they were all happened incidentally because of various factors which will result in the next slide.

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Where is Safety Assurance?

- Limitations of knowledge to predict events
- Past experience is not sufficient to estimate them
- Why do they happen?
- These events are VERY RARE
- But IMPACT IS SEVERE
- If so, how to guarantee the human and process safety under such conditions?

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The past experience learned by the safety professional was not found to be sufficient to estimate these accidents in advance. Now the fundamental question comes to our mind as a safety executive is why do such accidents happen? These events are very rare as you are seeing I have taken statistics from 1964 till 2010 compared to them about 17 to 21 major accidents were reported, so the frequency is very rare, very low but the intact cost is very severe. If so how to guarantee the human, and the process safety under such conditions.

So this is the valid point where every safety executive need to answer the people or person on boat, if you really want to promote a good working culture with a technical people working on boat in oil and gas industries, where is the safety assurance for people working on boat, because these accidents teaches a lesson that the limitations of knowledge do not train people to predict these events that is very important.

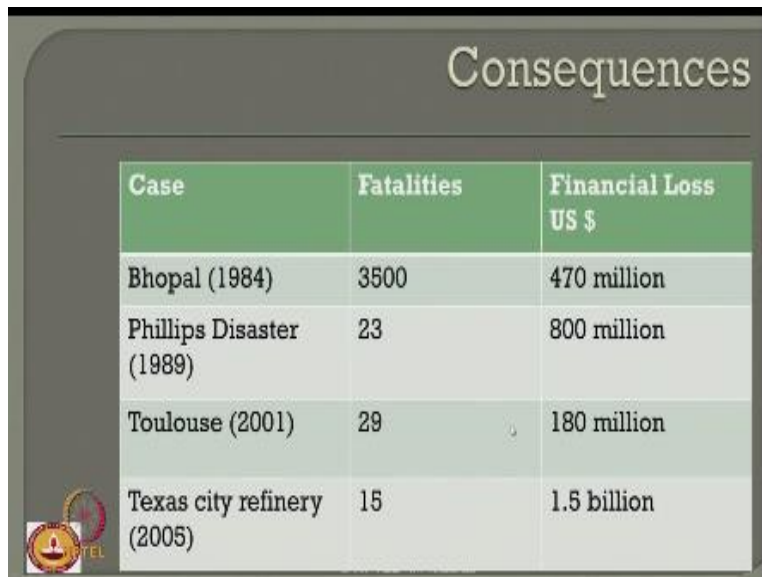
So let us create a clear summary here accidents in oil and gas industry cannot be predicted, can they be modeled, can you create a scenario similar to scenario where these studies can be calculated and foreseeing in advance, the answer is yes. That is where risk assessment becomes a very important subject for safety engineer to understand.

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Now interestingly if we look at the gas and oil industry with continuous experienced major accidents very frequently, Bhopal 1984, Phillips disaster, Pasadena 1989, Texas City refinery oil grow up 2005, Toulouse, France 2001, Piper disaster. So these are all very interesting and noticeable accidents which has spoiled, which has challenged, the images of respective companies which have been working in the industry for many years together. So accidents do not only bring bad economy to the industry, but also bad name and fame to the company which is owning these production units.

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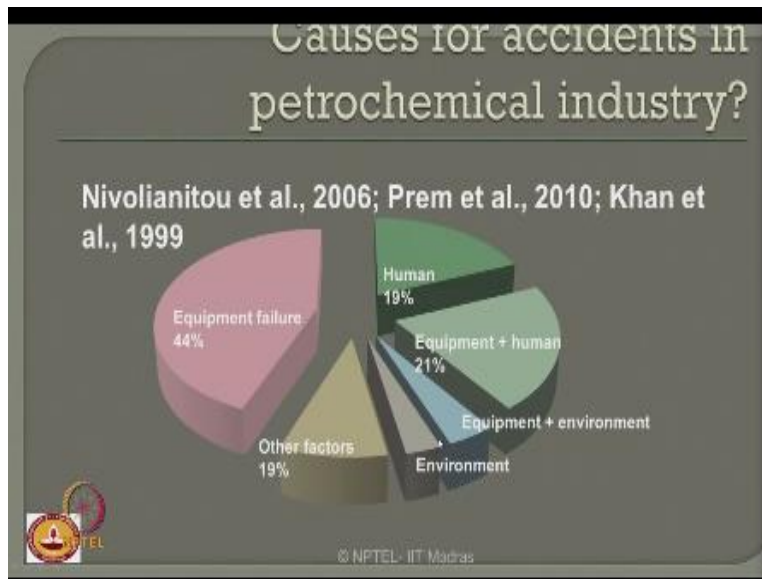
Case	Fatalities	Financial Loss US \$
Bhopal (1984)	3500	470 million
Phillips Disaster (1989)	23	800 million
Toulouse (2001)	29	180 million
Texas city refinery (2005)	15	1.5 billion

Now let us quickly look at the consequences of these accidents, look at Bhopal 1984, 3500 fatalities and financial loss estimated a 470 million years dollars. Phillips disaster only 23 people died, but the financial loss is 800 million years dollars. Toulouse, France only 29 people died but financial loss is about 180 million years dollars. Texas City refinery only 15 people died but 1.5 billion years dollars financial loss. Please understand that the number of fatalities and the amount of financial loss are not proportionate and they are not scalable.

So it all depends upon where the accident is actually occurring. So it is important that the event can be rare, but the consequences can be multi-dimensional, a consequence happening in a process industry compared to a manufacturing refining industry can vary in fatality as well as in financial loss significant we ladies and gentleman.

Therefore, the risk assessment methods should have a mechanism to capture both the fatality or the personal safety as well as the economical loss cause to the industry because of these accidents. If we look at the causes for accidents in.

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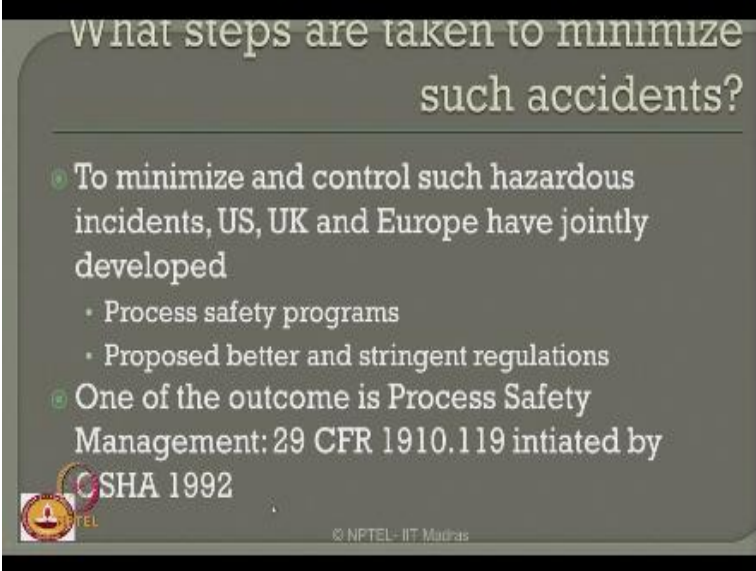
Petroleum and chemical industry if you look at the paper given by Nivolianitou et al., 2006; Prem et al., 2010, Khan et al., 1999 they simply summarize and show that the reasons for these accidents are equipment failure about 44%, human error about 19%, equipment plus human put together about 21%, and other factors about 19% and environmental and equipment environment are very marginal.

Therefore, ladies and gentleman being a safety executive kindly do not take the risk on making a statement saying accident occurred because of environmental reasons, because these accidents being summarize for the past 40 years in oil and gas industry clearly show that the factors contributing from environment and equipment together are very large than compared to equipment and human put together.

So if you look at equipment failure, human error and equipment plus human they come together more than about 70%. It means we are responsible for all the accidents. So I should make a clear summary making a statement here if at all accident create an oil and gas industry on a platform it is because of over sighting the equipment safety it is also because the people are not trained

properly in safety. So safety assurance becomes a very important segment in process industries in particular oil and gas industries very well. One can ask a question.

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What steps are taken to minimize such accidents?

- To minimize and control such hazardous incidents, US, UK and Europe have jointly developed
 - Process safety programs
 - Proposed better and stringent regulations
- One of the outcome is Process Safety Management: 29 CFR 1910.119 initiated by OSHA 1992

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What steps are taken to minimize such accidents? To minimize and control such hazardous incidents different countries like US, UK and Europe have jointly developed various programs; two important programs which I want to discuss here are different process safety programs, and proposed better and stringent regulations in particular for oil and gas industries. One of the outcome is the process safety management 29 CFR 1910.119 initiated by OSHA 1992.


There is one classical example where safety measures have been stringently prescribed to oil and gas industry to be strictly adhered and followed. Now when we talk about safety in during processor production let us talk about PSM which is process safety management. Generally PSM is focused on prevention, preparedness, mitigation, response and restoration. The objective is to remain pro-active and systematic in identification, evaluation.

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Process Safety Management

- Is focused on
 - Prevention
 - Preparedness
 - Mitigation
 - Response
 - Restoration
- Objective is to remain proactive and systematic in
 - Identification
 - Evaluation
 - Mitigation

Prevention of chemical releases



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Mitigation and prevention of chemical releases very clearly.

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The slide features a central image of an iceberg. The tip of the iceberg, which is above the water line, is labeled "\$1= (Direct + Indirect) Cost". The much larger, submerged part of the iceberg is labeled "Most Of The Cost Is Hidden" in red text, and below it, "\$10 = Intangible Cost". To the right of the image, the title "Iceberg theory" is displayed in a large, light-colored font. Below the title, there is a bulleted list of three items: "Direct costs", "Indirect costs", and "Intangible costs". At the bottom left of the slide, there is a small circular logo with a lamp and the word "NPTEL". At the bottom center, the text "© NPTEL- IIT Madras" is visible.

Iceberg theory

- Direct costs
- Indirect costs
- Intangible costs

\$1= (Direct + Indirect) Cost

Most Of The Cost Is Hidden

\$10 = Intangible Cost

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Very interestingly in the management perspective safety follows what is called an Iceberg theory, what is an Iceberg theory is there are different cost involved in the industry, some are called direct cost, some are called indirect cost, most off the cost unfortunately is hidden what you see on the top is only the ice what you see, but there is an iceberg below which actually hidden cost which we called intangible cost below there.

Therefore, interestingly if we look at the financial loses there are some direct cost involved in the industry, there are some indirect cost involved as well as there are something called intangible cost, one must address a safety program should address all these economy in a proper perspective to make the oil and gas industry as a successful producing or production unit.

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Then let us ask a question what do we understand by direct cost? There are some employee liabilities when an accident is met, there are third party liabilities, there are property damages caused because of accidents.

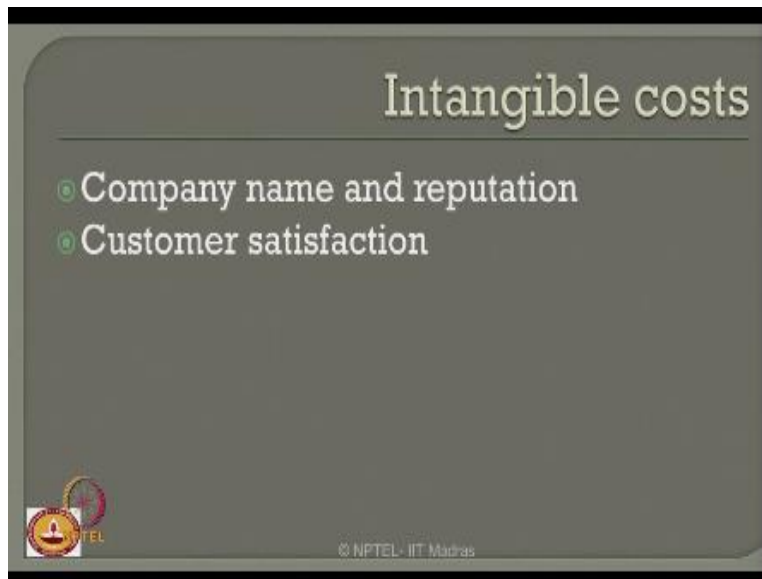
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What do we understand by indirect cost? Indirect cost arise from you conduct investigations, you make site clearances, you also calculate the equipment and material damage cost because of the accident, you also worry about the plant damage, you also talk about the production delay what we call shut down time of the product or the plant, you also talk about legal expenditure involved to set right the things in order.

And of course you will have to make the people to work overtime that will cause what is called overtime working as an indirect cost and above all most importantly insurance consecution becomes a major indirect cost in such major accidents.

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Then what are intangible cost? The company name and reputation is at stake when the accident is resulted in a very serious disaster, most importantly your stake holders, your investors should be given a guarantee that they will get return on their income that is what we call customer satisfaction of a business. And you lose a major business opportunity.

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The slide features a dark grey background with a light grey border. At the top right, the title "Intangible costs" is written in a light grey, sans-serif font. Below the title, a horizontal line separates it from a bulleted list of three items: "Company name and reputation", "Customer satisfaction", and "Business opportunity". Each item is preceded by a small green circular icon. In the bottom left corner, there is a small logo for NPTEL, which includes a stylized lamp and the letters "NPTEL". In the bottom right corner, the text "© NPTEL - IIT Madras" is displayed in a small, light grey font.

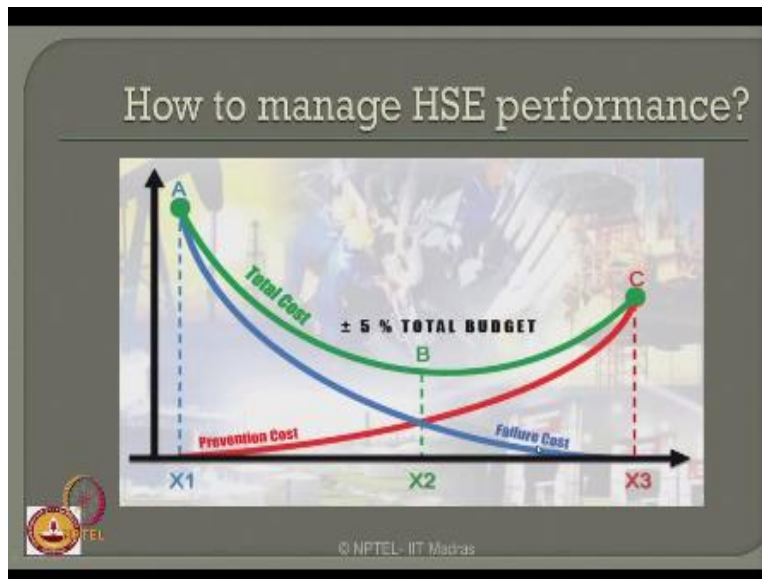
Intangible costs

- Company name and reputation
- Customer satisfaction
- Business opportunity

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If our company undergoes accidents continuously.

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Now how to manage HSE performance then? If we look at a prevention cost in three scale of x_1 , x_2 and x_3 where these are the points where x_1 is a point where the failure cost is maximum, x_2 is a point where the total cost is minimized, x_3 is a point where the prevention cost is maximum. So considering here and see and connecting them we have a total budget $\pm 5\%$ make a total cost and touch at the point where the total cost becomes as least as possible. So total cost of course includes the prevention cost and the failure cost together.

Initially the failure cost will maximum as you understand the errors and correct the mistakes the failure cost can go down whereas if you do not pay attention in the beginning we have no prevention policies, the prevention cost would be practically 0 because you do not invest on safety but you keep on investing on safety as you learn from mistakes. So there has got to be a balance where these intersections comes through and that is a point where the total cost of an industry should be as minimum as possible that is what is called the bath tub concept. The bath tub concept says minimize the total cost which includes the prevention cost as well as the failure cost.

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HSE Audit Management System

- It is important to perform HSE audit to understand the effectiveness of HSE management
- International Sustainability Rating System (ISRS)
 - It is an international practice to measure the effectiveness of HSE management of any company

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Then we want to emphasize such kind of economical balance in a oil and gas industry then one must understand how do we conduct what is known as HSE audit, there is an management system involved in HSE audit, let us see what are different scenarios, different platforms, different levels where this HSE audit is generally conducted in oil and gas industry. It is very important to perform HSE audit to understand the effectiveness of HSE management because just by providing safety principles.

You cannot be assured of safety we must also know how effectively this is being practiced and proclaimed to the management. So you have to do what is called HSE audit all the time. International sustainability rating system what we call ISRS, it is an international practice to measure effectiveness of safety or HSE management of any company. ISRS has different platforms to access safety.

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The slide is titled "Elements of ISRS" in a large, light-colored font at the top right. Below the title, the word "Leadership" is written in a green font. A numbered list follows, containing nine items: 1. Purpose and values, 2. Goals, 3. Policy, 4. Strategy, 5. Stakeholder engagement, 6. Business processes, 7. Business risks, 8. Accountabilities, and 9. Management commitment. In the bottom left corner, there is a small circular logo with a lamp and the number 8. In the bottom right corner, there is a small number "31" and some faint text that appears to be "© NPTEL - IIT Madras".

There are different elements of ISRS which we will see one by one, first thing is how the leadership of a company is challenging or addressing the safety assurance. What is the purpose and values, what are the goals of leadership, where the policy involved, what is the strategy you follow, what is the stakeholder engagement you do, what is a business process you address, what are the different business risks you take, and what accountabilities you produced to the auditors, and what management commitment you have for better production of tomorrow.

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The slide is titled "Elements of ISRS" in a large, white, serif font at the top right. Below the title, the text "Planning & Administration" is written in a green, bold, sans-serif font. Underneath this, there is a numbered list of five items in a white, sans-serif font: 1. Business planning, 2. Work planning & control, 3. Action tracking, 4. Management System documentation, and 5. Records. In the bottom left corner, there is a small circular logo with a yellow background and a red border. In the bottom center, there is a small text string "© NPTEL - IIT Madras". In the bottom right corner, the number "32" is displayed.

Elements of ISRS

Planning & Administration

1. Business planning
2. Work planning & control
3. Action tracking
4. Management System documentation
5. Records

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The second stage of element of ISRS comes from planning and administration. So you must know what is a business planning, how your work planning and control is effective, what are the actions taken industry, how are they actually tracked, what is the management system documentation you practice, and how do you maintain an update your records.

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Elements of ISRS

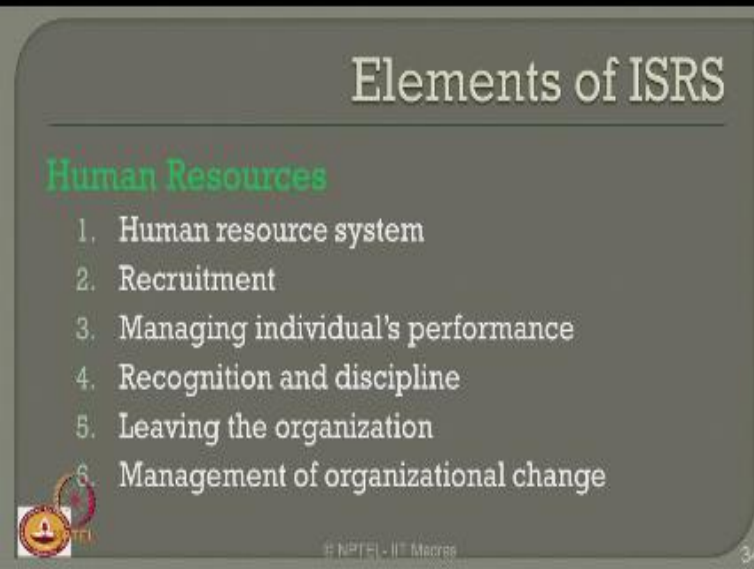
Risk Evaluation

1. Health hazard identification and evaluation
2. Safety hazard identification and evaluation
3. Security hazard identification and evaluation
4. Records
5. Process risk identification and evaluation

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The third element is how do you do risk evaluation. Health hazard identification and evaluation, safety hazard identification and evaluation, security hazard identification and evaluation, process risk identification and evaluation are the different four stages how we actually do risk evaluation which is one of the important element of ISRS.

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The slide is titled "Elements of ISRS" in a large, light-colored font at the top right. Below the title, the section "Human Resources" is written in a green font. A numbered list follows, containing six items: 1. Human resource system, 2. Recruitment, 3. Managing individual's performance, 4. Recognition and discipline, 5. Leaving the organization, and 6. Management of organizational change. In the bottom left corner, there is a small circular logo with a lamp and the letters "NPT". In the bottom right corner, the number "34" is visible.

Elements of ISRS

Human Resources

1. Human resource system
2. Recruitment
3. Managing individual's performance
4. Recognition and discipline
5. Leaving the organization
6. Management of organizational change

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34

The next element is from the human resources what human resource system you practice, what are the recruitment policies, how you are managing individuals performance, how are you encouraging better workers and how are you discouraging accidents and name these reports, recognition and discipline, how do you take care of people leaving the organization, how do you address management of organization change in industry.

(Refer Slide Time: 25:01)



The slide is titled "Elements of ISRS" in a large, light-colored font at the top right. Below the title, the text "Compliance assurance" is written in a green font. Underneath, there is a numbered list of six items: 1. Regulations, 2. External authorizations to operate, 3. Industry codes and standards, 4. Reporting to authorities, 5. Information security, and 6. Compliance assessment. In the bottom left corner, there is a small circular logo with a person's face. In the bottom right corner, there is a small number "35" and some faint text that reads "# NPTEL - IIT Madras".

Elements of ISRS

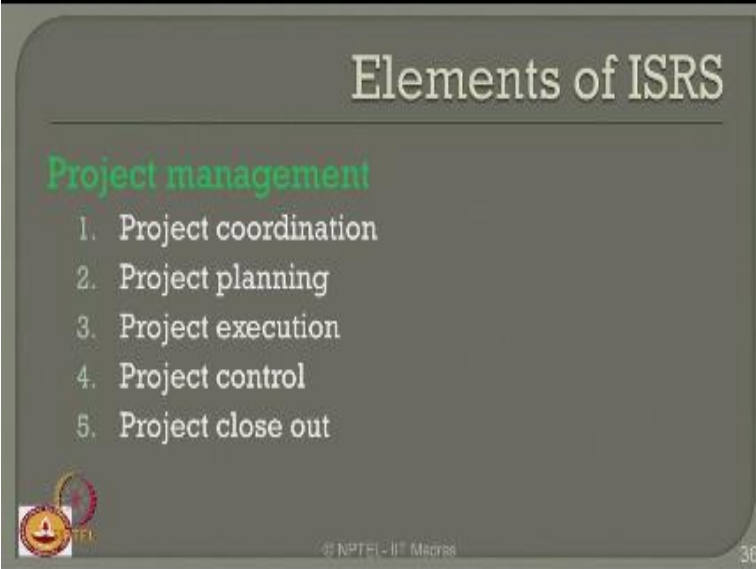
Compliance assurance

1. Regulations
2. External authorizations to operate
3. Industry codes and standards
4. Reporting to authorities
5. Information security
6. Compliance assessment

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That is called HR management. The next level of ISRS is compliance assurance which talks about how do you form regulations, how external authorizations are allowed to operate, what are the work permanent practices, what is industry code and standards you adopt, what reporting phenomena you do, and what is hierarchy of authorities you report, what is the information security you maintain, what is a compliance assessment you make periodically is it week wise, month wise, year wise, etc.

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Elements of ISRS


Project management

1. Project coordination
2. Project planning
3. Project execution
4. Project control
5. Project close out

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The next level of element of ISRS is what is a project management you do, what is a project coordination you follow, what is a project planning you do, how do you execute the project, how do you control the laws, and how do you close out the project.

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Elements of ISRS

Training and competency

1. Training system
2. Training need analysis
3. Instructor qualification
4. Delivery of training
5. Leadership orientation
6. General orientation
7. Job orientation

8. Training systems evaluation

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37

The next level is training in competency what training system you play, keep in place, what is the training need analysis you have done, what do you specify qualification for the instructor, what is the delivery of the timing on training, what is a leadership orientation you give to your employees, what are the general orientation you create in the work culture, what is a job orientation you create for employees, and what training system evaluation you have to run the training professional within your system.

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The slide is titled "Elements of ISRS" in a large, white, serif font at the top right. Below the title, the text "Communication and promotion" is written in a green, sans-serif font. A numbered list follows, with each item preceded by a small white number. The list items are: 1. Communication system, 2. Meetings coordination, 3. Management meetings, 4. Work group meetings, 5. Joint committee meetings, 6. Coaching, 7. Recognition, 8. Promotion campaigns, and 9. Away from work information. In the bottom left corner, there is a small circular logo featuring a lamp and a book. In the bottom right corner, the text "© NPTEL - IIT Madras" and the number "38" are visible.

Elements of ISRS

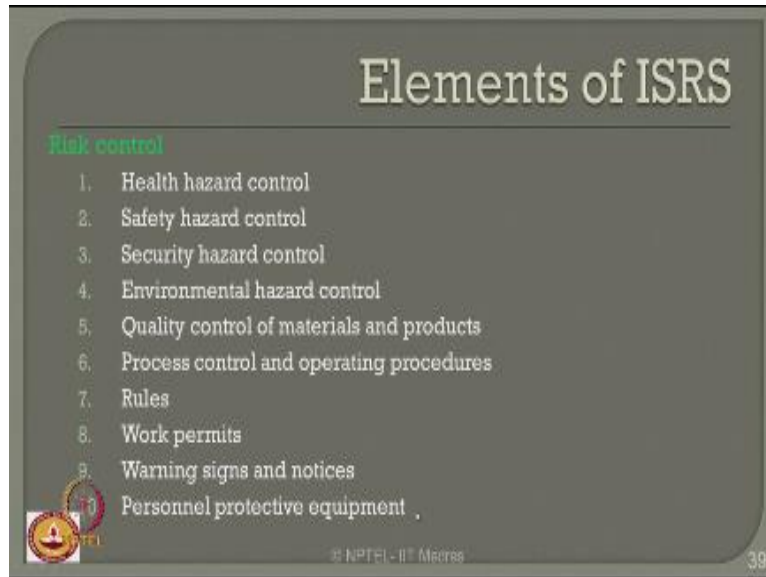
Communication and promotion

1. Communication system
2. Meetings coordination
3. Management meetings
4. Work group meetings
5. Joint committee meetings
6. Coaching
7. Recognition
8. Promotion campaigns
9. Away from work information

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The next level is communication and promotions what is a communication system your adopt, how you coordinate your meetings, how management conduct meetings, how work group meetings are conducted, how joint committee meetings are organized, what kind of coaching you extend to your employees, what recognition you give for people reporting extension preventing accidents, what promotion campaigns you do, how do you record away from work information that is a very important area where even though you are not staying at the work environment how do you communicate with people, how do maintain the link with the communication even when your away from the platform. The next element of ISRS focus on risk control.

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What are the health hazards controls you practice, what are the safety hazard controls you employ, what are the security hazard controls you have in position, what are the environment hazard controls you practice, what quality control of material and products you deliver, what process control and operating procedures you have in your industry, what are the rules you have to control risk, how do you show work permits, what are the warning signs and notices you have placed in position, what personal protective equipment you have and how people are trained to use these equipments are very important aspects of risk control.

These are the areas where most of the people do not focus interestingly and oil and gas industry, because they always think they are trained safety personal should know for example, how to operate a protective equipment, you have seen in the earlier cases were major disasters happen because there is lack of coordination. So every point in safety training becomes very important because if you really want to control the risk you must clean people first and you will be very careful and you are showing what become work permits.

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Elements of ISRS

Asset management

1. Maintenance program
2. Maintenance planning and scheduling
3. Executive of maintenance program
4. Maintenance review
5. Inspection of general working conditions
6. Survey of physical conditions
7. Inspection of Special equipments
8. Inspection, measuring and testing equipments

Acquisition and sale

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40

The next element is asset management which is very important factor of any oil and gas industry, how do you maintain or how do you develop a maintenance program, how do you do maintenance planning and scheduling, how do you execute the maintenance program, what is the review process you follow for the maintenance programs, how do you inspect general working conditions, what is survey you conduct for physical conditions, how do you inspects special equipments, how do you conduct inspection, measuring, and testing of equipments, how do you acquisition and sale your equipments.

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The slide is titled "Elements of ISRS" in a large, white, serif font at the top right. Below the title, the text "Contractor HSE management" is written in a green, sans-serif font. Underneath this, there is a numbered list of five items: "1. Contractor/supplier selection", "2. Contractor operations", "3. Contractor assurance", "4. Supply chain and purchasing", and "5. Logistics". In the bottom left corner, there are two circular logos: one with a lamp and the text "NPTI" and another with a gear and the text "IIT Madras". In the bottom right corner, the text "© NPTEL - IIT Madras" and the number "41" are visible.

Elements of ISRS

Contractor HSE management

1. Contractor/supplier selection
2. Contractor operations
3. Contractor assurance
4. Supply chain and purchasing
5. Logistics

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The next element is contractor HSC management, contractor suppliers election, contractor operations, contractor assurance, supply chain and purchasing, a logistics is very important in oil and gas industries.

(Refer Slide Time: 29:01)



The next element is emergency preparedness what is the level of emergency needs assessment, what is the crisis management you have, what business continuity plan you have, what emergency plan reviews you are made, what emergency communications you establish, what emergency protections system you have in place, what emergency controls you know to operate, what are the emergency workforce you have in place, what is a first aid practice you have, what is a medical support and assistance you give to your employees, and how do you organize outside assistance that is a very important because this will manage the media image of the industry in public domain.

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Elements of ISRS

Learning from events

1. Learning from events failure
2. Learning from success
3. Participation in investigations
4. Near-miss and substandard conditions
5. Complaints management
6. Event announcements
7. Away from work accidents
8. Action follow-up
9. Event analysis
10. Improvement teams

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The next element becomes learning from the events what are the learning from events failure you have conducted, whether I will learn from any successful events, have a participated investigations, having ever reported near-miss events and substandard conditions, is complaints management properly adheres the industry, is event announcements made properly, how do you take care of away from work accidents, what is the action follow up you have made, what is a event analysis you have done to improve or create what is called improvement teams.

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The slide is titled "Elements of ISRS" in a large, light-colored serif font. Below the title, the sub-section "Results and Review" is written in a green, bold, sans-serif font. Underneath this sub-section, there is a numbered list with three items: "1. Business results", "2. Management review", and "3. Reporting to stake holders". In the bottom left corner, there are two circular logos: one with a lamp and another with a gear. In the bottom center, the text "© NPTEL - IIT Madras" is visible. In the bottom right corner, the number "44" is displayed.

The next element is about rules and review what are the results what you conduct because of business review. what is a management review policy you have. what are the reporting you have made to the stakeholders to assure there is return on the finance investments.

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Ladies and gentleman interestingly safety is an inherent part which one can easily practice, HSC in general comes in cans.

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HSE comes in CANS

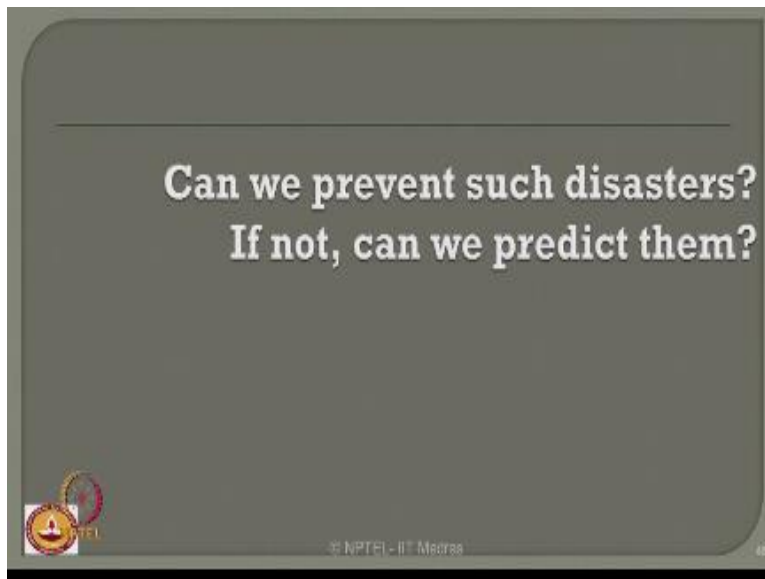
- I CAN
- YOU CAN
- WE CAN



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I CAN, YOU CAN, and WE CAN practice safety very easily.

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No the fundamental question comes is can we prevent such disasters if not, at least can we predict them. Are we mathematically capable to understand to make to model risk and hazards this is what we are going to address in this first module of lectures from tomorrow onwards, there are interesting.

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Accidents reported which are unpleasant to see back again, but we will learn them as accidents and lessons.

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Which we should avoid.

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As a safety executive.

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Unfortunate but we must remember you have very important statement successful management will understand profit is revenue – cost. So what are those cost involved in controlling mitigating, managing, and training people to prevent such accidents. Though there may be a revenue loss here, but the profit will increase because your production will go high. So remember investment towards safety assurance is not a loss, it is actually a cost toward safety which will add to a profit when the revenue go aside. Thank you ladies and gentlemen, bye..

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