



OISD

ओ. आई. एस. डी. न्यूज़लैटर

तेल उद्योग सुरक्षा निदेशालय का मासिक समाचार पत्र
पेट्रोलियम और प्राकृतिक गैस मंत्रालय, भारत सरकार, नई दिल्ली

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WORLD ENVIRONMENT DAY 2009

World Environment day was celebrated at OISD on 5th June' 2009.

OISD members took pledge for protecting environment.

World Environment Day (WED) was established by the UN General Assembly in 1972 to mark the opening of the Stockholm Conference on the Human Environment.

World Environment Day is commemorated each year on 5th June, is one of the principal vehicles through which the United Nations stimulates worldwide awareness of the environment & enhances political attention & action.

This year theme for WED 2009 is 'Your Planet Needs You-UNite to Combat Climate Change'. It reflects the urgency for nations to agree on a new deal at the crucial climate convention meeting in Copenhagen some 180 days later in the year, and the links with overcoming poverty and improved management of forests.



We can all do our part to protect the planet by using less and acting more. Going green is not as difficult as one might think. It is our sincere request to all readers to try to incorporate all of these into your life as a matter of routine. Get others to do so the same. And get involved!

AT HOME...

- Save water in simple ways like not letting the tap run while shaving, washing, or brushing teeth.
- Install timer on water heater to save power. Insulating water heater will help save valuable energy. Installing showerheads with a low flow in bathrooms for bathing purposes to help save water.
- Plant a tree.
- Use towels for drying face and hands instead of tissues that are used and thrown away.
- Juice or yoghurt lovers can buy juice in concentrates and yoghurt in reusable containers instead of single serving packages.
- When packing lunch, opt for reusable containers for food storage instead of wrapping the food with plastic wrap.
- Switch off all the lights and appliances whenever going out of the house or not required to be used and unplug chargers as they continue



Mexico is also a leading partner in UNEP's Billion Tree Campaign. The country, with the support of its President and people, has spearheaded the pledging and planting of some 25 per cent of the trees under the campaign. Accounting for around 1.5 per cent of global greenhouse gas emissions, the country is demonstrating its commitment to climate change on several fronts.

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to consume even if they are not charging; saving energy helps reduce air pollution.

- Remove lamps or TV sets near air-conditioning thermostat as it senses heat from these appliances, which can cause the air-conditioner to run longer than necessary.
- When cooking dinner, match the size of the pan to the size of the heating element to lower energy wastage.

TO WORK.....

- Carry cloth bag so that one can just say no to plastic bag during shopping.
- Easiest way to reduce carbon footprint is by avoiding driving separately. Use bicycle, walking, carpooling, public transport.
- Use most fuel-efficient car model and keep tyres inflated to the correct pressure.
- If stuck in traffic, consider turning car engine off if it will be idling for more than 2 minutes.
- High speed driving lowers car mileage, accelerate gradually.

AT WORK.....

- 80% of plastic bottles are recyclable but only 20% are actually recycled. Cup and reusable bottle be put in recycle bin.



- Write on the back of an used document for lists and messages instead of new writing pad.
- Start recycling system in office. It is estimated that 75% of what is thrown in the trash could actually be recycled, though currently only 25% is being re-cycled.
- While taking print out, make sure to click default printer option to use both sides of the paper.
- Most computer accessories like ink cartridges, CDs and DVDs are made of materials that could be reused. Computer cords and speakers are fairly standardized, meaning they can be used for a variety of computer models and makes. Maximise the re-use.
- Office's carbon footprint can be lowered by switching to energy saving features in computers, monitors, printers, copiers, speakers and other business equipment and turning them off at the end of the day.
- Turn off all unnecessary lights, especially in unused offices and conference rooms to save energy.
- House plants are good for the environment because they remove quantities of pollutants present in the air.

- Send and store documents electronically to save paper and also trees.

Some low-carbon lifestyle choices at home, in the office and when travelling include:

- Waking up with a traditional wind-up alarm clock rather than the beep of an electronic one - this can save someone almost 48 grams (g) of CO₂ each day;
- Choosing to dry clothes on a washing line versus a tumble dryer - a daily carbon diet of 2.3 Kg of CO₂;
- Replacing a 45-minute workout on a treadmill with a jog in a nearby park. This saves nearly 1 Kg of the main greenhouse gas;
- Heating bread rolls in a toaster versus an oven for 15 minutes saves nearly 170g of CO₂;
- Switching from regular 60-Watt light bulbs to energy-saving ones will produce four times less greenhouse gas emissions;



- Taking the train rather than the car for a daily office commute of as little as 8 km will save 1.7 Kg of CO₂;
- Shutting down computer and flat screen both during lunch break and after working hours will cut CO₂ emissions generated by these appliances by one-third;



- Investing in a water-saving shower head will not only save 10 liters of water per minute, but will also slash CO₂ emissions resulting from a three-minute hot shower by half;
- Reducing the weight of goods and items carried onboard by airline passengers to below 20Kg could cut global green house gas emissions by two million tonnes of CO₂ a year.

ENVIRONMENTAL SUSTAINABILITY INDEX(ESI)

Source : CDF, Rupanwita Dash

Extract:

The Environmental Sustainability Index (ESI) is a ranking tool which maps the environment performance of states or country and projects the ability of the states to protect their environment in the coming years. A state with higher ESI ranking means, it has managed its natural resource stock judiciously; face less stress on its environment systems and less impact on human health. On the contrary, a state with lower ESI indicates that it has depleted its stock of natural resources and has accumulated waste and pollution which has created stress on ecosystem and human health. It is a new concept to determine environment assessment.

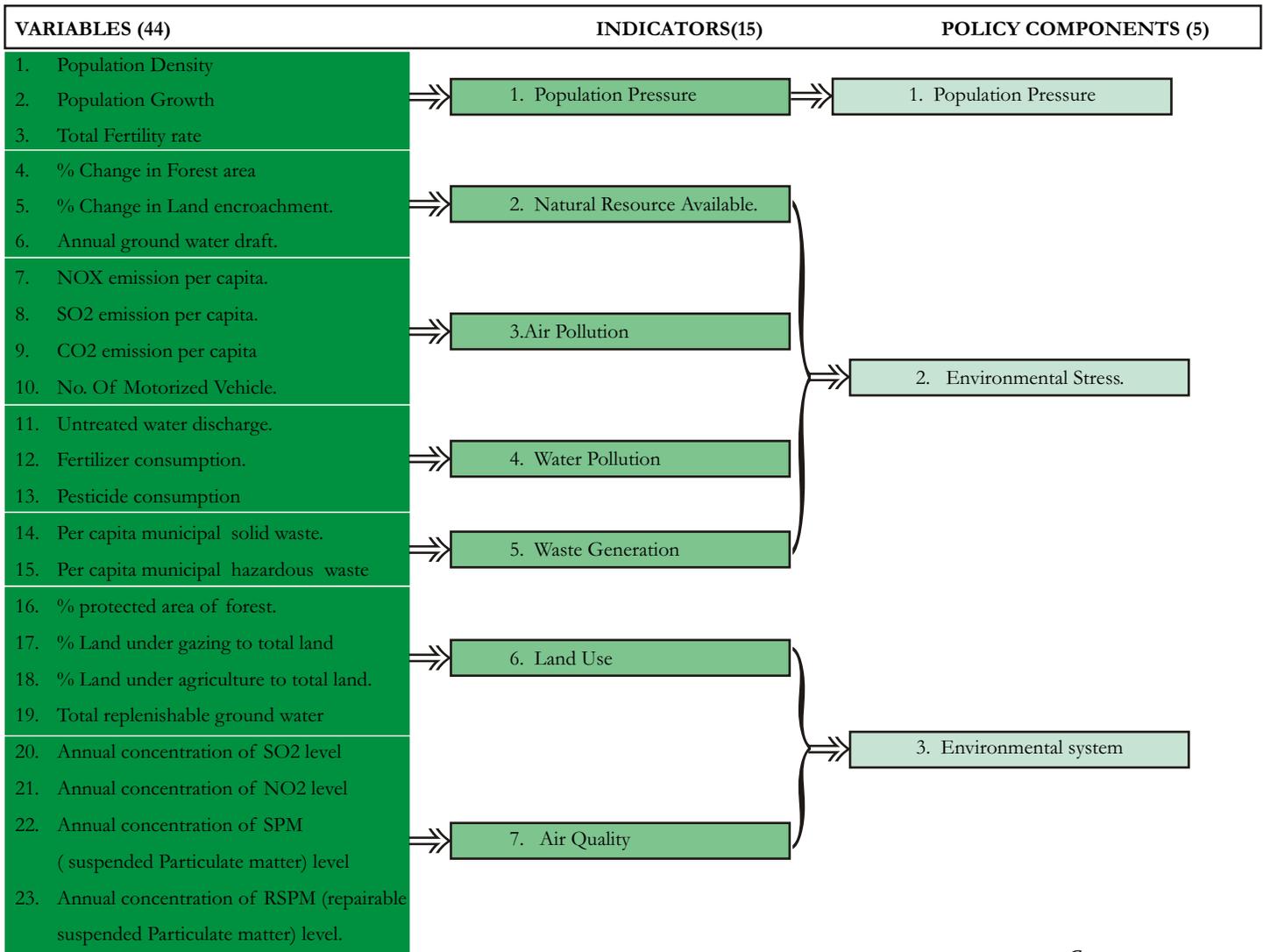
ESI holds much more importance in the context of developing economies. Since economic growth gives an incomplete picture of a country or state's development as it does not reflect the impacts on ecological and natural systems.

The index gives a comparative picture of the environmental conditions in

each state in terms of water, air, soil, forest and other natural resources and it will show the magnitude of pollution and depletion of resources, which should be a signal for industries to pay more attention to their environmental footprints and should create competitive pressure for improved performance.

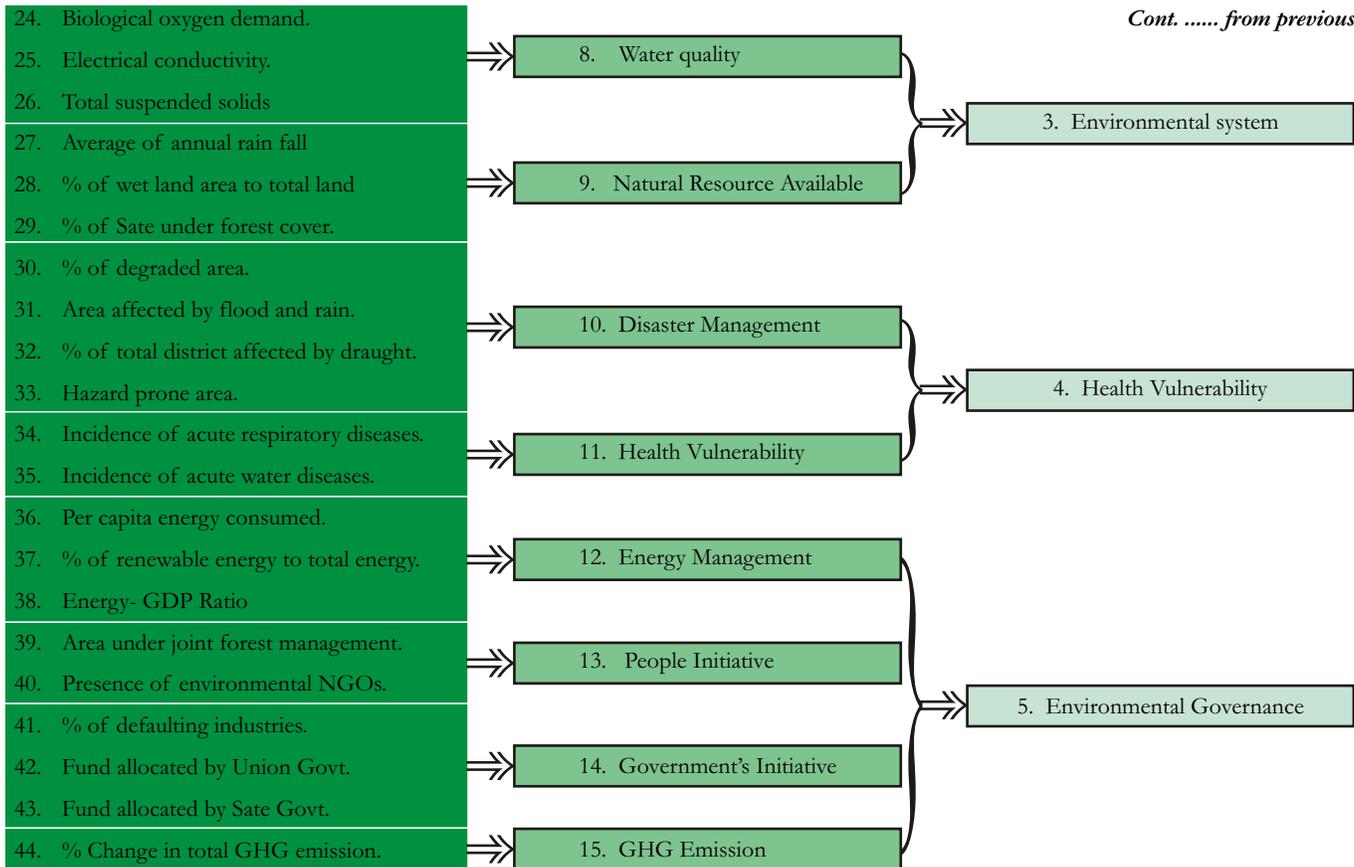
ESI index is estimated from 15 indicators that are derived from 44 variables or datasets, which cover a wide range of issues such as population, air and water pollution, waste management, land use pattern, forest and other natural resources, air and water quality, environment degradation, impacts on health, energy management, GHG (Green House Gas) emission, and governance as given in Table below. The ESI score is the equally weighted average of these 15 indicators. Each of the indicators is in turn an aggregate of 2 to 4 underlying variables. For example, to measure the indicator 'air quality' the underlying variables chosen are annual concentration levels of SO₂, NO₂, suspended particulate matter (SPM) and repairable suspended particulate matter (RSPM).

The 44 variables , 15 indicators and 5 policy components considered are as follows :



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Silence is one of the hardest things to refute.....Josh Billings (1818- 1885).

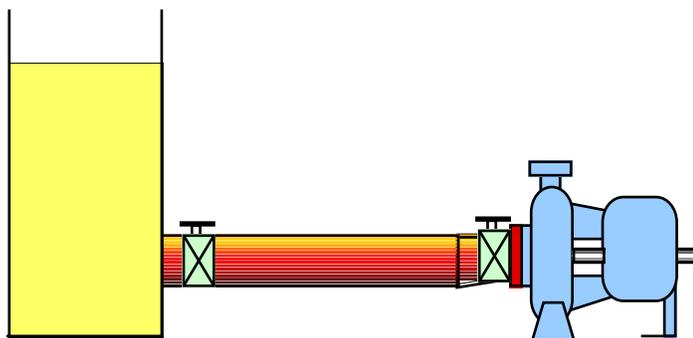


The idea behind publishing this article is to apprise readers the latest concept and at the same time they can invent their own variables, indicators and policy components to calculate the ESI of various units of the company located all over the country.

PRESSURE SURGE IN PIPELINE

1. What is Surge Pressure?

When there is a rapid change in flow rate in the pipeline due to operational change requirement, rapid change in pressure occurs. This phenomenon of rapid increase and decrease of pressure is called surge pressure.



2. Why Surge Occurs?

In any hydraulic system whether a simple pressurised water main or a complex process network, operational change is a routine affair which causes velocity fluctuation (change of flow rate). This can be caused by

starting or stopping of a pump, closure of an automatic emergency shutdown valve, rapidly closing or opening of motor operated valve, slamming shut of a non return (check) valve, sudden pump failure etc. Rapid changes in flow rate in a pipeline generates pressure waves which travels upstream and downstream from the point of origin. The resultant pressure in the pipeline (steady state pressure +/- pressure wave) is rapidly increased or decreased. This is known as surge or water hammer. The propagation velocities can be in the range of 330 meter/second to 1000 meter / second.

3. Some Basics about Surge Pressure

- a. **Period** : The time required for a pressure signal to travel the length of the pipeline system from the point of origin to other end and from the other end to originating point. Thus the time is twice the length of the pipeline divided by the wave speed.
- b. **Wave speed** : The velocity of sound in the fluid flowing in pipe, and is the speed at which surge pressure is transmitted along a pipeline.
- c. **Shutdown time**: The time required from initiation of emergency shutdown command to final closure of the required valve.
- d. **Signal Response Time** : The time between initiation of ESD at a remote control room to start of operation at the ESD interface unit at the main control room.
- e. **Actuation Response Time** : The time between operation of ESD unit at main control room to the commencement of an ESD

We won't have a society if we destroy the environment.....Margaret Mead.

valve closure at field.

- f. **Valve Closure Time** : The time required for valve to move from the open to the closed position.
- g. **Effective Valve Closure time** : The period over which an ESD valve reduces the flow from 90% of its steady state to zero. In relation to valve closure time, this is about last 5% for gate valves, about last 15% for butterfly valves, about last 25% for ball valves and about last 30% for plug valves.

4. How to Calculate Maximum Surge Pressure

The maximum surge pressure in a liquid filled pipeline when a surge occurs, following simplified equation can be used as per Pipeline Rule of Thumb.

$P = 0.8wV$ where P = Surge pressure in PSI, w = weight of liquid in lb / cubic foot, V = Velocity Change (in foot / second)

For each foot / second fluid velocity, there is approximately a 50 psi (3.5 kg/cm²) pressure rise. In case of a pipeline operating at a pressure of 400 psig (28.12 kg/cm²) with fluid velocity 10 foot /second, the approximate pressure rise due to surge will be 500 psi (35.16 kg/cm²). The total pressure will be 500 psi + 400 psig (operating pressure) = 900 psi (63 kg/cm²). If the pipe and pipe component used in the system is of 300 # (50 kg/cm²), then 900 psi (63 kg/cm²) pressure due to surge will be above design pressure of the piping component and the pipeline system may fail or over stressed.

5. Probable cause for Surge Pressure

- a. **Sudden tripping of pumps**: Sudden tripping of pumps is not uncommon in operation. Due to the pump failure, the flow in the pipeline suddenly drops but the column of liquid in the pipeline continues to move forward under its momentum. This creates a low pressure zone behind the liquid column. Due to static head of liquid column and the frictional force acts in opposite direction of this momentum which pushes the liquid column back towards the tripped pump. This flow with pressure gets obstructed by the NRV or check valve fitted on the discharge side of the pump resulting in rise in pressure. As a result, the net pressure is more than the pump discharge pressure. This excess pressure over the normal operating pressure is the surge pressure.
- b. **Sudden Closure of Valve** : Sudden closure of valve due to ESD operation or activation other safety interlocks in the process and pipeline operation is not an abnormal condition. Due to closure

of any valve in a flow line, the flow through the valve reduces which gives rise to pressure place on the upstream side of the valve and decrease in pressure taken on the downstream side of the valve. The pressure rise in the upstream pipe section of the closed valve transmits back through the liquid at a wave speed to the valve/equipment/pump. This rise in pressure (due to back and forth movement of pressure wave resulted from closure of the valve) adds to pump discharge pressure at some points on the pipeline and exceeds the maximum discharge pressure of the pump. This is nothing but the surge pressure.

6. What could happen due to surge pressure in the system if protection measures are not taken ?

- a. Axial separation of flanges
- b. Failure of pipe weld joints.
- c. Severe damage to pipe, pipe fittings and piping support.
- d. Pump misalignment.
- e. Damage to loading arm, hoses, filters bellows

7. Protection Measures

- a. **Install Surge Relief Valve in the system** : This will act at a pre-set pressure. When there is pressure rise in the system, the valve will automatically open and allow excess fluid to go to a designated tank. When the pressure comes back to normal, this relief valve will close automatically.
- b. **Increase the valve closure time** : Identifying those MOVs or actuated valve whose closure can be cause of high surge pressure. The desired closure time of the valve (increase valve closure time) can be incorporated in the purchase specification.
- c. **Converting MOVs to HOVs** : Those valves whose closure can result in high surge pressure can be converted to HOVs (provided those valves are not ESD valves) to rule out any surge effect .
- d. **Installing high discharge pressure tripping for the pump**: The set pressure for high discharge tripping of the pump be set at normal operating pressure + 10%. In case the discharge pressure is the maximum allowable operating pressure of the piping system, then trip pressure be set at MAOP + 4% or at a pressure which can produce a hoop stress equal to 75% of SMYS whichever is lower.
- e. **Tripping of the Pump on no flow condition or at minimum continuous flow condition.**

OVERHEATING OF CENTRIFUGAL PUMP

Many centrifugal pump failures were the result of a blocked-in discharge. The result could be cracked mechanical seals and excess vibration in the pump in some instances and could be a total seizing of the pump in some other cases. Most pump manufacturer or pumps manual recommend not to run pumps at blocked flow situation or no flow pump condition.

When a centrifugal pump is in a no-flow condition, it is still developing pressure to the trapped liquid. Shut off pressure of any pump is about 125% of its rated head. Roughly the no-flow horsepower is 40% to 60% of full flow. Much of this power energy is dissipated through heating the confined liquid in the pump casing.

An approximation of the liquid temperature rise in the casing during no flow centrifugal pump can be calculated from the following equation :

$$\Delta T = 81HP_{NF}t_{min} / D^3 \rho C.$$

where:

ΔT = Liquid temperature rise in pump casing, °F

HP_{NF} = No flow or blocked-in horsepower

t_{min} = Time pump operates at blocked-in condition, minutes

D = Impeller diameter, ft

ρ = Liquid density, lb/ft³

C = Specific heat of liquid, Btu/lb-°F

Let us consider the example of a 100 hp-centrifugal water pump with a one-foot-diameter impeller, using a 50% average blocked-in horsepower. It is blocked-in for two minutes to switch remote pumps.

$$\Delta T = 81 \times 50 \times 2 / 1^3 \times 62.4 \times 1 = 130^\circ F$$

The temperature of the trapped water in the casing would rise by 130° F

Ecology has become the political substitute for the word "mother".....Jesse Unruh

(54°C) which may or may not cause problems depending on the pump. What is important is that there are five variables in the above simple equation. Just saying a pump can be run for some more time with no flow would be damaging. As can be seen by the equation, a pump with a low no-flow horsepower and a large casing probably won't seize, but a high-energy pump with a smaller volume may cause serious problem.

Eventually the heat is dissipated through the casing, piping and shafting to the atmosphere and the temperature becomes steady state and doesn't keep increasing, which isn't considered here. This case considers a blocked-in discharge for a short time and is based on the casing being filled with a liquid. It must be remembered that this particular case applies to a radial-flow centrifugal pump, not a mixed-flow, axial-flow or other type of pump since they can have completely different no flow characteristics.

Starting up the pump with a slightly cracked opened discharge valve is standard practice on many low and medium-specific-speed pumps. In case a pump is required to operate in no flow condition for longer time this must be discussed with the pump manufacturer. In such case, pump manufacturer would work out how long its pump can be operated in this condition or if a by-pass arrangement is required or not.

Pumps handling Hydrocarbons would have a larger temperature rise than water since they have low specific gravity and specific heat values. Vaporization in the casing and run-dry conditions would be a concern. Therefore, it is always recommended to provide pump tripping at high casing temperature and/or tripping of pump at no flow condition or tripping of pump in case the discharge valve fail to open after a specific time.

Input Source : Hydrocarbon Processing

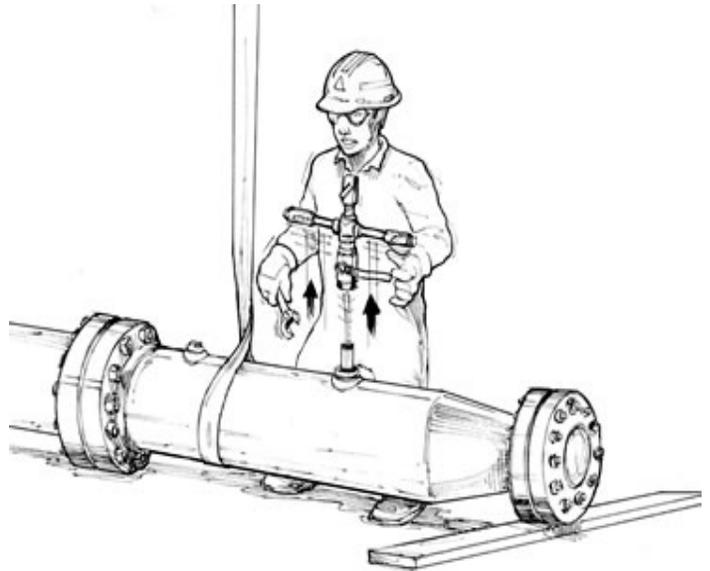
INCIDENT ALERT

FATALITY DURING PRESSURE TESTING OIL FIELD PIPING

In a welding shop, two workers pressurized two 16-inch "pig traps" (oil field piping) to 2,150 psi (151 kg / cm²). This pressure test verified the welds on the pig traps. Then one of the workers, started to disassemble the connection between the piping being tested and the pressure-recording device. However, he did not depressurize the piping pieces first. He used a pipe wrench to remove a test tee from a 1-inch ball valve that isolated the test tee from the piping pieces. The test tee did not unthread from the valve as expected. Instead, the valve itself unthreaded from the pipe nipple connecting the valve to the still-pressurized pig traps. As a result, the valve and the test tee shot upwards, striking the worker and causing serious injuries. He died in hospital after surgery.

Corrective actions and Recommendations :

1. It shall be ensured that a pressurized system is completely depressurized before carrying out any work on the system.
2. It shall be established and enforce written safe work procedures for pressure-testing operations, including the following:
 - a. A step-by-step process for pressurizing and depressurizing a system, including instructions for the required safety devices (pressure relief valve, pressure gauge, etc.)
 - b. The number of workers needed to perform pressure tests safely.
 - c. The specific role of each worker during pressure testing.



3. New workers shall be provided with the required orientation and training. Records of all orientations and training must be properly maintained.
4. Workers shall be provided with adequate supervision procedure during pressure testing to ensure safety

INCIDENT ALERT

FIRE IN AN AROMATIC EXTRACTION UNIT IN A REFINERY

In one of the refinery (outside India) having conventional petroleum processing units (atmospheric distillation, vacuum distillation, catalytic cracker, catalytic reforming, isomerisation, and alkylation), a fire was reported by an employee at the one of the units.

Consequences:

There was no human fatality. The environmental impact was limited to smoke released by the fire. Several main pipeline circuits were exposed to the flames. The fire-resistant concrete protecting the skirts around the stripping and extraction towers received only superficial damage. The framework elements trapped in the fire were not deformed, except for two supporting beams. The aluminium sheeting covering the heat insulation of certain

circuits were partially melted. Approximately 70 electrical and instrumentation cables were damaged by the fire. The property damage remained essentially within the unit.

Causes of the accident:

The cause of the incident was the thermocouple which was improperly installed on the bottom pipeline circuit of the one of the stripping tower. The installation was not in compliance with the construction drawing of a thermocouple well on a pipe.

The investigations conducted following the incident showed that the thermocouple had been installed without a "sensor pocket", thus without

What is the use of a house, if you have not got a tolerable planet to put it on?...Henry David Thoreau (1817-1862).

protection. The hot process fluid was thus in direct contact with the sensor. As the process fluid was at a very high temperature (320 °C), the tube fitting was unable to properly maintain the seal, leading to leakage and self ignition of the product released and in contact with the air. The equivalent diameter of the break at the pipe level is roughly 10 mm. A pool of flame quickly spread across the ground, forming flames of 5 to 6 m. The fire reached the scaffolding planks within the structure, increasing the height of the flames up to approximately 15 m for about 8 minutes.

LESSONS LEARNT

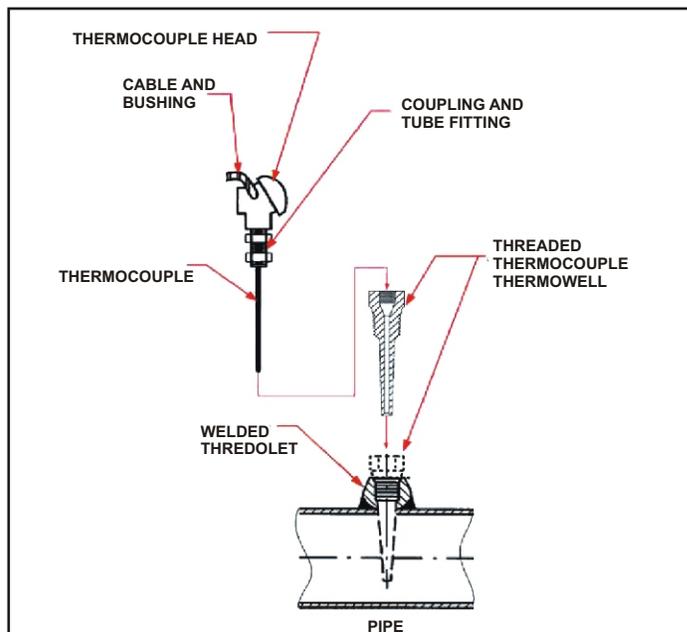
In addition to the human error that resulted in significant property damage to the unit, the faulty installation on the thermocouple resulted in a **failure of the Safety Management System**:

- Lack of communication between the refinery's "Piping" and "Instrumentation" departments,
- Poor definition of each department's role,
- Incorrect application of the procedures,
- Written work acceptance, on completion of job.

What is the actual procedure for Installation of thermocouple :

A proper installation of a temperature sensor (see diagram →) adapted to the installations' service conditions would consist of the following:

1. A threaded boss on the pipe wall for installation of the thermocouple;
2. Screwing of a "sensor pocket" on the aforementioned boss and reinforcement by means of a weld bead;
3. The thermocouple is then screwed into the pocket;
4. The wires are connected to a signal transmitter, once the cable is connected to the sensor by means of a coupling.



In this configuration, while ensuring a reliable temperature measurement, the thermowell guarantees that there will be no direct contact between the process fluid (for which measurement of the temperature is to be done) and the thermocouple.

In the above case of accidental rupture (contact between the process fluid and the thermocouple), the tube fitting limits / prevents the loss of confinement provided that the leak is not excessive.

DRAFT OISD STANDARDS HOISTED ON OISD WEB SITE FOR PUBLIC COMMENTS

Following OISD standards were hoisted on OISD web site <http://www.oisd.gov.in> with effect from 12th November, 2009. Comments if any be sent by 10th December' 2009 as detailed below :

OISD Standard No.	Subject	Comments to be sent to
OISD-STD-141	Design, Construction and Inspection requirements for cross country liquid hydrocarbon pipelines	sknandy.oisd@nic.in sknandy@hotmail.com
OISD-STD-164	Fire Proofing of Steel supporting structures in oil and gas industry.	ypgulati.oisd@nic.in gulatiyashpal@hotmail.com
OISD-GDN-166	Guidelines for occupational Health Monitoring in Oil and Gas Industry.	svardhan.oisd@nic.in svp57@rediffmail.com

CONSENT GIVEN BY OISD FOR OFFSHORE INSTALLATION

Consent for operation of installations:

(a) Consent for operation of semi-submersible Drilling Rig 'Actinia' given on 05.06.09

The Rig 'Actinia' is owned by M/s Transocean Inc. & hired by ONGC. This rig was built in the year 1982 at Hitachi Zosen, Japan and is classed as A1 Column Stabilized Drilling Unit. It is designed for operation in water depth up to 600m and maximum drilling depth is 25,000 ft.

(b) Consent for Drill Ship 'Discoverer 534 (D-534)' given on 08.06.09:

Discoverer 534 is a drill ship hired by Reliance Industries Limited from M/s Transocean Inc. for drilling in KG-DWN-98/3 (KG-D6) field in Bay of Bengal. D - 534 is capable of drilling in water depth of 1,800m and to a drilling depth of 7,600m and has class certificate from ABS for its fitness.

(c) Consent for Drill ship Deep Water Frontier (DWF) given on 10.6.09.

Deep Water Frontier (DWF) is a drill ship hired by Reliance Industries Ltd. from M/s Transocean Inc. for drilling in KG-DWN-98/3(KG-D6) field in Bay of Bengal. DWF is designed for max. water depth of 10,000 ft and drilling depth (rated) as 30,000 ft. It has class certificate of ABS.

The planet and mankind are in grave danger of irreversible catastrophe....war of mass destruction, overpopulation, pollution, and depletion of resources.....Richard A Falk.

(d) Consent for Jack up Drilling Rig 'Virtue -1' given on 11.6.09:

Virtue#1 jack up drilling rig hired by ONGC from Jindal Drilling & Industries Ltd. is of KFELS B CLASS design with spud can of 53 feet diameter. It is classed as ABS+A1. It can operate in maximum water depth of 300-350 feet & has drilling depth rating of rig 6,000m+.

(e) Consent for Work-over Rig Sundowner #7, 6 given on 2.7.09 & 22.7.09 respectively:

Sundowner # 6, 7 are modular work-over rigs deployed in Mumbai High for ONGC by M/s Sundowner Offshore International (BERMUDA) Ltd. Unlike jack up rig, which has legs and floats from one location to another, this rig is designed as components that are assembled on a platform. The primary advantage of this rig is the ability to be transported and assembled on offshore platform in a very short period.

(f) Consent for Wellhead Platforms 'HI, HJ, HSC and B-134' of ONGC given on 15.07.09:

HI, HJ, HSC and B-134 are new wellhead platforms connected to Heera Process complex, situated 70 km southwest of Mumbai, through pipelines. All the four platforms are conventional fixed jacked type. HI will have 6 well fluid producers and 3 water injection wells, HJ will have 5 well fluid producers and 1 water injection well, HSC will have 11 well fluid producers and 3 water injection wells and B-134 will have one well fluid producer.

AUDITS

EXTERNAL SAFETY AUDIT

EXPLORATION & PRODUCTION

OFF-SHORE:

1st to 4th June, 2009: Two offshore jack up rigs Sagar Uday & Pride Pennsylvania (ONGC owned and hired offshore jack-up drilling rigs respectively) were audited by the OISD team. The objective of this audit was to evaluate compliance to the 'Petroleum and Natural Gas (Safety in Offshore Operations) Rules, 2008'. The audit comprised of systems audit including verification of operations.

(a) Sagar Uday MODU (Mobile offshore drilling unit) is owned by ONGC and is capable of drilling in water depths up to 300 feet. Built in 1990, it is classed as 'A 1 self elevating drilling unit' by ABS. At the time of the audit, the rig was engaged in workover operations at well #6 at SP platform in Mumbai High South field.

(b) Pride Pennsylvania is an independent leg cantilever jack up rig of 'Marathon design – MLT 53', owned by Pride International. The rig is capable of drilling in water depths up to 300 feet. Built in 1973, it is classed as 'A 1 self elevating drilling unit' by ABS.

ONSHORE

6th to 10th July, 2009: Following Installations of Oil India Limited:

- i. Drilling Rig – E 3000 (S-8)
- ii. Production Installation – OCS - Makum
- iii. Drilling Rig – CH3-ZJ 50D (Jay Bee)
- iv. Work over Rig – Cardwell C
- v. Production Installation – EPS - Baghjan
- vi. Work over Rig - CH4 – ZJ 20 (Shiv-Vani)

PRE-COMMISSIONING SAFETY AUDITS

CROSS COUNTRY PIPELINE

3rd June'2009: IOCL's Rewari Intermediate Pump station under Mundra – Panipat Crude oil Augmentation project. Augmentation of this intermediate pump station is done by installation of two motor driven pumping units to

enhance the pipeline capacity from 6 MMTPA to 9 MMTPA.

MARKETING COORDINATION

20th July'2009: HPCL's LPG Bottling Plant, Kochi.

SURPRISE SAFETY AUDITS

EXPLORATION & PRODUCTION

8th July, 2009: Oil India Limited's Production Installation -OCS Tengakhat

MARKETING COORDINATION

2nd to 4th June'2009: HPCL's POL Terminal, Pampore

21st to 22nd July'2009: IOCL's LPG Bottling Plant, Kochi

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