



Precautions & Prevention of Pipeline Accidents

Chemical & (Industrial) Disaster Management (CIDM)
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Cross Country Pipelines in India

- The rapid growth of business all over the world requires increasing hydrocarbon transport capacity.
- A pipeline is actually a system of equipment designed to allow material to flow continuously or intermittently from one location to another.
- With sophisticated technologies providing increased applications, pipelines are gaining advantage over other means of transport due to economic and safety considerations.



India is having more than 42000 KMs of Cross Country Pipelines

Hazards of Hydrocarbon Cross Country Pipelines

- Hydrocarbons are highly flammable substance, transported through cross country pipelines at high pressure often close to centres of high population or through areas of high environmental sensitivity.
- Hydrocarbon Pipeline system pose severe hazard problems for human being and property in the vicinity.



*Jet Fire, Flash Fire,
BLEVE, Vapur Cloud
Explosion etc.*

- Provision of protective measures are essential for safe operation of Pipeline system. The requirement is based on
 - Hazardous properties of Hydrocarbon
 - Quantity of Hydrocarbon, which could be released and its effect.

Cross Country Pipelines Incidents

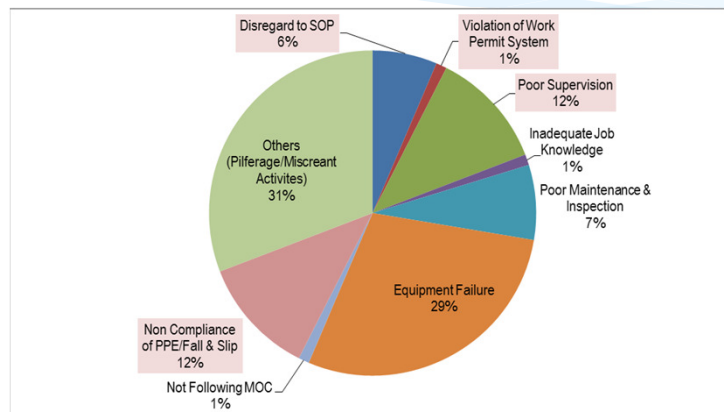
Fire erupted in one of the Natural Gas Pipeline

Minneapolis — A natural gas-fueled fire erupted in south Minneapolis on Thursday morning, March 17, 2011. The fire forced Interstate 35W to close in both directions, though it reopened late in the morning. There were no reported injuries and the fire was extinguished.

Rupture of TransCanada Natural Gas Pipeline

ST. PIERRE-JOLYS, Manitoba, Canada, January 27, 2014 (ENS) – A TransCanada natural gas pipeline ruptured and exploded early Saturday morning in an isolated area near the town of Otterburne, 25 kilometers (15 miles) south of Winnipeg. The pre-dawn pipeline break and resulting explosion sent a massive fireball into the night sky.

Major Cross Country Accident Statistics: OISD (2004-2015)

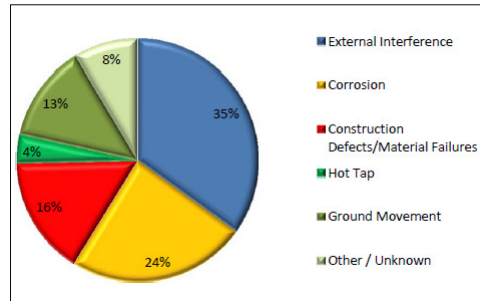


31% of Pipeline Incidents attributed to Pillferage/Third Party Interference Activities. However, 36% of Incidents attributed to Equipment Failure and Poor Maintenance and Inspection.

Accident Statistics - EGIG

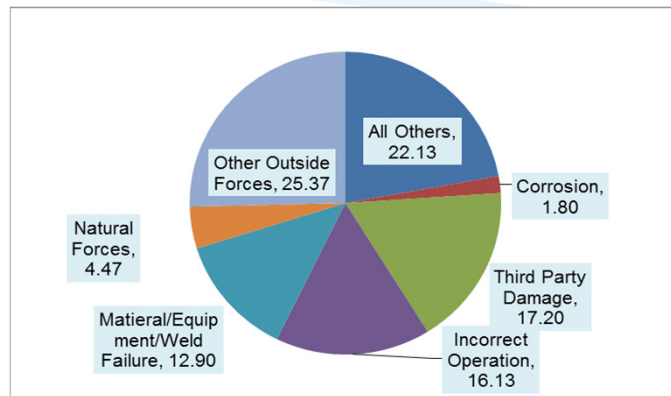
In 1982 six European gas transmission system operators took the initiative to gather the data on the unintentional release of gas in their transmission pipeline system known as EGIG (European Gas Pipeline Incident Data Group).

EGIG has maintained the European Gas Pipeline Incident Database of fifteen European Countries on more than 143000 KM of pipelines every year.



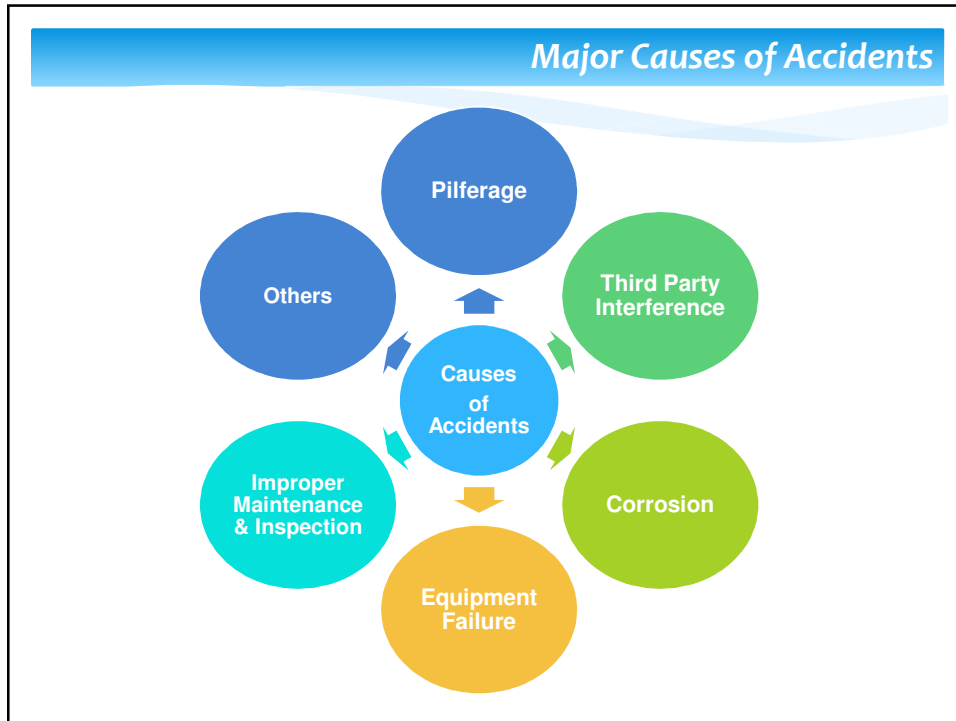
Source: 9th EGIG Report 2004-2013

Major Accident Statistics – PHMSA (2015-2017)




Source: US Department of Transportation Pipeline and Hazardous Materials Safety Administration (2015-2017)

US Department of Transportation Pipeline and Hazardous Materials Safety Administration maintained Incident Data of more than 500000 KMs of Cross Country Pipelines.

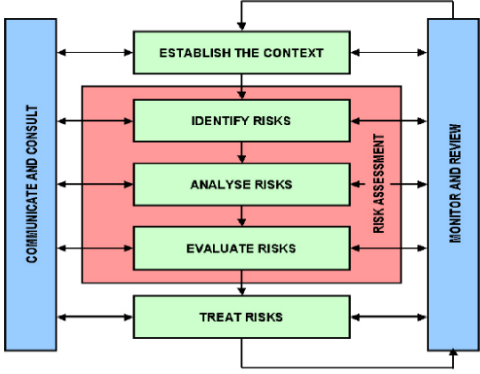


Leadership & Commitment

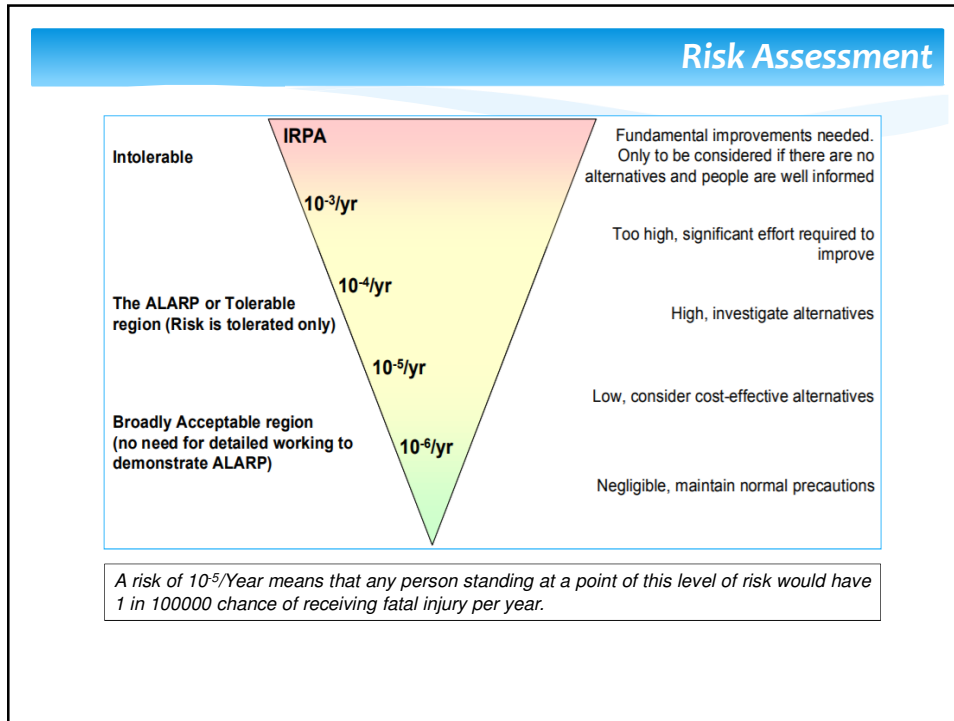
- To formulate and maintain HSE Policy, Goals & Objectives
- To allocate necessary resources to meet the requirements
- To promote a positive HSE Culture and its assessment periodically
- To encourage engagement and leadership at all level of the Organization
- To conduct periodic HSE Management System review and recommend changes for continual improvement



Risk Assessment



- To identify emergent, plausible, and severe risks resulting during Life Cycle of facilities
- To determine “Risk Acceptance Criteria”.
- Clear guidance on how to measure the risks and define the limits of acceptability.
- To emphasize the usage of the Hierarchy of Controls for reducing the unmitigated risk.



Design & Construction

- **To adopt National & International Codes & Standards as 'Minimum Requirements'**
- **Thinking beyond 'Minimum Requirements' for long term aspects**
- **More focusing on 'Inbuilt Safety System'**
- **Introduction of new technologies on Leak Detection, Corrosion Monitoring, Distributed Acoustic Sensing System etc.**
- **Quality Control**


Design & Construction		
Construction, Operation & Maintenance of Natural Gas Pipeline System		
PNGRB	OISD	ASME 31.8
(Technical & Safety Standard of Natural Gas Pipelines)	(Standard 226 – Natural Gas Transmission Pipeline and City Gas Distribution Network)	(Gas Transmission and Distribution Piping Systems)
(Technical & Safety Standard of Petroleum & Petroleum Product Pipelines)	(Standard 214 – Cross Country LPG Pipelines)	(Managing System Integrity of Gas Pipeline)
(Integrity Management System for Natural Gas Pipeline)	(Standard 141 – Cross Country Liquid Hydrocarbon Pipelines)	

Operation, Maintenance & Inspection

- To maintain safety in a manner consistent with specified requirements of regulations and National & International applicable codes and standards.
- Process Safety Information
- To formulate Standard Operating Procedures
- To implement 'Integrity Management System' to minimize the probability of failure of Pipelines
- To keep focus on quality of 'Outsourced Manpower'.



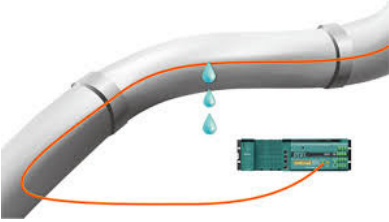
Training & Competency




- Engagement of employees having Minimum Qualification and Experience, as stipulated in Codes/Standards/Regulations.
- Engagement of Subject Matter Experts on aspects like Pipelines Corrosion, Cathodic Protection (CP), in line Inspection (ILI), Coating, metallurgy and welding etc.
- Development of skilled and certified professionals like NACE Certified Corrosion Expert etc.

IT Support

- Mapping of all the pipelines on GIS platform containing all pipeline related information along with satellite imagery, cadastral maps etc.
- Centralized Pipeline Integrity Management System (CPIMS) based on Risk Based Analytic software
- Leveraging IT in Safety functions like Work Permit System, Incident/Accident Reporting & Analysis, Risk Assessment, Compliances etc.



Societal Capacity Building



- Awareness Programme for surrounding villagers along the pipeline route
- Public awareness about the gas pipelines safety through Radio Jingle/Video/Skit etc.
- Engagement of Villagers residing near the pipeline ROU
- Collaboration with Government Authorities on Management of Emergencies in Hydrocarbon Pipelines

