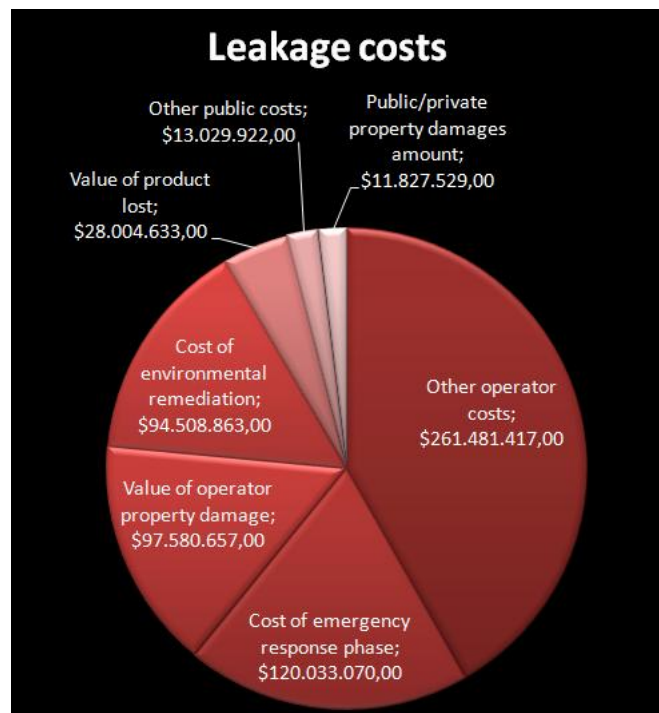


## THE TRUTH ABOUT LEAKS IN OIL AND DERIVATIVES PIPELINES

This job was prepared with the purpose of alerting the community of professionals from pipelines of oil transportation or other products that may cause risks to people, environment, including wildlife, property etc. It also serves to call the attention of legislators, politicians, technicians and engineers from environmental institutes to the importance of equipping the pipeline system with appropriate technology for disasters prevention.

This study is based on data taken from PHMSA - Pipeline and Hazardous Materials Safety Administration website, from US Department of Transportation, covering virtually all American pipelines companies from 2002 to 2009.

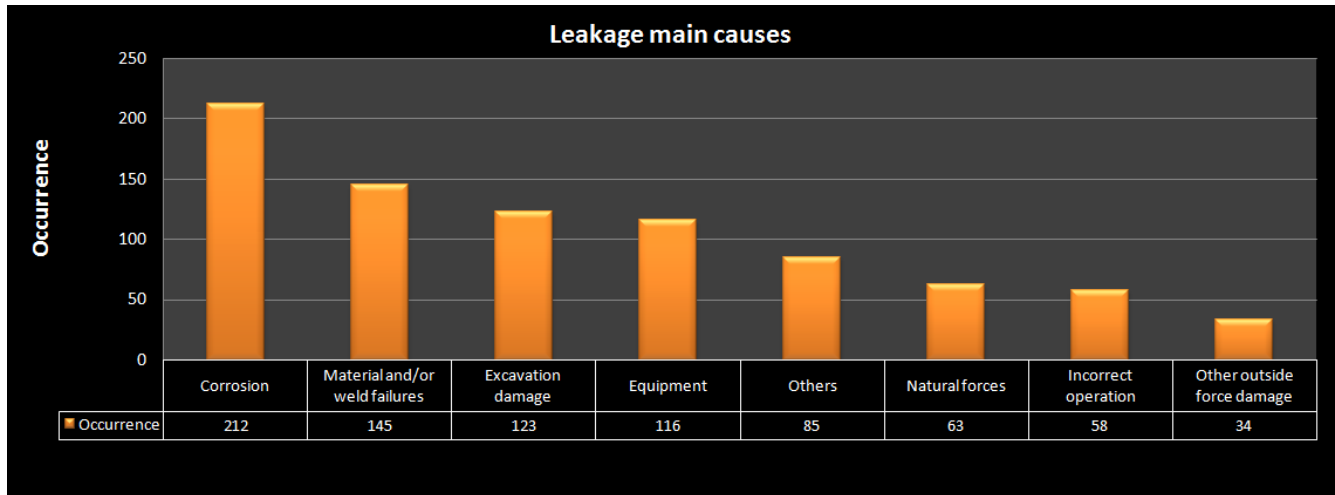
The environmental accidents with oil products and derivatives can be defined as unexpected events that directly or indirectly affect the safety, the company and health of the population involved, causing impacts to the environment generating high operating costs, as shown in Graph 1. This chart shows that the direct cost of these accidents surpassed **\$ 600 million**. However, it was not considered companies shares devaluation that may have been around **\$ billions**, as in the recent case of BP. The accident in the Gulf of Mexico in April 2010.



Graphic 1 - Source: PHMSA Significant Pipeline Incidents, 2002-2009.

The accidents of technological origins (corrosion, cracks, digging error, etc.) are mostly predictable. That is the reason why it is necessary to work primarily on the prevention of these episodes, not forgetting of course the preparation and action upon the occurrence of them.

The **Graphic 2** shows the main causes of the pipelines leaks occurrences. **It is interesting to note that even with the advanced monitoring technology; corrosion is the most frequent cause of leaks.** Excavation error (interference from others) and natural forces are also significant. It is easy to verify that a leak detection technology effectively makes a great lack in these cases.

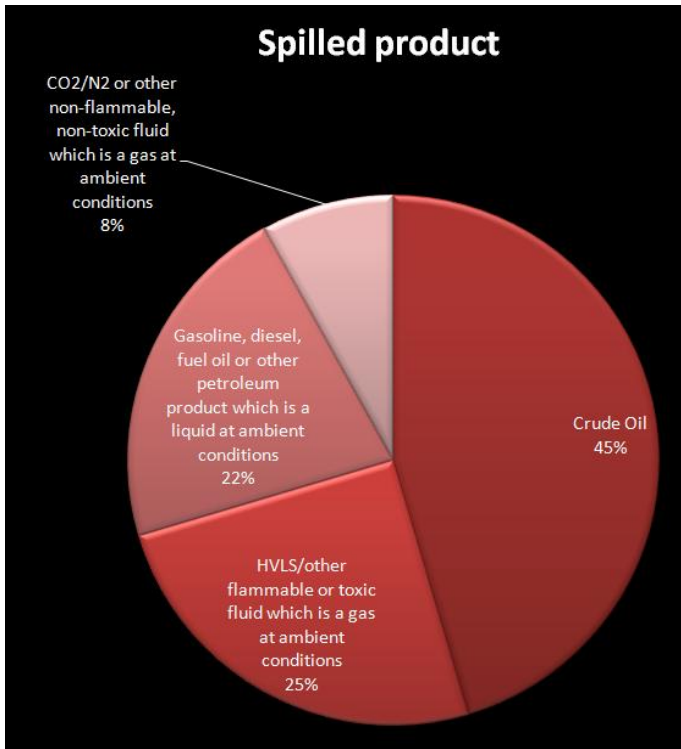


**Graphic 2 - Source: PHMSA Significant Pipeline Incidents, 2002-2009.**

**Disasters (Figure 1) could be avoided with a warning from a fast and effective leak detection system that would allow the pump stop and closing the valves.**



**Figure 1 - Examples of big proportion accidents**



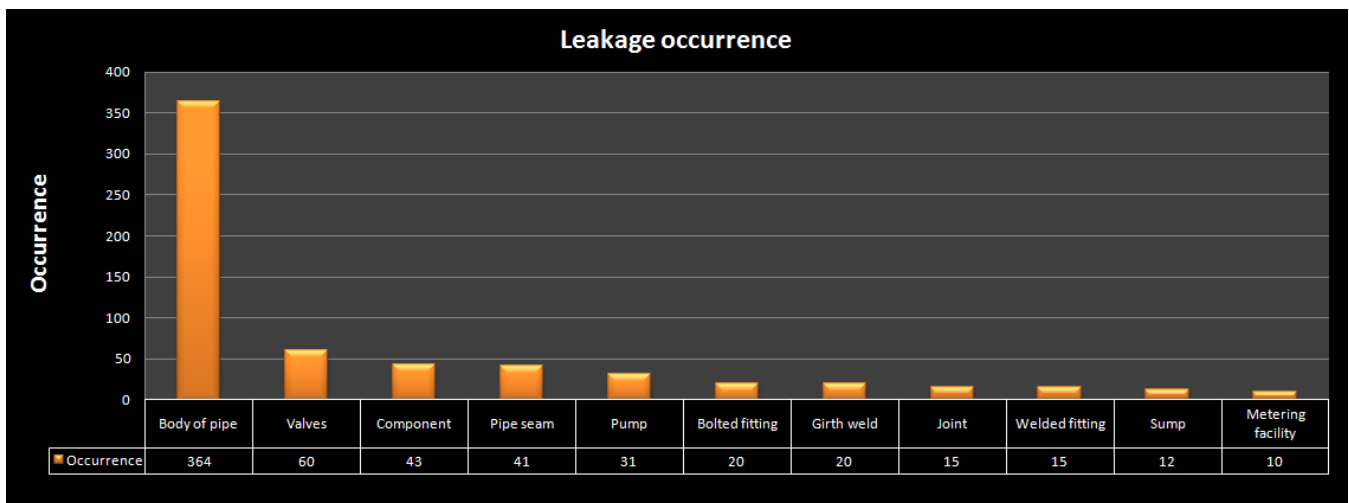
The **Graphic 3** shows the percentage of the leaked products with consequences already known to persons or to public and private property:

- Loss of life
- Environment impacts
- Human health damage
- Economic damage
- Commitment with the image of industry and government

**Graphic 3 - Source: PHMSA Significant Pipeline Incidents, 2002-2009.**

### Risk identification and assessment

The **Graphic 4** shows that **the most part of leaks incidence occurs in the pipeline body**. The leak occurred on flanges, valves and other accessories are much smaller. **Therefore, it is necessary to think in detecting and locating leaks in pipelines.** This measure would reduce the chances of new disasters.



**Graphic 4 - Source: PHMSA Significant Pipeline Incidents, 2002-2009.**

The ideal Leak Detection and Location System should react (alarm) to leaks as quick as possible, ie, in seconds. It should also have the ability to locate the leak, either in a buried or submerged pipeline, with the best possible accuracy, ie, in meters. Quantifying the poured volume it is also very important, giving the correct problem dimension to the responsible ones, as well as the exact information about the steps to be taken to rectify the problem.



Figure 2 – Team working to clean the affected region

A **reliable Leak Detection and Location System** is the fundamental factor to reduce or even prevent major accidents (Figure 2), as reported by PHMSA and that also happen frequently in all countries with networks of pipelines. Certain variations may occur in cases of leaks, depending on the culture, laws, economic situation and the political system of each country.

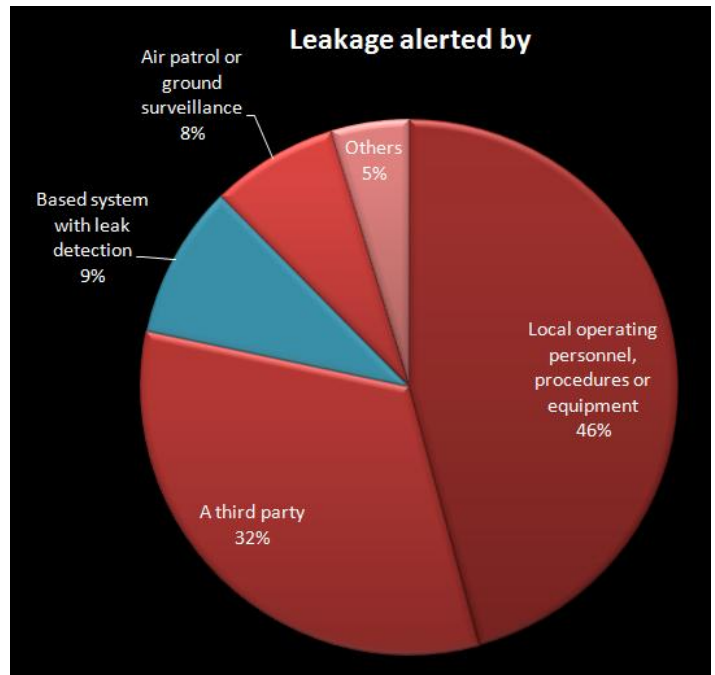
This study does not cover leaks caused by stolen products, what is much more common in countries with lower development index. This type of "leakage" is responsible for big financial losses and tragedies involving human lives, as happened several times in Nigeria.

## Prevention

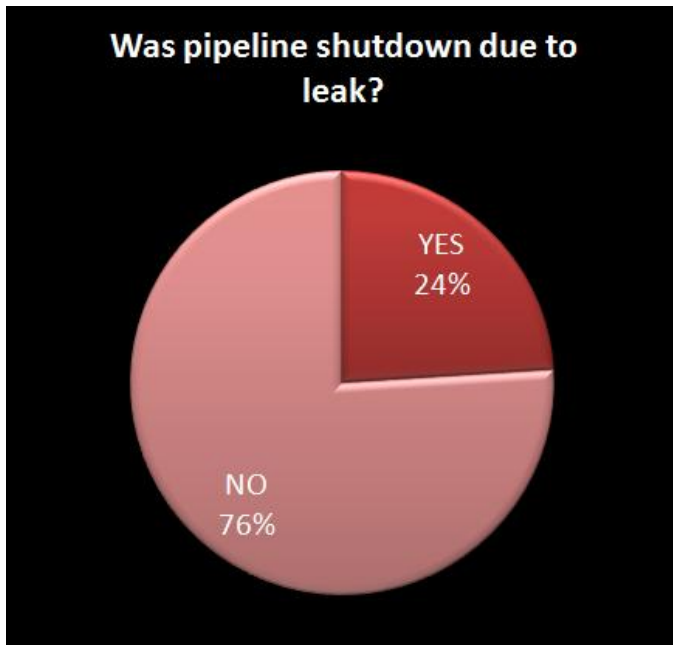
This study shows us that unfortunately 78% of leaks (**Graphic 5**) were only announced after the DISASTER has occurred, and only 9% of the leaks were alarmed by Leak Detection Systems.

As seen in **Graphic 6** in 76% of reported leaks, the pipelines have not ceased their operation, and most are located at risk areas, according to **Graphic 7**.

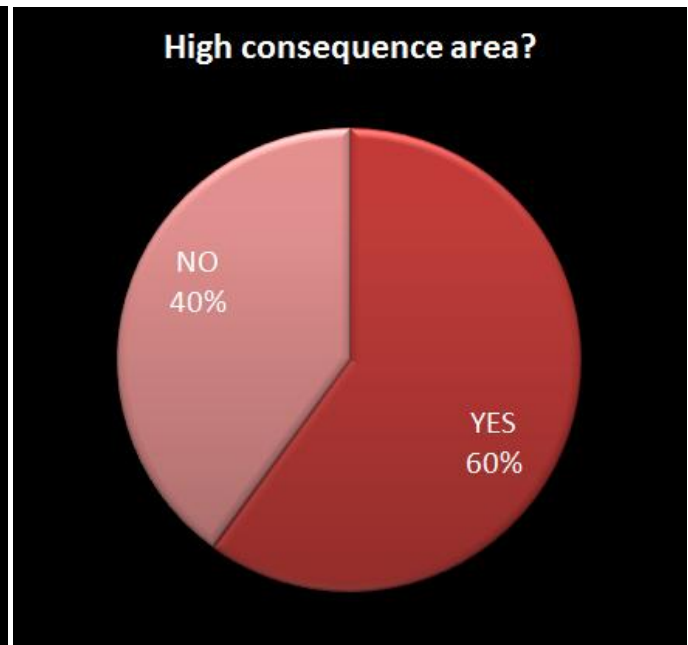
It proves that the use of quick and effective Leak Detection Systems would be essential to avoid irreparable damage to the environment and the economy of countries and companies involved.



**Graphic 5 - Source: PHMSA Significant Pipeline Incidents, 2002-2009.**



**Graphic 6 - Source: PHMSA Significant Pipeline Incidents, 2002-2009.**



**Graphic 7 - Source: PHMSA Significant Pipeline Incidents, 2002-2009.**