Statistical analysis of spills from Western European cross-country oil pipelines 1971-2016

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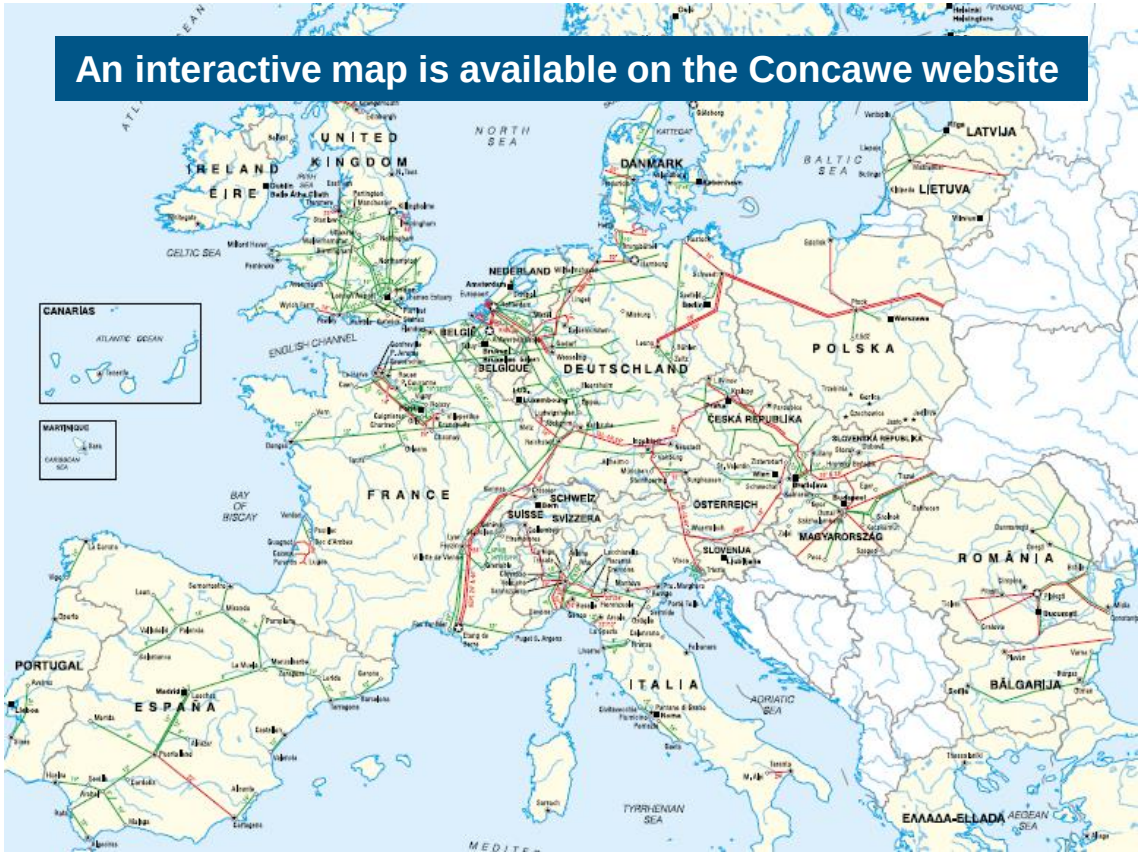
01 The Concawe Network

The “Concawe” network in picture



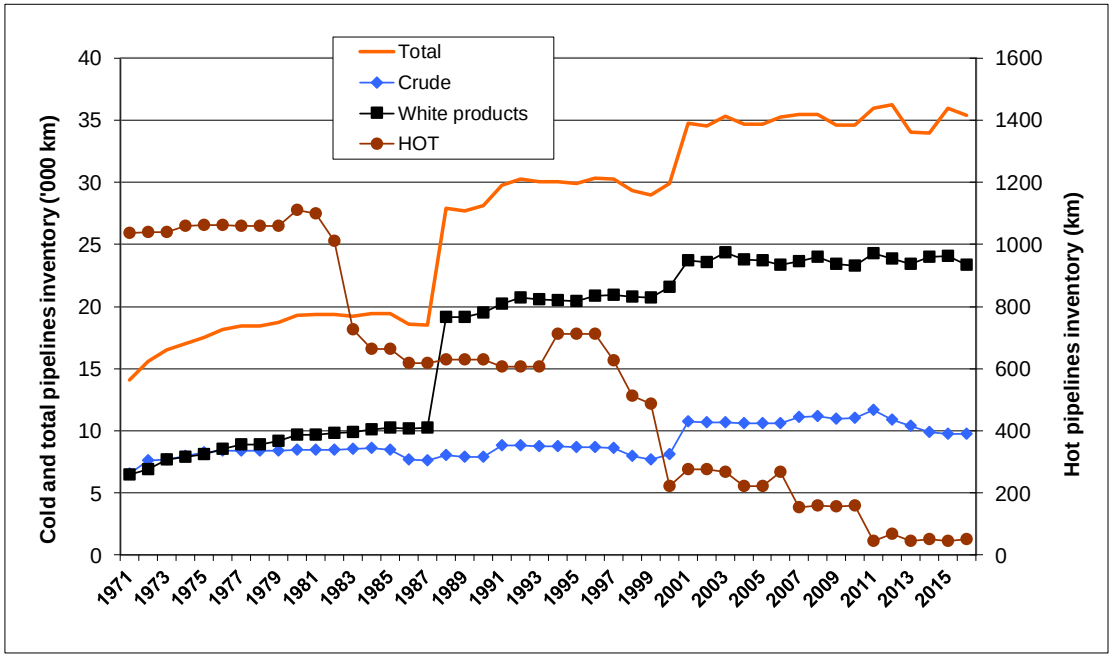
The “Concawe” network in figures

- CONCAWE maintains contact with 78 companies
  - **About 165 separate pipeline systems**
  - **Divided in over 699 active sections**
  - **Combined length > 37,000 km**
- For 2016 we received information from 68 companies
  - **145 systems**
  - **639 sections**
  - **~ 35,000 km combined length**
  - **Combined throughput ± 755 Mm^3**
    - *Crude: 449 Mm^3*
    - *Products: 306 Mm^3*
  - **Traffic* volume ± 119 10^9 m^3.km**
    - *Crude: 77 10^9 m^3.km*
    - *Products: 42 10^9 m^3.km*

**Traffic = flow rate x distance travelled*

The “Concawe” network in figures (cont’d)

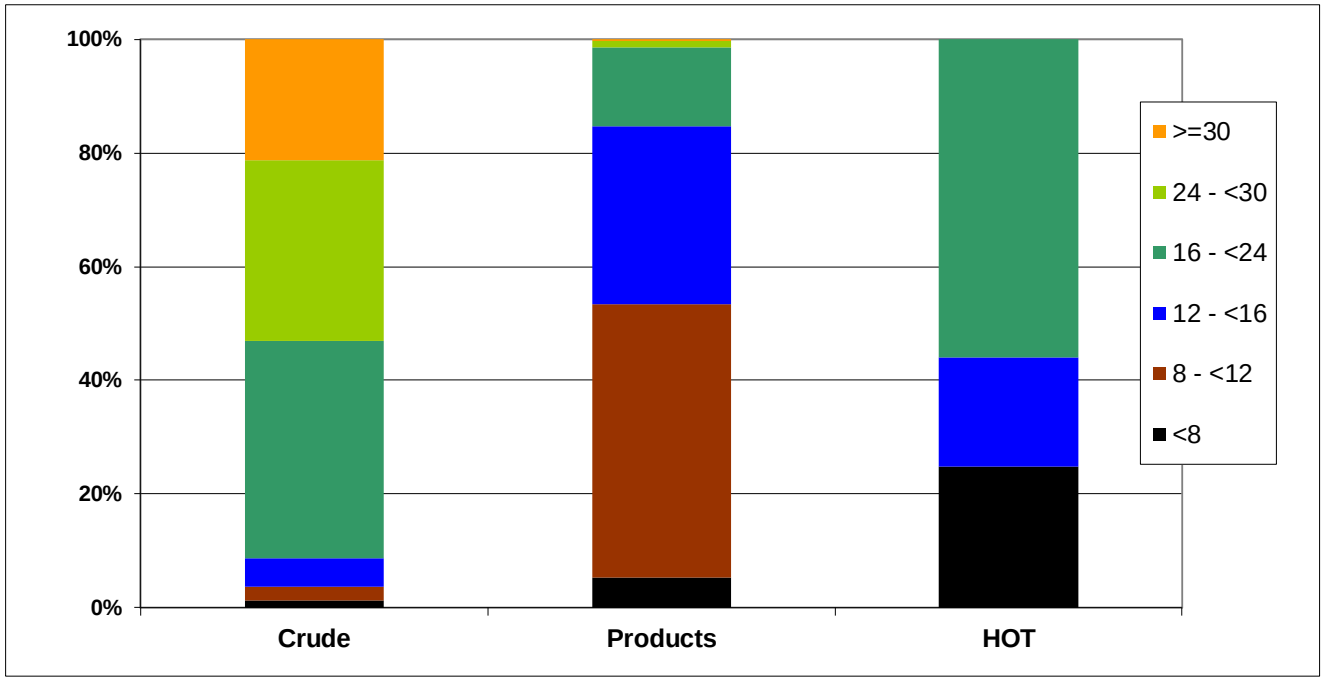
- Inventory by service and over time



- **The inventory has increased over the years as more operators joined (NATO, former Eastern bloc)**
- **“Hot” pipelines has virtually all been retired**

The “Concawe” network in figures (cont’d)

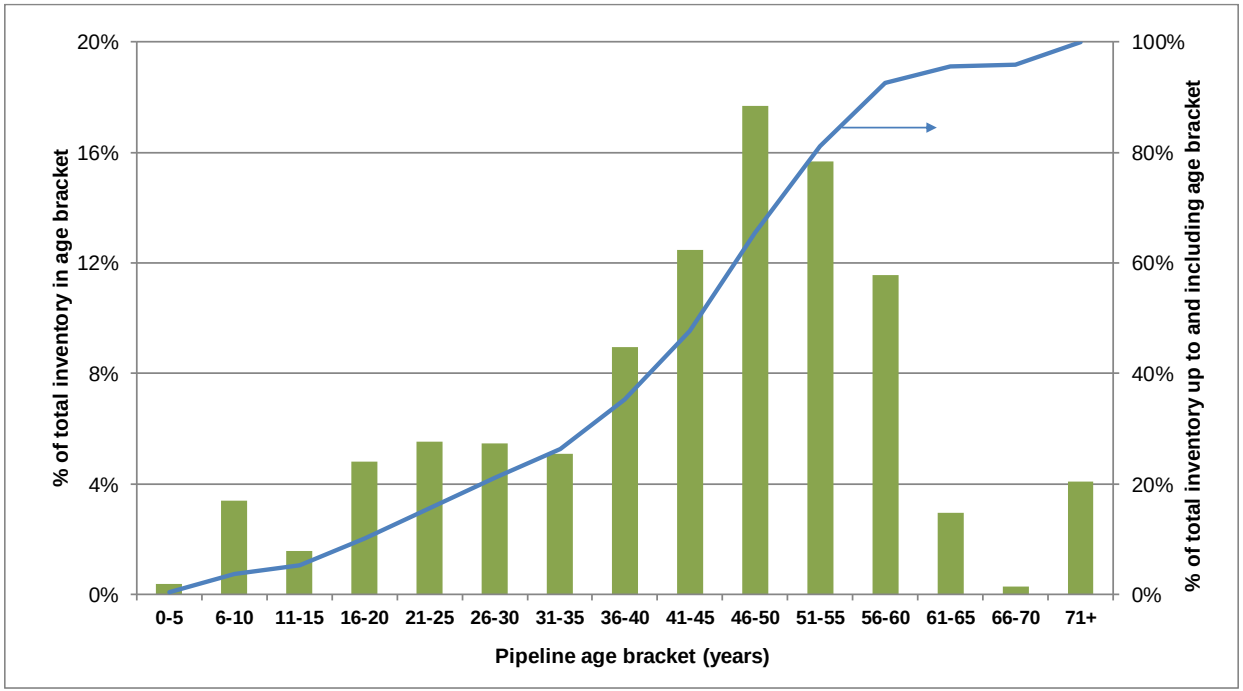
- Diameter distribution (2012)



- **Crude lines tend to be larger than product lines**

The “Concawe” network in figures (cont’d)

- Age distribution (2016)



- **Over 60% of the inventory is 40 years old or more**

02 Safety record

Safety record (in relation to spillage incidents)

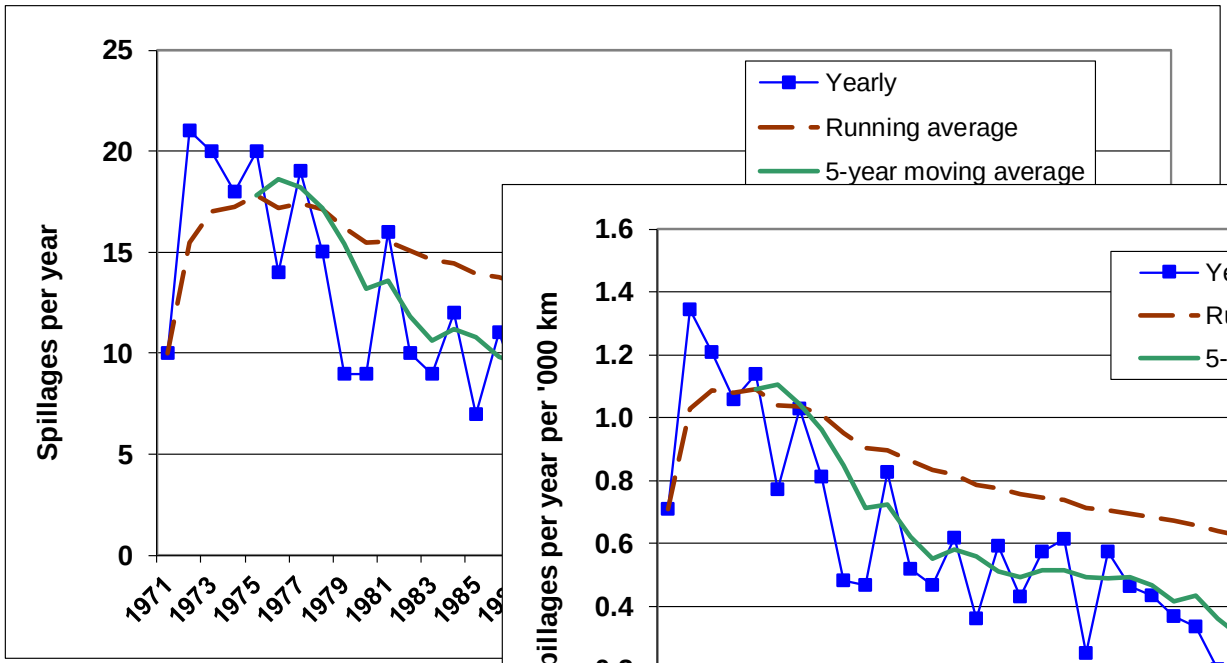
- No fatality, injury or fire reported since COPEX 2014
- 3 injuries reported since 1971
  - **Last recorded injury was in 2006**
- 14 fatalities in 46 years, none involving members of the public
  - **Last recorded fatality was in 1999 (1 fatality)**
- 9 fires in 46 years
  - **Last fire in 1999**

03 Spillage statistics

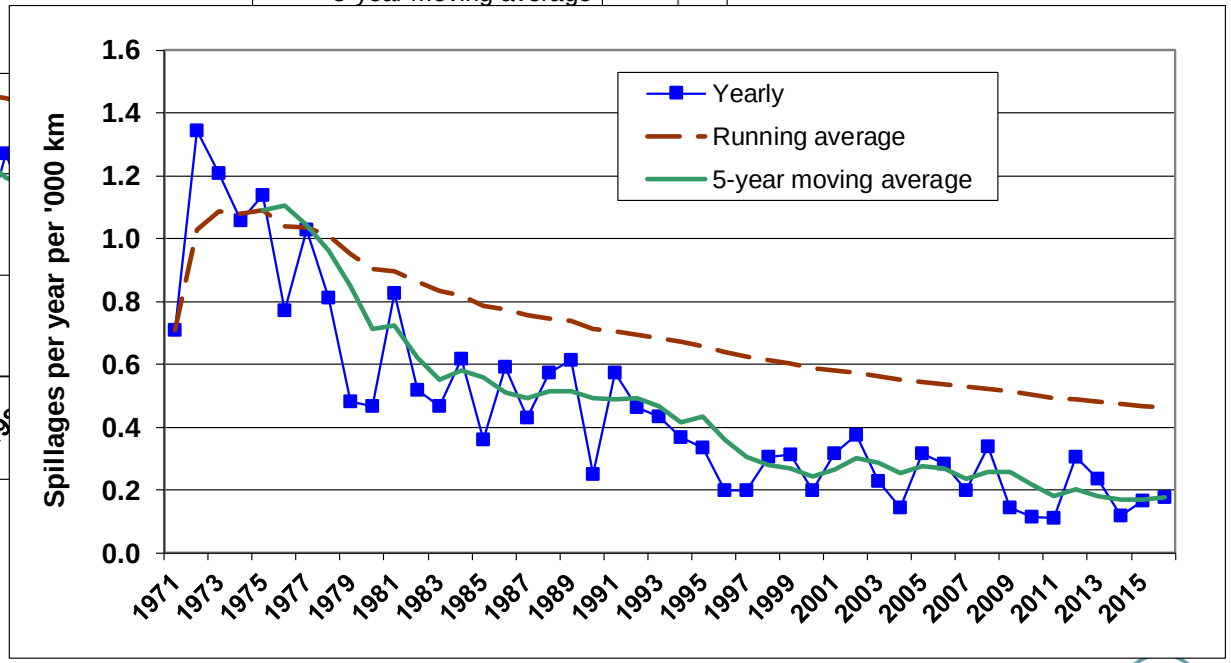
Spillage events

- Since the beginning of the decade, the game changer has been the very rapid increase of the number of product or attempted theft, often resulting in a spill
  - **Out of a total of 741 spillage events, 247 were caused by theft or attempted theft of product**
- In order not to distort the long-term statistics, we report these theft-related events separately

Spillage incidents (exc. theft)



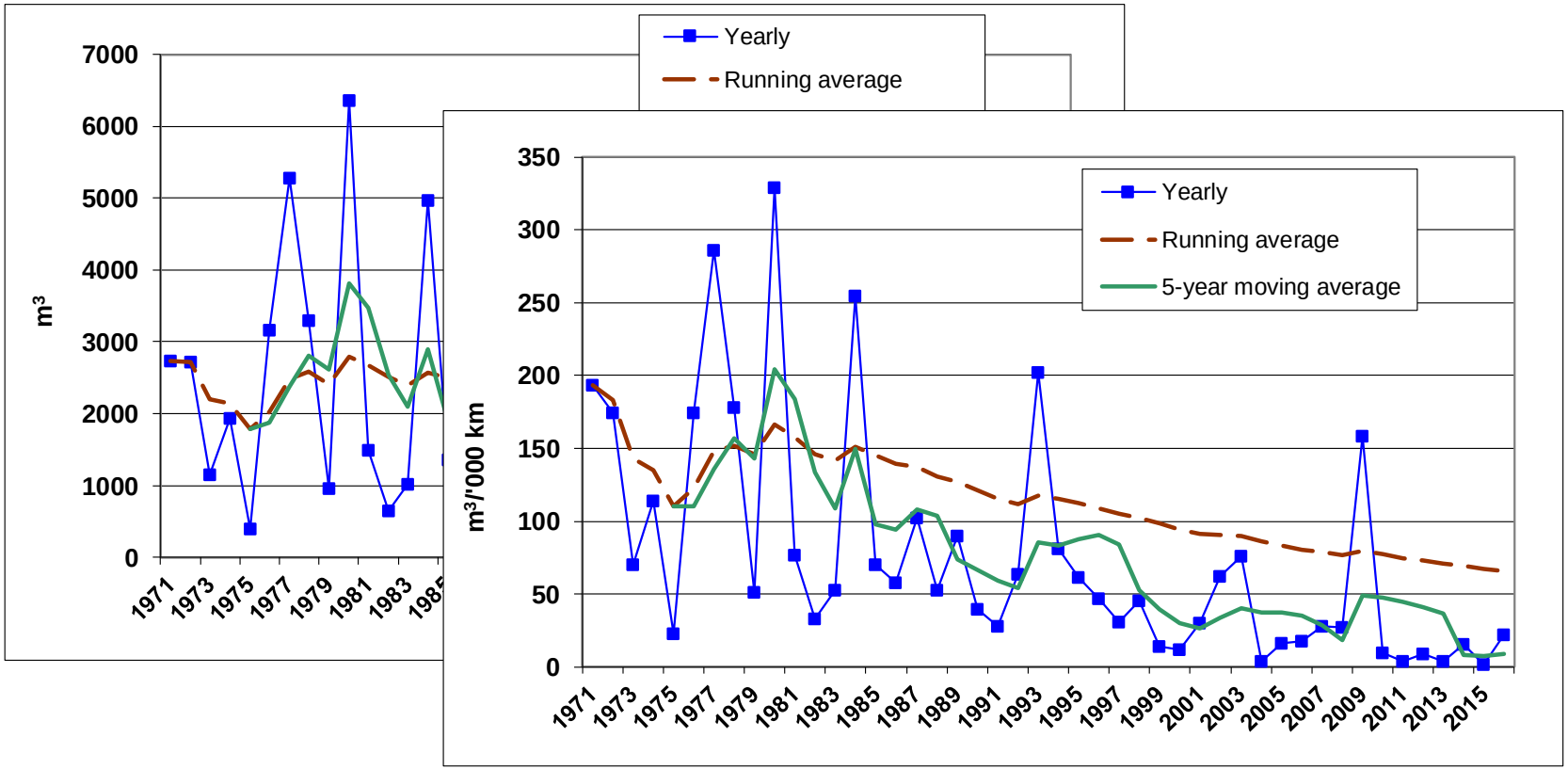
Number of spillages



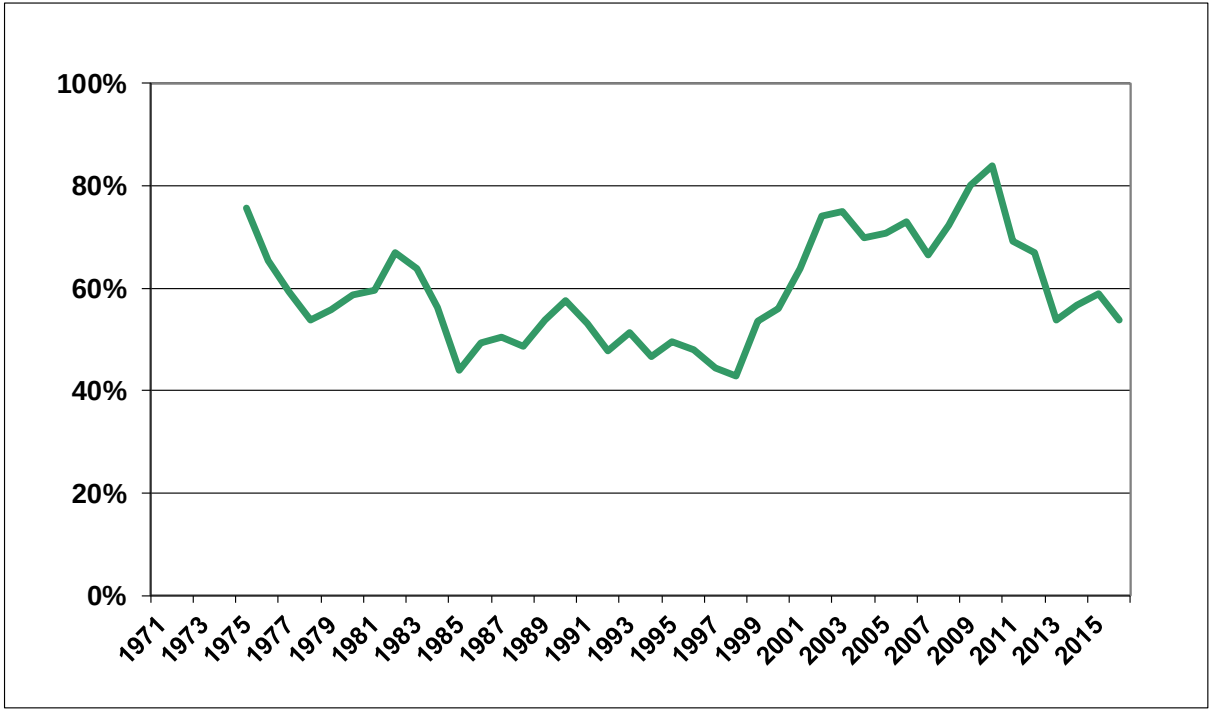
Frequency

Concawe

Gross volume spilled

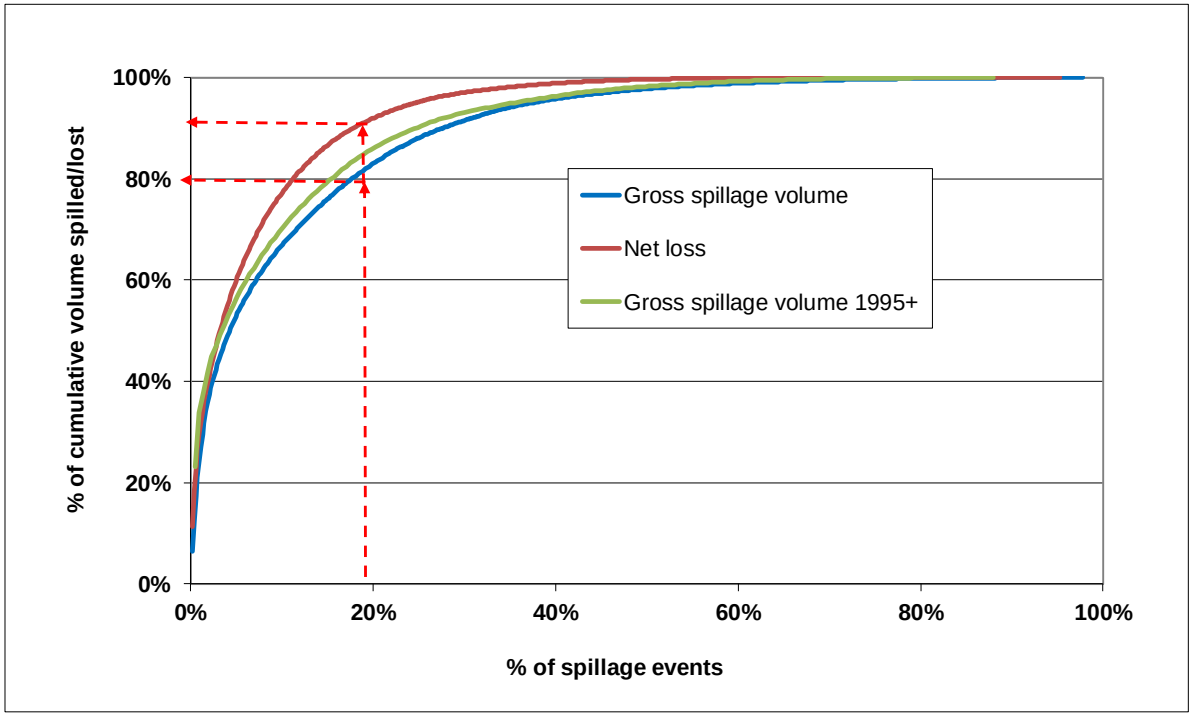


Spilled volume recovered



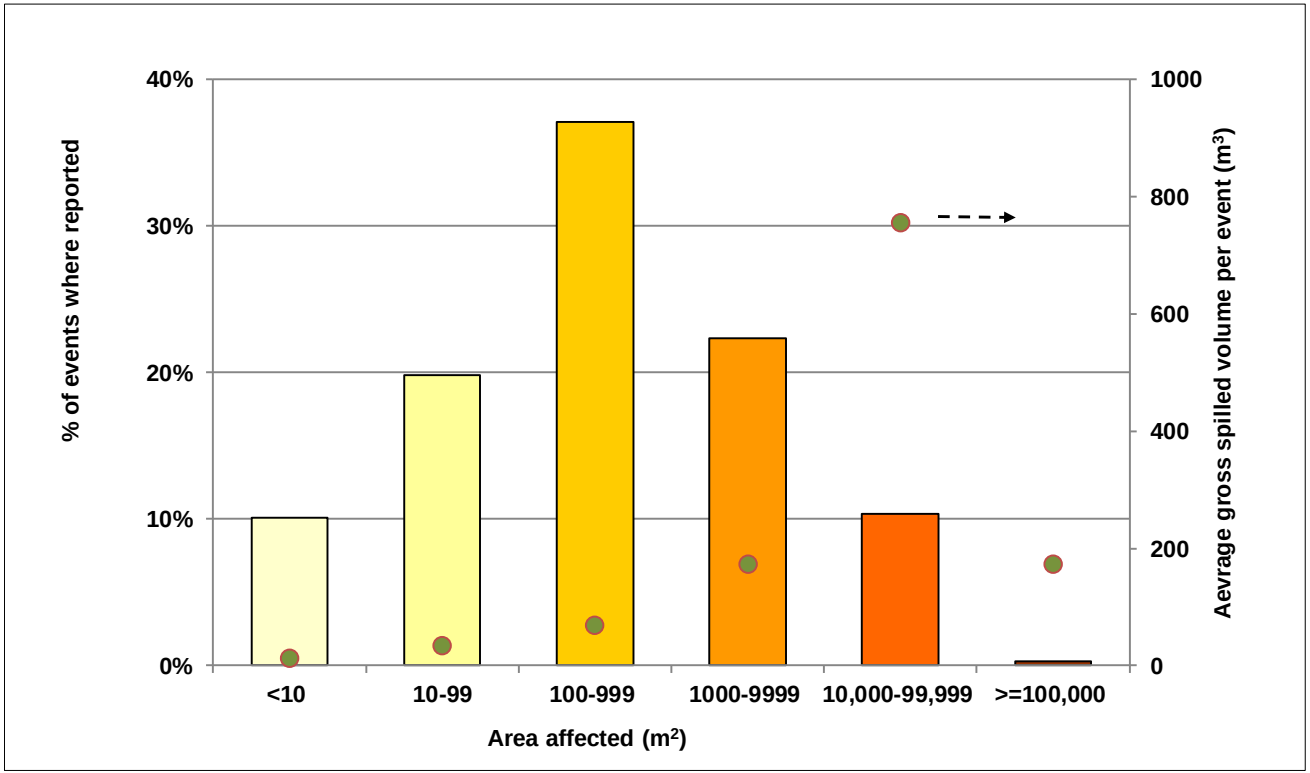
- About 60% of spilled volume is recovered on average

Spillage volume distribution



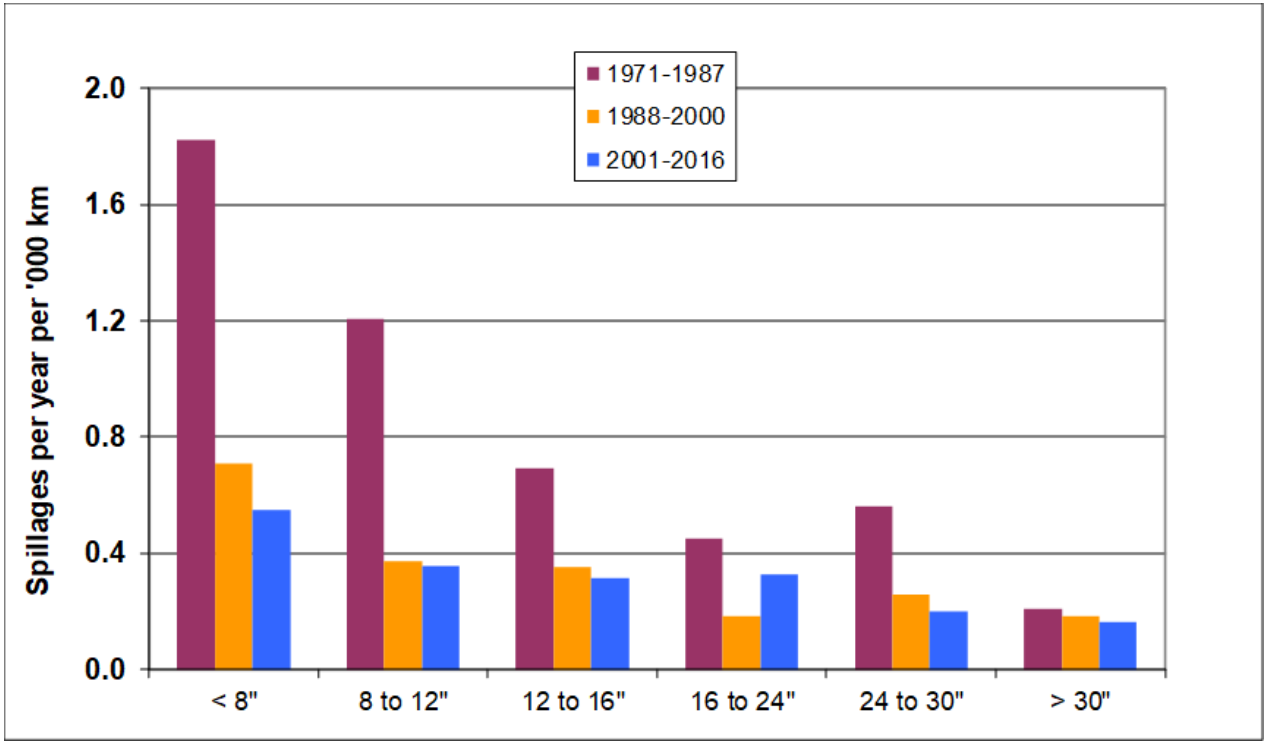
- 20% of events account for 80% of the gross spillage and 90% of the net loss
  - **The picture has not changed much with time**

Ground area affected by spills



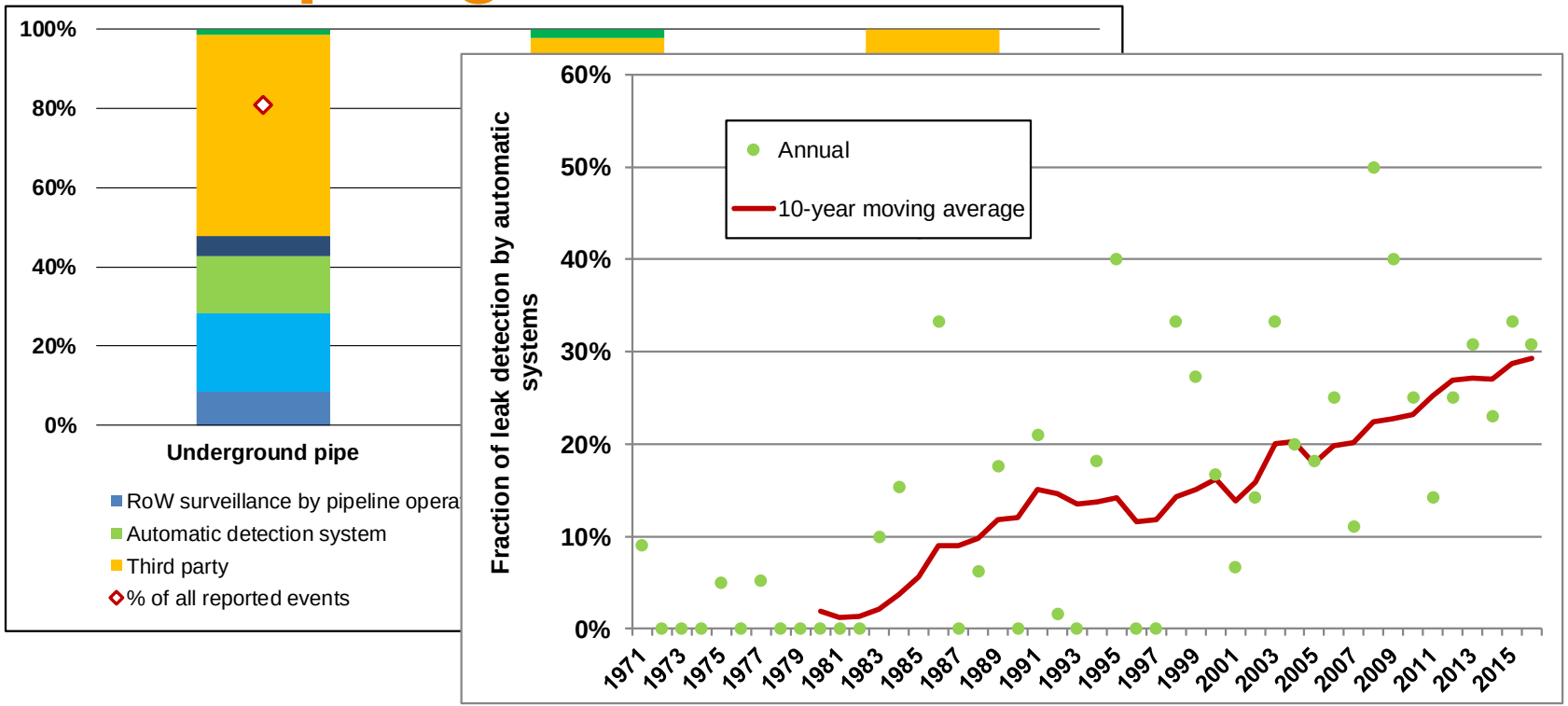
- A relatively small spilled volume can contaminate a large area

Spillages per diameter class



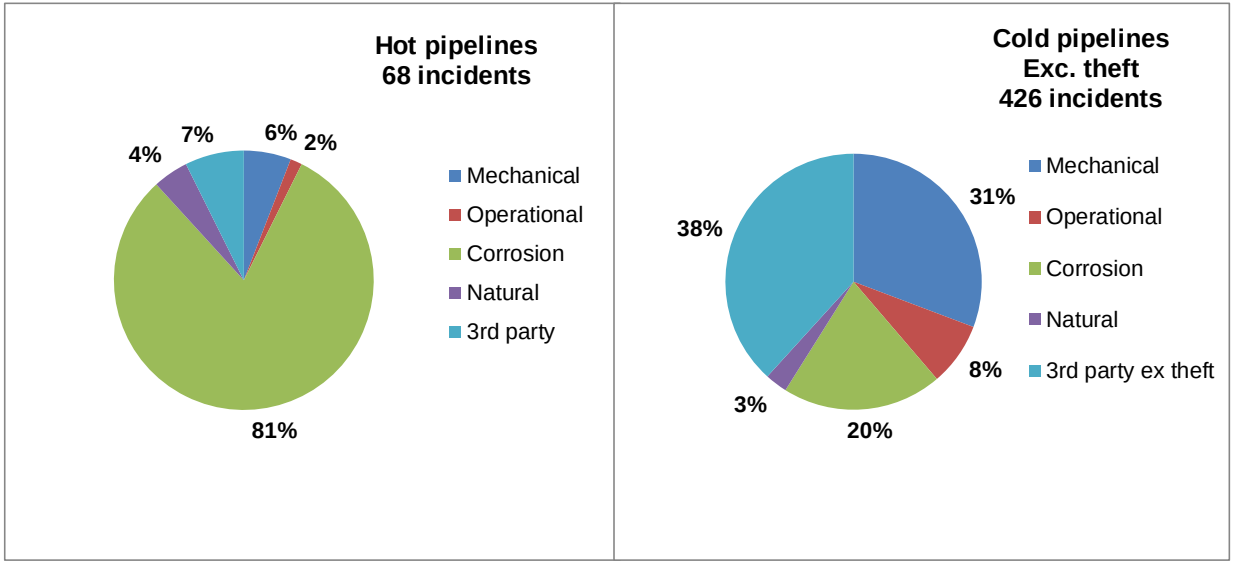
- Spillages are more frequent in smaller pipelines

Leak / spillage detection



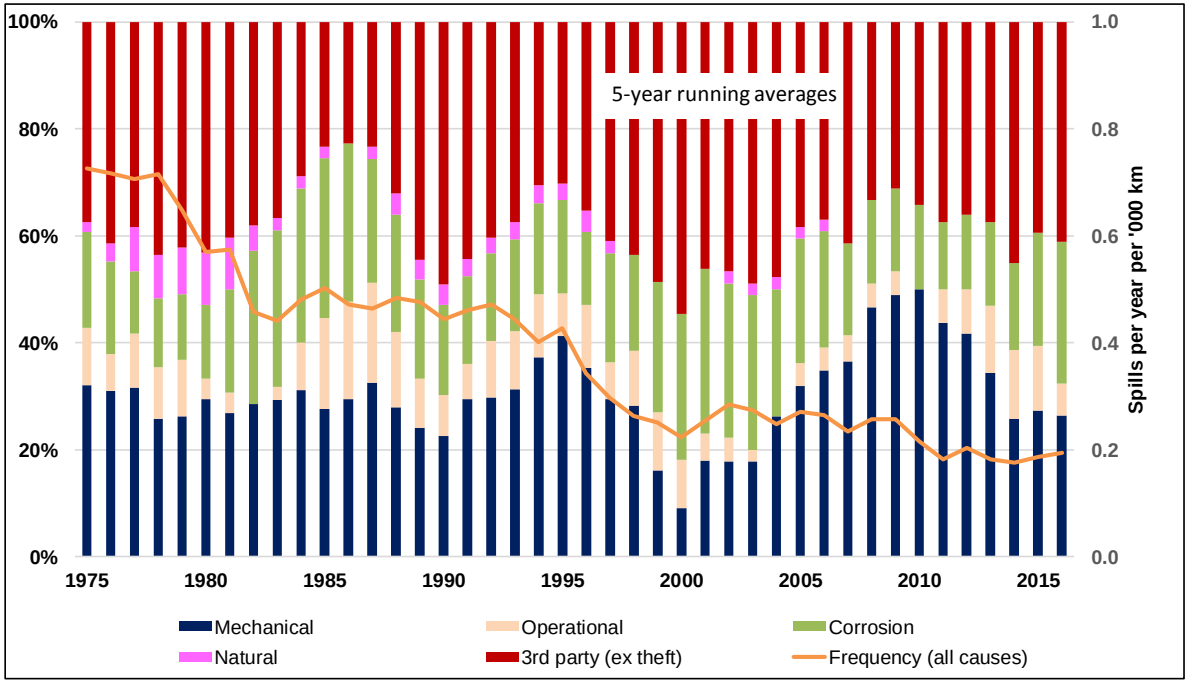
- Automatic Leak Detection systems are increasingly effective

Causes of spills: all events



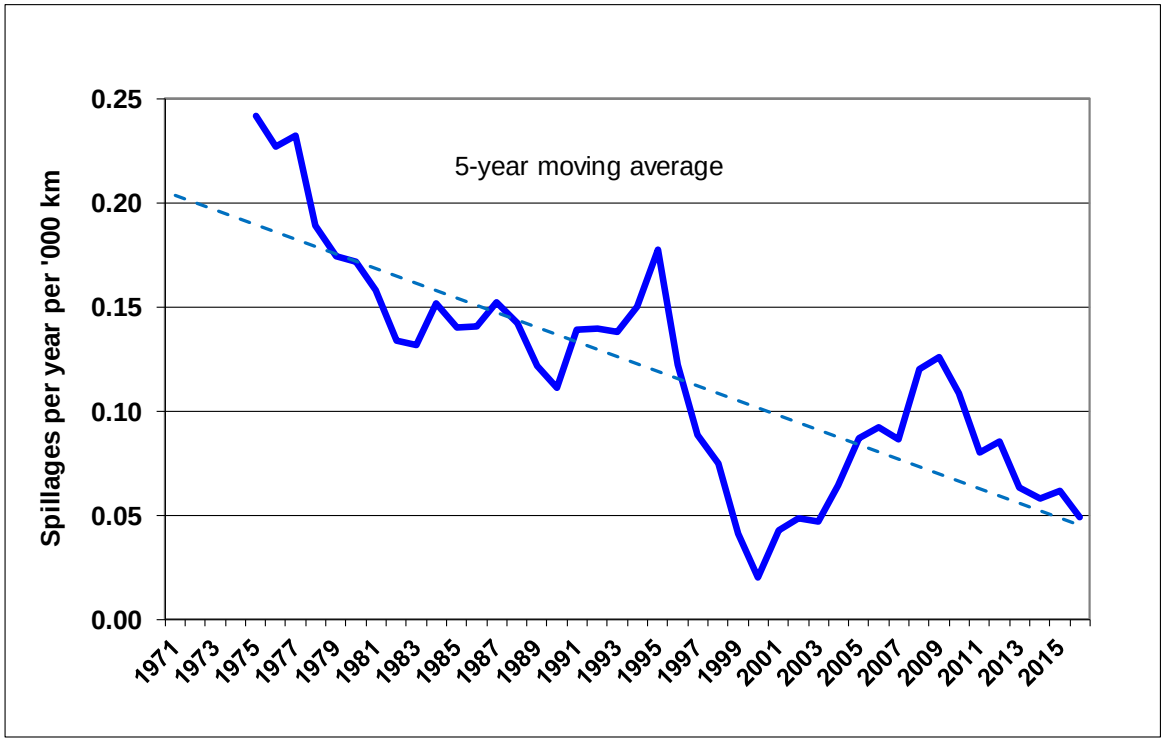
- Most spills on hot pipelines are corrosion related
  - **Hot lines have virtually all been shutdown**
- On cold pipelines the main causes are mechanical and third party interference

Causes of spills in cold pipelines over time



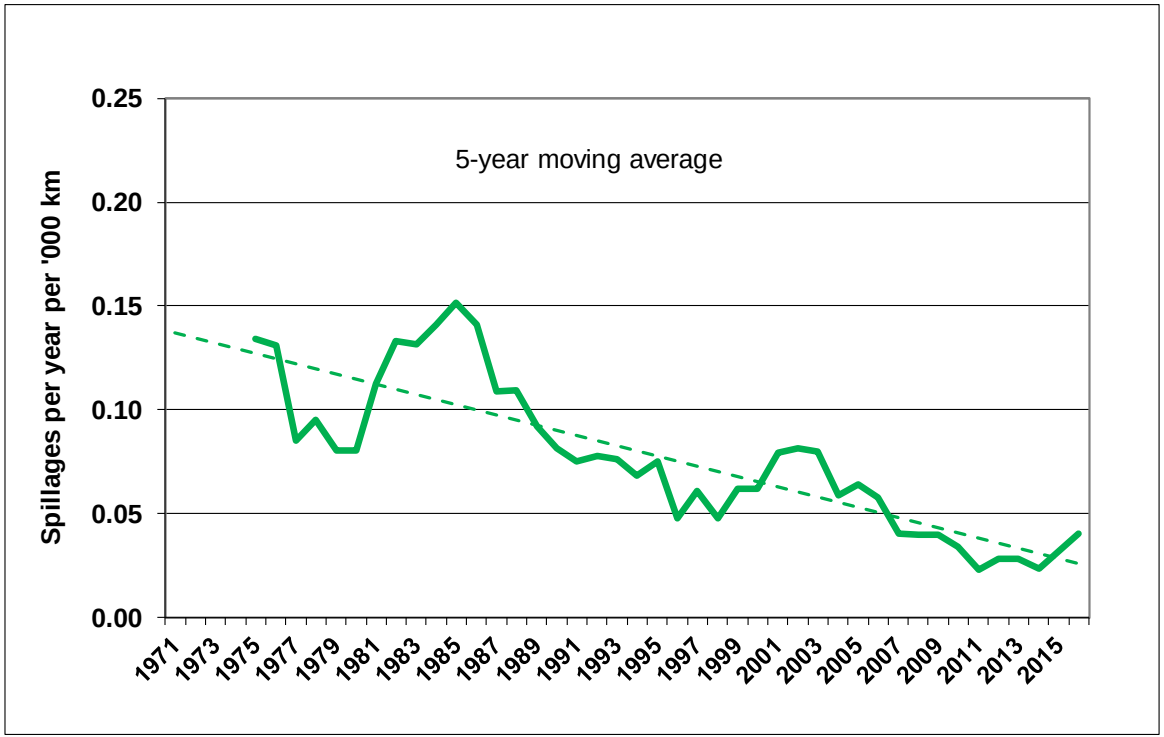
- Third party interference remains the main cause
- After an increase in the last decade mechanical causes have returned to historical levels

Mechanical causes frequency (cold pipelines)



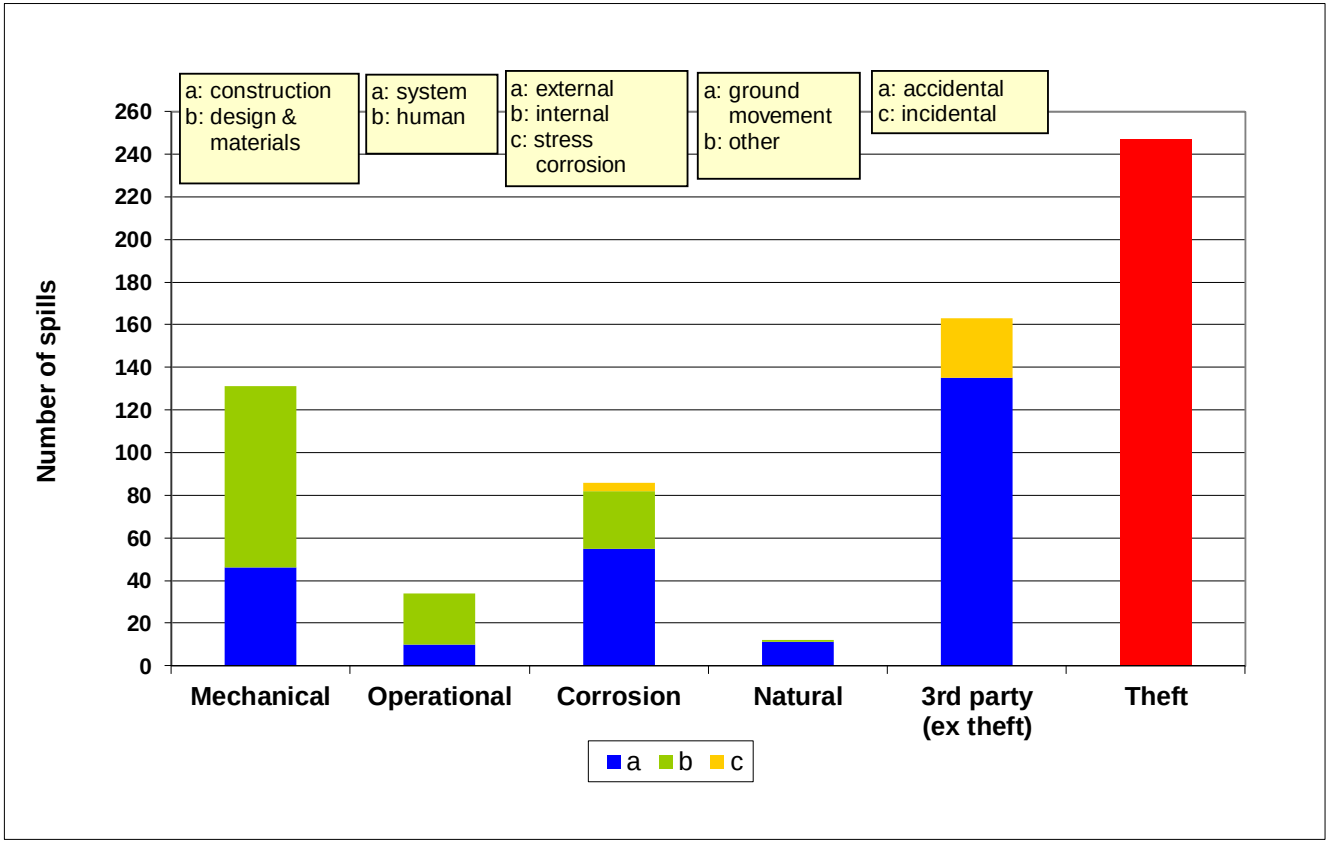
- After a spike in the first decade of this century, the long-term downward trend has resumed

Corrosion causes frequency (cold pipelines)

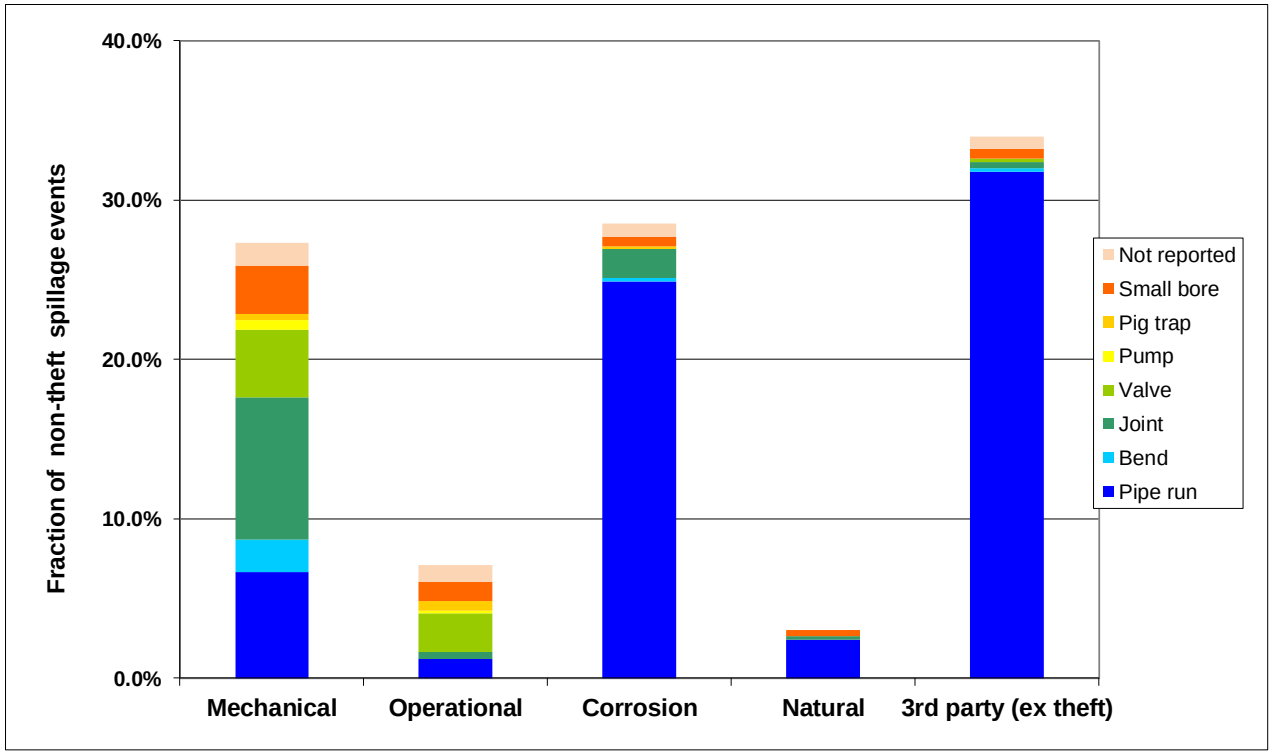


- The frequency of corrosion-related spillages is decreasing slowly over time
- Ageing-related issues appear to be under control

Causes of spills in cold pipelines

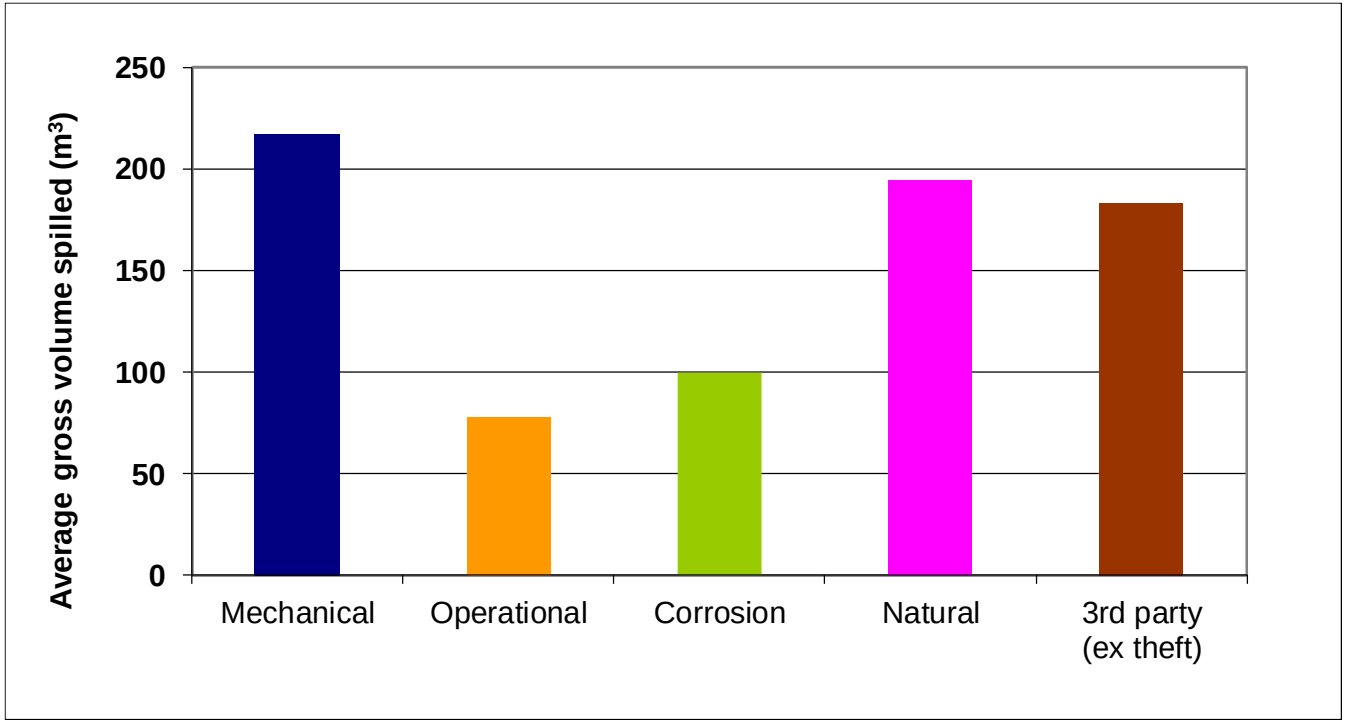


Failure location



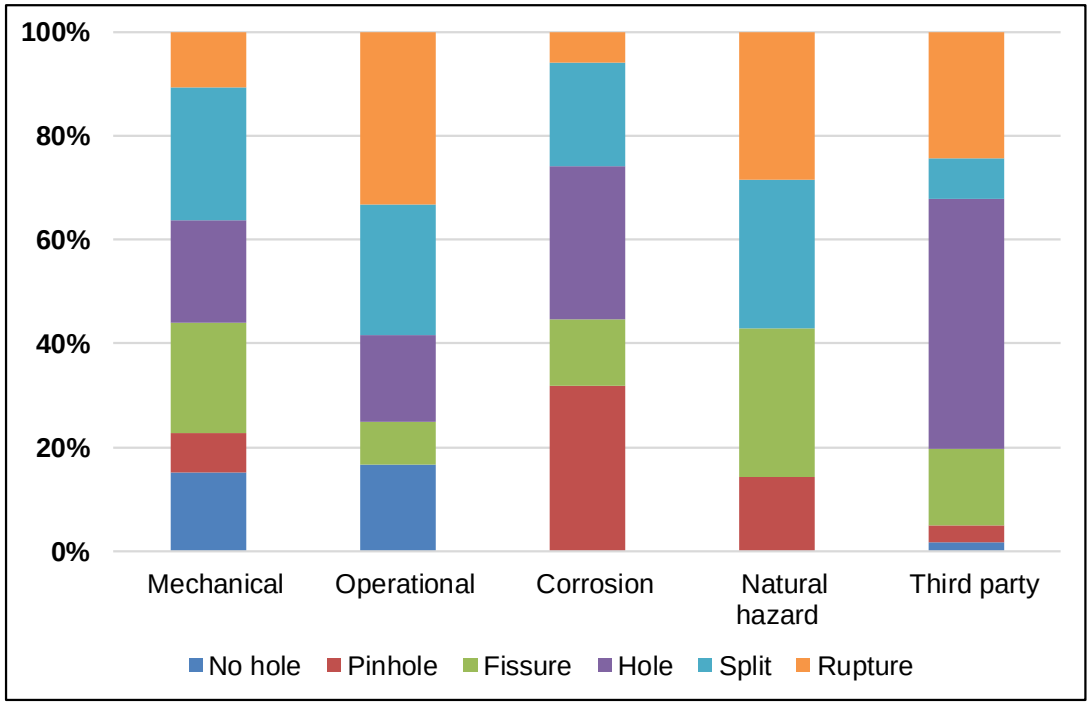
- Most incidents occur in pipe runs except for Mechanical and Operational causes

Gross volume spilled by cause



- Operational and corrosion related causes result in lower spilled volumes

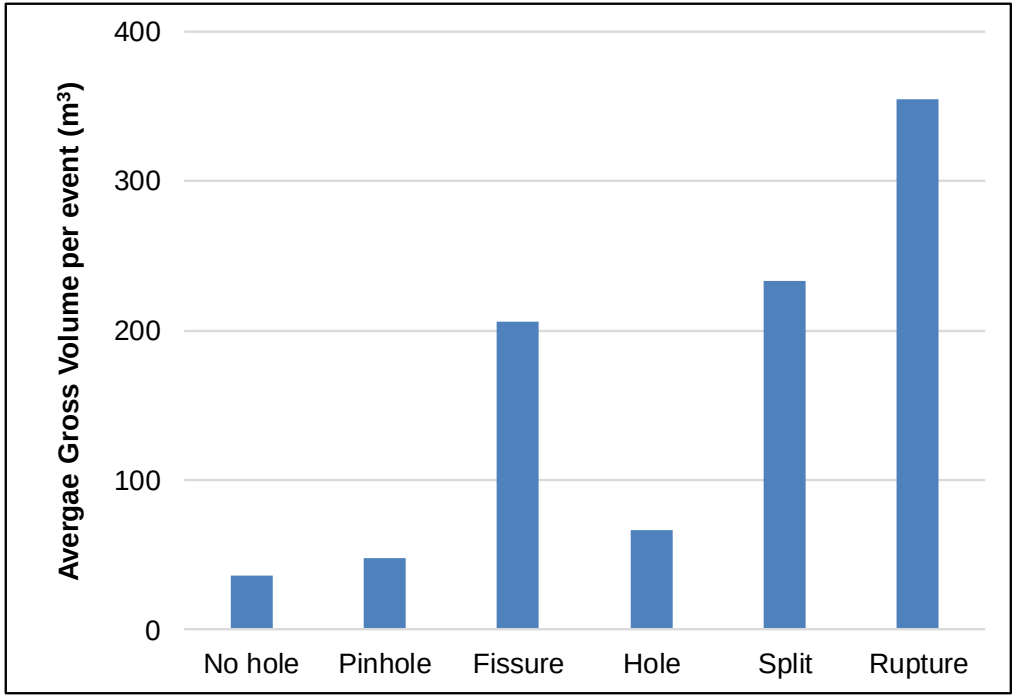
Hole size



- Mechanical and corrosion related causes tend to result in smaller holes

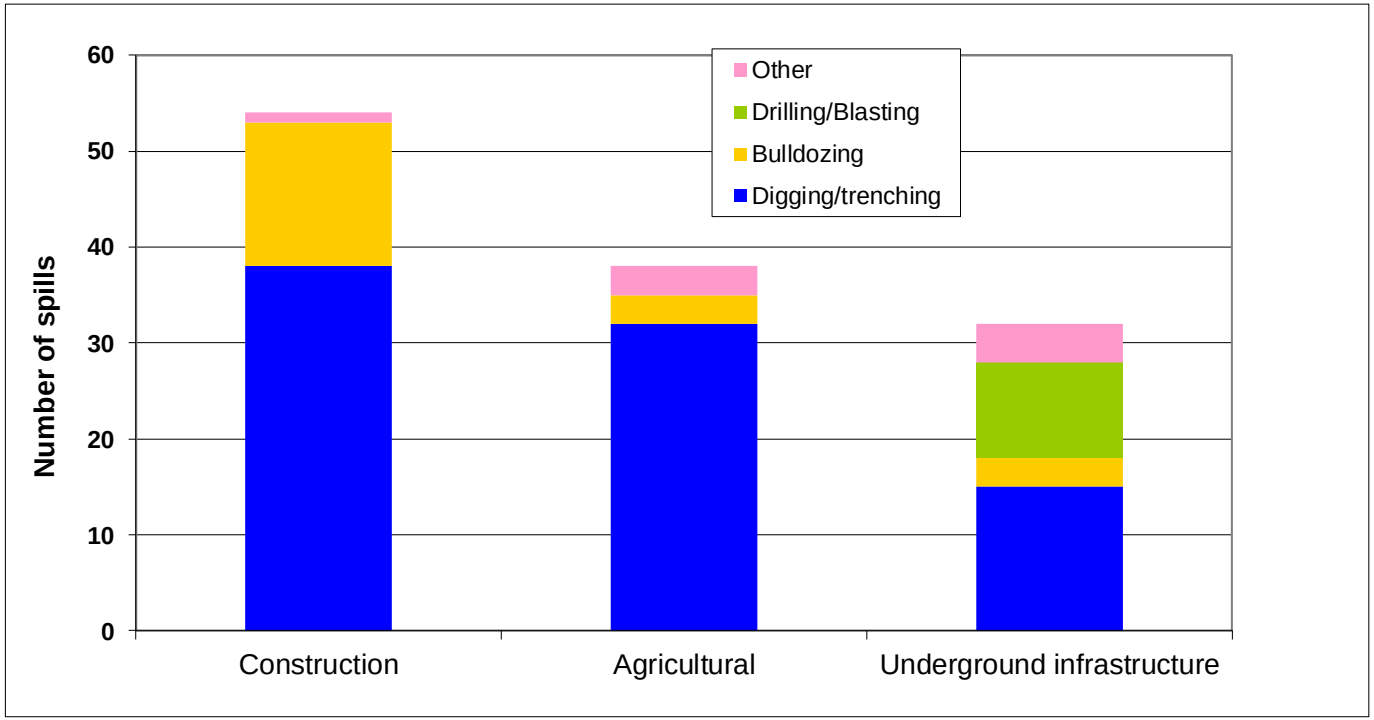
Pinhole	Less than 2 mm x 2 mm
Fissure	2 to 75 mm long x 10% max wide
Hole	2 to 75 mm long x 10% min wide
Split	75 to 1000 mm long x 10% max wide
Rupture	>75 mm long x 10% min wide

Gross volume spilt by hole size



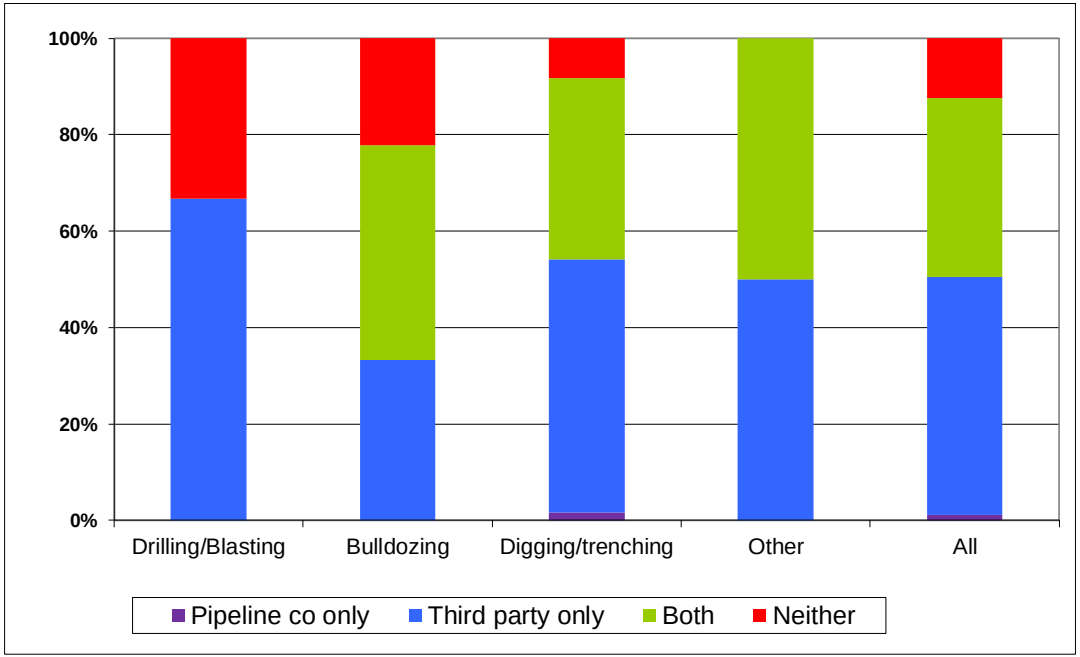
- Larger holes lead to bigger spills?

Circumstances of third party spills



- Most third party related spills occur during digging or trenching activities

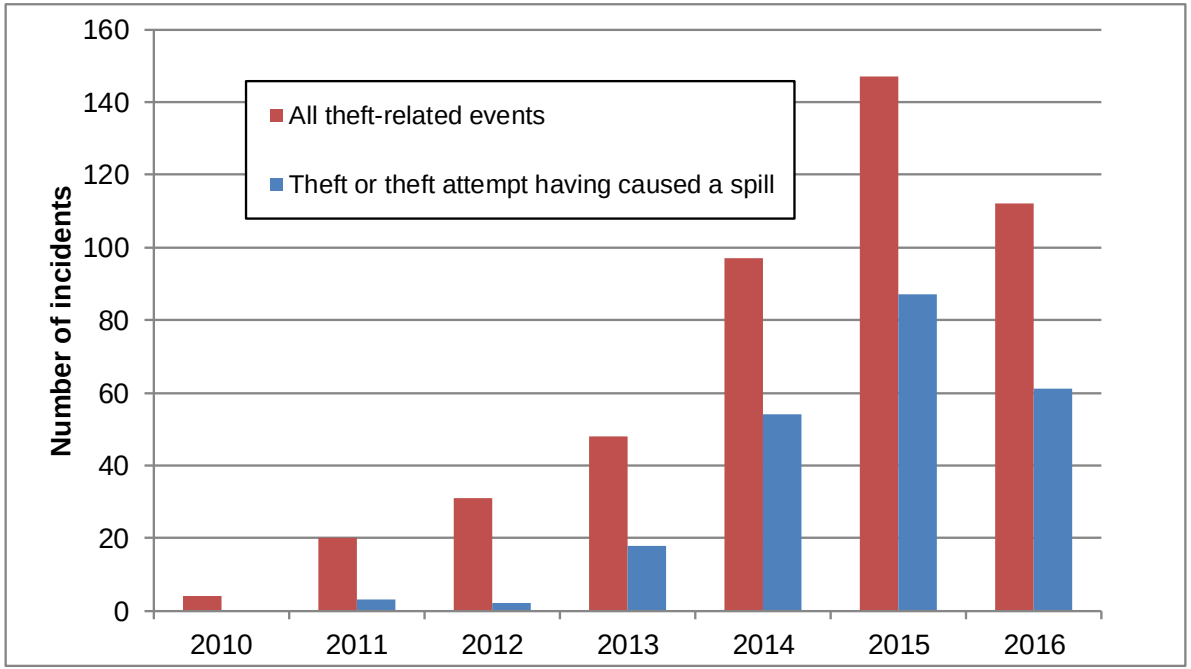
Mutual awareness of activities



- In nearly 50% of cases the third party is aware of the presence of a pipeline but the pipeline company is not informed of potentially hazardous activities near the pipeline
- Incidents occur even when both parties are mutually aware
- In some 12% of cases neither party is aware of the other

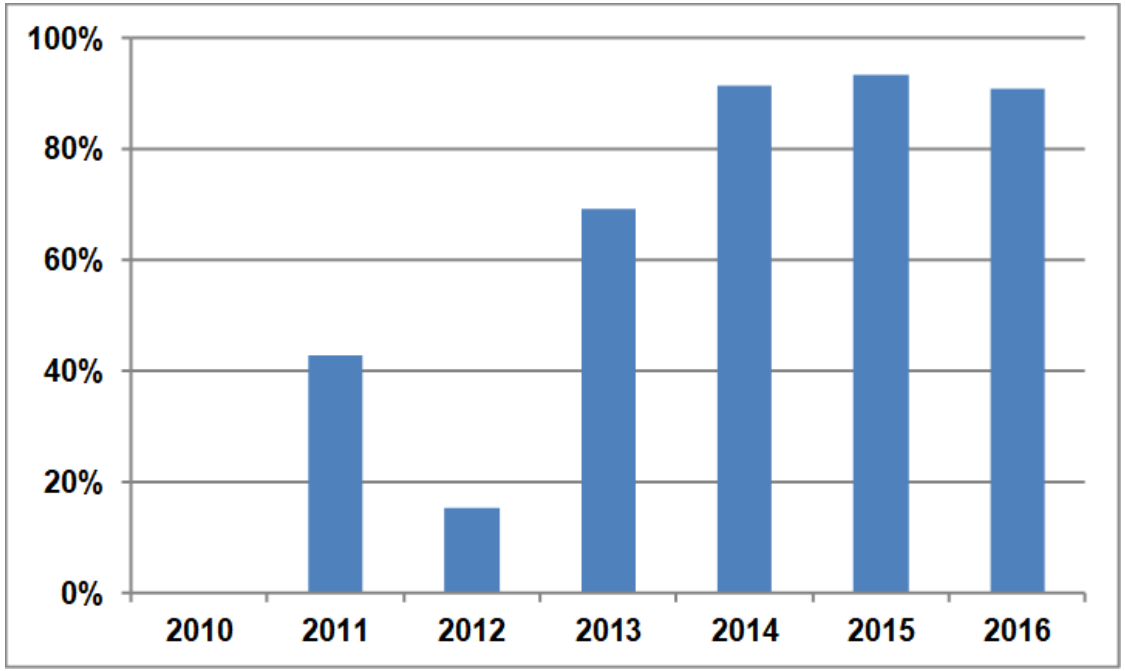
04 Product theft

Product theft



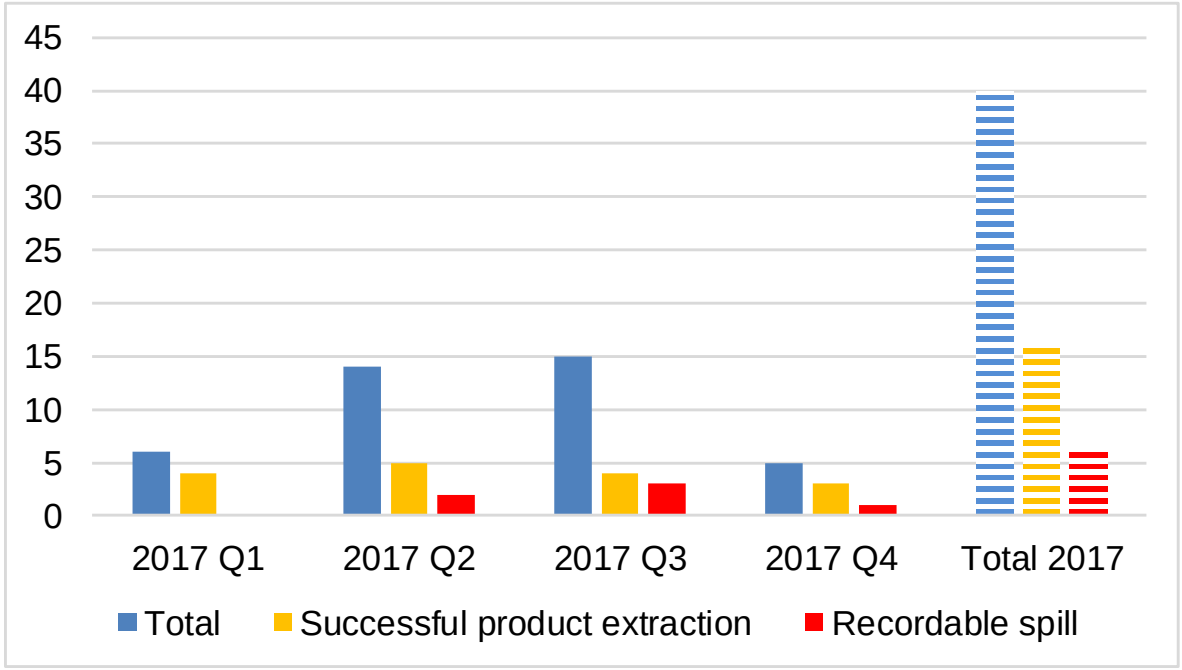
- The problem is not new, but the frequency is…
- Have we seen the worst?

Theft-related spillages



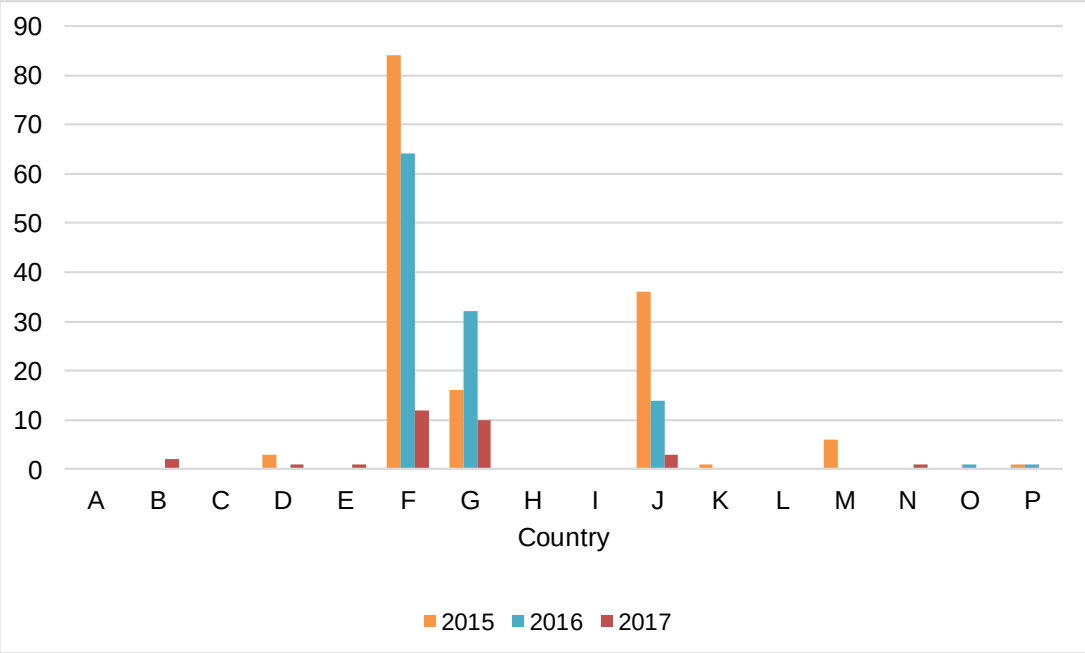
- In the last 3 reporting years, over 90% of reported spillages have been theft-related
- Out of a total of 741 reported spillages, 247 are theft-related

Theft: 2017 quarterly survey



- Total 2017 number appears much lower than recent years (2016: 112, 2015: 147)

Theft: geographic spread



- Wide geographic spread but 2 countries particularly targeted

Putting the report together

- This information is extracted from the data YOU supply
- The 2016 report has just been published
- The on-line database is available for filling in the 2017 data (a reminder will be sent in the next few days)

The report is used extensively in the Industry including pipeline risk assessment, support and/or challenge of regulations, operators to focus on high risk and high consequence events

Please respond promptly and ensure the data is filled as compeletely as possible

The quality of the report depends on the quality of your data

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Thank you for your attention

Jean-François Larivé