

Western European oil pipelines

30 years of spillage performance monitoring

The integrity and reliability of cross-country oil pipelines is vital to the European economy. One quarter of Europe's refineries are situated inland and depend entirely on pipelines for their crude oil feedstocks. Major oil fields in Russia and the North Sea use cross-country pipelines to export their productions. Currently, European pipelines transport some 350 Mt/a of crude oil (more than 50% of the EU-15 consumption) and 180 Mt/a of oil products (one-third of the EU-15 demand and a majority of the long distance transportation requirement) over an average distance of 250 km and 200 km respectively.

CONCAWE has now compiled data on Western European oil pipeline spillage incidents and their consequences for a full 30-year period. From 14,000 km in 1971, roughly evenly split between crude and products, the pipeline network monitored by CONCAWE has, 30 years on, increased to 31,000 km. The increase exclusively concerns product lines and is largely due to the extension of reporting coverage, the largest single change being the addition of non-commercially owned pipelines in 1988.

Some 40% of the current inventory has been built since 1971 and, over the period, about 18% of the network has been taken out of service. The overall picture shows an ageing inventory, of which only 10% is less than 10 years

of age and 80% more than 20 years (from 70% and a few percents respectively in 1971). Remarkably, this has not prevented the continued improvement in the performance of the network. The very oldest pipelines are more than 65 years old and still safe and reliable.

The results for 2000 have recently been published (CONCAWE report 03/01) and show the best ever annual performance on record, with only six spillages totalling 360 m³. The causes were typical: three were due to third parties accidentally digging or drilling into pipelines while carrying out unrelated ground work; one was the result of previous mechanical damage, done by an unknown third party, which subsequently caused a crack; one was localized external corrosion; and one was from mechanical failure of small bore instrument pipework. Clean-up activities recovered 77% of the spillages and only very localized temporary pollution resulted.

Even though it has always been good in Europe, spillage performance has improved dramatically over the past 30 years. A few major pipeline spillage incidents elsewhere in the world have caused sufficiently severe problems to attract broad media attention and public concern. In Europe, however, the general public is completely unaware of the millions of tonnes of oil being safely and silently transported under their feet, which is exactly as it should be.

The number of spillages per 1000 km of pipeline that occur in successive years gives a good indication of the spillage performance trend. This indicator was 0.2 in 2000 from a peak of 1.5. Thus the moving average taken over the total 30-year period monitored has reduced from around 1.2 spills per 1000 km per annum to 0.65

The age of the European pipeline network

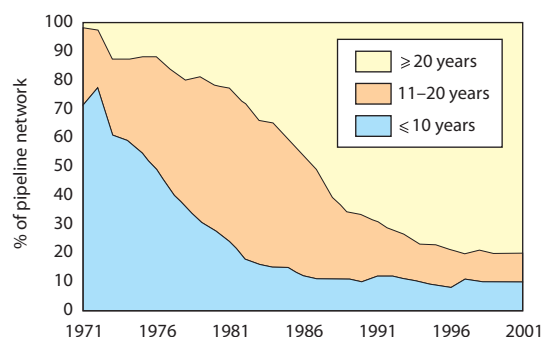


Figure 1

The very oldest pipelines in the European network are more than 65 years old, and still safe and reliable. Even though 80% of the network is more than 20 years old, performance of the network overall continues to improve.

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Figure 2

The moving average taken over the period from 1971–2000 shows a reduction in spills from around 1.2 to 0.65 spills per 1000 km per annum. The plot of five-year averages shows about a five-fold improvement from 1.2 to 0.25.

Pipeline spillages, 1971–2000

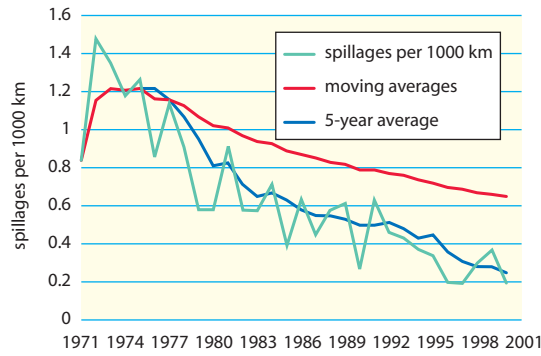
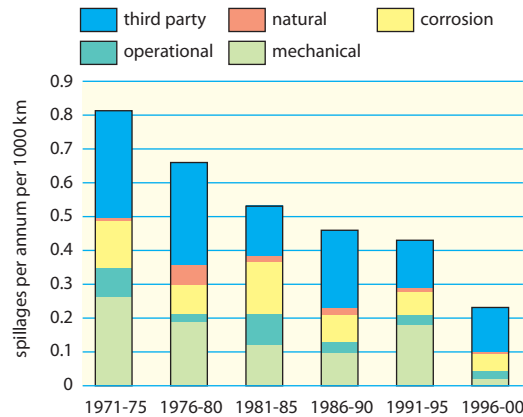


Figure 3

Pipelines carrying heated fuel oil and crude oil (only 5% of the network) typically suffer from corrosion; however, about one-third of these have now been shut down or converted to cold service, contributing significantly to the overall improvement. In the bulk of the network spillages are most frequently caused by third-party activities, often resulting in larger spill sizes.

Causes of cold pipeline spillages, 1971–2000



(see Figure 2). The rate of improvement is illustrated by the plot of the five-year averages, which shows about a five-fold improvement from 1.2 to 0.25.

Pipelines handling heated fuel oil and crude oil have historically suffered excessive external corrosion prob-

lems due to the integrity of the heat insulation system in underground conditions. Although these always represented only a very small part of the pipeline network (5%), in 1971–75 for example, they were responsible for some 37% of the spillages. About one-third of them have now shut down or converted to cold service through a combination of business (declining market) and maintenance reasons. This has contributed significantly to the general improvement.

In the bulk of the network, which is in cold service, spillages are most frequently caused by third-party activities, often resulting in a larger spill size.

It can be seen that considerable progress has been made on all fronts and this has required sustained efforts in all aspects of the business. Many issues are directly within the control of the pipeline operator such as internal inspections using intelligence pigs, maintenance policies, control systems and operational procedures. Third-party activities can only be influenced by trying to inform and control. The increase of mechanical failures in the first half of the 1990s initially gave rise to concern that this could be the onset of an adverse trend but the subsequent improvement has proven this to be unfounded.

The detailed analysis of these 30-year statistics has recently been published in a comprehensive CONCAWE report (1/02) and was used to set the scene at the COPEX 2002 seminar for pipeline operating companies held by CONCAWE in April. This seminar, held every two years, provides an opportunity for disseminating information and for discussing best practice in the field of pipeline operation and maintenance.