Integrity of oil pipelines in Western Europe

CONCAWE has been undertaking surveys of the number of spillage incidents from oil industry cross-country pipelines for nearly thirty years. The results have been presented in a series of annual reports, the most recent being CONCAWE report 3/00. Additionally, CONCAWE report 2/98 reviewed the first twenty-five years' data up to 1995.

The CONCAWE pipeline statistics now includes data from 72 companies and other bodies operating oil pipelines in Western Europe. These organizations operate some 250 different service pipelines which, at the end of 1999, had a combined length of 30 720 km; this length has remained fairly constant for a number of years. The volume transported in 1999 was 674 million cubic metres of crude oil and refined products, again similar to recent years. The total traffic volume (i.e. volume x distance transported) in 1999 amounted to 125 x 10^9 m^3 x km.

There were eleven oil spillage incidents during 1999, nine from pipelines themselves and two from associated pump stations. None of these incidents led to associated fires but there was one fatality associated with an attempted theft. This number is less than the long-term average of 12.9 spillages per year since 1971. It must be remembered that in the earlier years of the survey, the length of pipelines included was much lower so that the improvement is better than it appears at first sight. This is shown by Figure 1 which plots the frequency of spills per year per 1000 km of pipeline. Generally the performance has improved since the 1970s although the curve may have flattened out over recent years.

Although the frequency of spillage has levelled off, the volume of oil spilled has decreased over the last five years. In 1999, this was only 516 m^3, a very small volume which represents only 0.00008% (or 0.8 parts per million) of the volume of oil transported. What is more, some 67% of this oil was recovered so that the net oil loss into the environment amounted to only 171 m^3, equivalent to 0.00002% (or 0.2 parts per million) of the total volume transported. Put another way, this only amounted to 6 m^3 lost per 1000 km of pipeline. These figures are significantly better than the long-term annual averages of 101 m^3 and 46 m^3 per 1000 km, respectively for gross and

Figure 1
Although the frequency of pipeline spillage has levelled off in recent years, performance has improved since the 1970s.

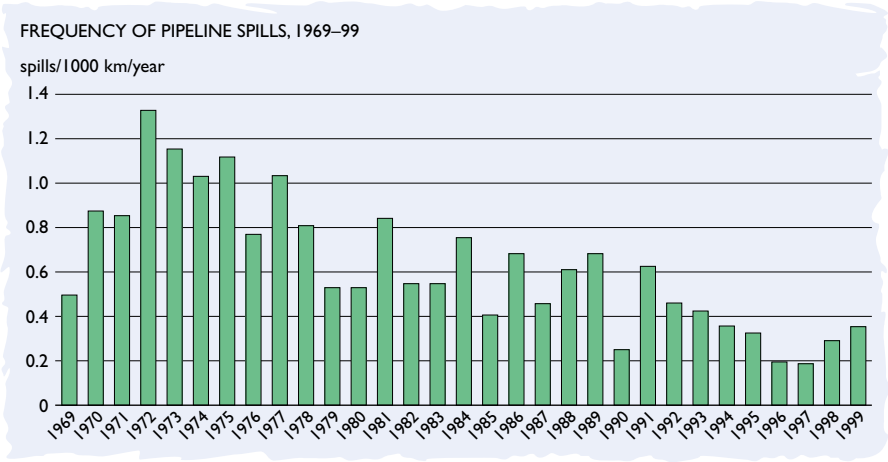
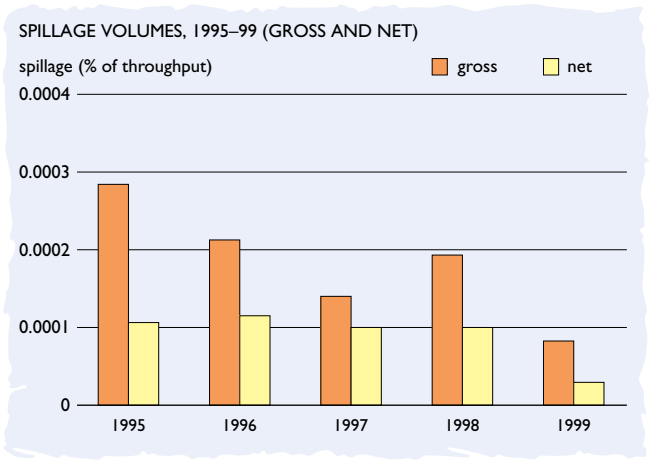


Figure 2
In 1999, only 8 parts per million of oil was spilled, with 67% recovered—a significant improvement over the long-term average.



net spillage, in fact, they are only about 17% and 12%, respectively, of the long-term averages. The 1999 volumes are compared with those for the last five years in Figure 2. This shows a significant reduction in the volume of oil spilt over the period.

CONCAWE also collects information on the intelligence pig inspection activity. This is a method for detecting defects in a pipeline before failure occurs. It is a highly specialized activity, the results of which must be interpreted with care. Not all types of defects can be detected and not all parts of the system can be accessed. It is also obviously of no assistance in stopping many of the incidents caused by third parties (such as attempted theft or external penetration by e.g. mechanical excavation). To date, 70% of the current pipeline inventory in Western Europe has been inspected at least once using intelligence pig techniques and this has undoubtedly contributed to the continuously improving safety record.

Of the 11 incidents that occurred in 1999, nine were either small or otherwise straightforward to clean up. Two spillages required extensive clean-up programmes and one of these was categorized as causing severe soil pollution. None affected watercourses or potable water supplies so that the overall environmental impact of these incidents was limited.

The causes were fairly typical. There were no spillages categorized as mechanical failure and only one in the operational category resulting from an error carrying out a manual valve operation. Four spillages were due to external corrosion, one of which was from a hot fuel oil pipeline. Such pipelines used to be a major cause of spillages in the past, but because of their poor record, and changes in the fuel oil market, most such pipelines have been shut down. In 1999, there were no spillages due to the effects of a natural hazard event.

As usual, third-party activity was the main cause of spillages from oil pipelines in 1999 with six incidents. The depressingly familiar cause of four of these was uncontrolled excavations. Immediate spillage resulted in three of the cases, whereas in the fourth case, spillage ensued from damage sometime in the past that had not been detected then. Unusually for Western Europe, two incidents were caused by attempted theft, one of which resulted in a spillage of 36 m^3 gross, for which the resulting repair and clean-up cost 24 000 Euro and took 35 days. The second had more serious consequences. Thieves attempted to steal the product by digging a steep-sided pit to get to a pipeline with 1.5 metres of ground cover and drilling into the pipeline. The release filled the pit with 80 m^3 of product. When the emergency response squad pumped this out, they found a dead body. Although such incidents have been very rare in Western Europe, they have been more common in Central and Eastern Europe, but fortunately (as far as we know) without fatalities.

CONCAWE started collecting data for Central and Eastern Europe a few years ago, with more systems being added to the database from year to year. Reporting from the companies involved is steadily improving but more time will be needed before the reported data reach the required standard. For this reason Central and Eastern European data have not been incorporated into the CONCAWE database used to produce the oil pipeline integrity report as yet. The companies concerned are working hard to improve pipeline environmental performance. Although incidence of leaks is higher than in the West, this is mainly due to theft and attempted theft related incidents. However, the incidence of theft seems to be declining as monitoring of the systems improves.