Downstream oil industry safety statistics for 2010

The 2010 safety statistics report analyses personal injury and process safety statistics.

Safety management systems are widely recognised by the oil industry as an essential tool for collecting and analysing safety incident data, and continuously improving the safety of personnel and operations. To support this effort, CONCAWE has been compiling statistical safety data since 1993 for the European downstream oil industry in order to:

1. provide member companies with a benchmark against which to compare their own company's safety performance; and
2. demonstrate how responsible approaches to safety management can help to ensure that accidents stay at low levels in spite of the hazards that are intrinsic to refinery and distribution operations.

Most importantly, CONCAWE's annual safety data report enables companies to evaluate the efficacy of their own management systems, identify any shortcomings, and take corrective actions as quickly as possible.

What safety data do we evaluate?

CONCAWE's 17th report on our industry's safety performance (CONCAWE Report 5/11) presents statistics on work-related personal injuries sustained by oil industry employees and contractors during 2010. It also highlights trends over the past 17 years of data collection and compares the oil industry's performance to that of other industrial sectors.

The 2010 report compiles safety data submitted by 34 CONCAWE member companies, representing about 93% of the refining capacity of the EU-27 plus Norway, Switzerland and Croatia. The statistics are reported primarily in the form of key performance indicators that have been adopted by the majority of oil companies operating in Western Europe, as well as by other types of manufacturing industries. These indicators are:

- number of work-related fatalities;
- Fatal Accident Rate (FAR) per 100 million hours worked;
- All Injury Frequency (AIF) expressed as the number of injuries per million hours worked;
- Lost Workday Injuries (LWIs) and the Lost Workday Injury Frequency (LWIF) calculated by dividing the number of LWIs by millions of hours worked;
- Lost Workday Injury Severity (LWIS), the average number of lost workdays per LWI;
- Road Accident Rate (RAR), the number of road accidents per million km travelled; and
- Process Safety Performance Indicators (PSPI) that report the number of Process Safety Events (PSEs) expressed as unintended Losses of Primary Containment (LOPC).

Process Safety Performance Indicators

Several major industrial accidents, like the Toulouse explosion (2001), the Buncefield fire (2005) and the Texas refinery explosion (2005), have led to increased attention on the causes of such events. This has led to several initiatives that focus on the gathering of Process Safety Performance Indicators. The lagging indicators for these events are Process Safety Events, mainly Loss of Primary Containment, because these have frequently been shown to be the initiating events for major accidents.

As part of the 2010 survey, PSPI data were collected for the second consecutive year, following the publication of the latest guideline by the American Petroleum Institute. These additional data provide insights into the types and causes of process safety incidents. PSPIs also enable the refining and distribution industry to compare their European process safety performance with similar data from other regions of the world.

Twenty-four CONCAWE companies provided PSPI data in 2010, which was a significant increase over the eighteen that reported in 2009. From these responses, a Process Safety Event Rate (PSER) indicator of 2.3 was recorded for all PSEs. Although this is a notable reduction compared to the 2009 PSER of 4.1, this improvement may be partly due to more companies responding with data. The overall results of the PSPI survey are presented in Table 1. Fortunately, none of the reported PSEs resulted in a major accident that the understanding of PSE causes is trying to prevent.

Personal Safety Indicators

Accident frequencies in the European downstream oil industry have been quite low historically and the 2010

data show that this trend is continuing. The 1.9 LWIF for 2010 has stayed below 2.0, which has been the case since 2007.

In general, performance indicator results are of greatest interest when these can be analysed for historical trends. The evolution of safety performance over a period of time provides indications on how well safety management efforts are working. Figure 1, for example, shows the changes and improving trends in the three-year rolling averages for the four main performance indicators mentioned above.

The trends in these indicators show a steady performance improvement over the past 17 years, with a slow but constant reduction in LWIF that has stayed below 2.0 for the fourth consecutive year. Although the data suggest that AIF peaked around 1996–97, this could also be due to better data reporting. This is because the AIF indicator was not formally used in all companies in the early years of CONCAWE's data gathering. Since 1997, the trend in AIF has generally been downwards except for a slight increase in 2010.

Regrettably, 14 fatalities in 14 separate incidents were reported in 2010. Two of these fatalities were due to road accidents, three were due to three different confined space entry incidents, and one was caused by a fall. Of the remaining eight fatalities, two resulted from hazards directly associated with maintenance and construction activities while five were caused by burning/electrocution and one was a result of other industrial activities.

The 14 fatalities in 2010 are higher than in 2006, which was the best year over the entire 17 years of data collection (Figure 2). After a steady downward trend during the 1990s, fatalities began to rise again in 2000 with a very high value of 22 fatalities in 2003. Fortunately, this unfavourable trend was reversed in 2004–6 and the fatality numbers have shown little variation since that time. The three-year rolling average for FAR has also stayed at about 2 for the past four years.

In 2010, contractors in the manufacturing sector of the European oil industry were the most vulnerable work group, experiencing 10 fatalities. This is clearly a con-

Table 1 Results of the 2010 PSPI survey

Sector	Manufacturing	Marketing	Both sectors
Companies reporting			
Total	34	23	23
Process safety data	24	11	11
Percentage	71%	48%	48%
Hours worked (Mh)			
Total	237	285.1	522.2
Process safety data	201.7 (177.7)[a]	200	401.7
Percentage	85% (75%)[a]	70%	77%
Tier 1 PSE: *No. of PSEs*	175	32	207
Tier 2 PSE: *No. of PSEs*	546	169	715
Tier 1 PSER: *PSE/Mh reported*	0.87	0.16	0.52
Tier 2 PSER: *PSE/Mh reported*	2.71	0.85	1.78
Total PSER: *PSE/Mh reported*	3.57	1.01	2.30

[a] Figures in brackets are the hours reported by the companies that provided Tier 2 PSE data.

Figure 1 Three-year rolling average personal incident statistics for the European downstream oil industry

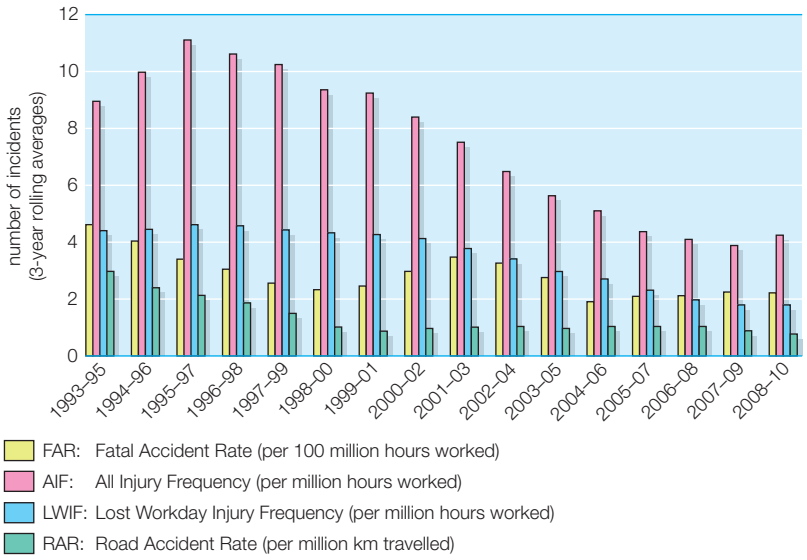


Figure 2 Numbers of reported fatalities since 1993

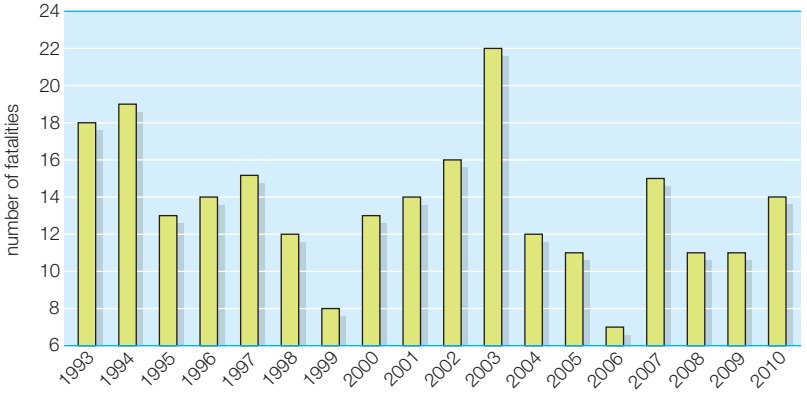


Figure 3 Relationships between incidents and fatalities for the European downstream oil industry

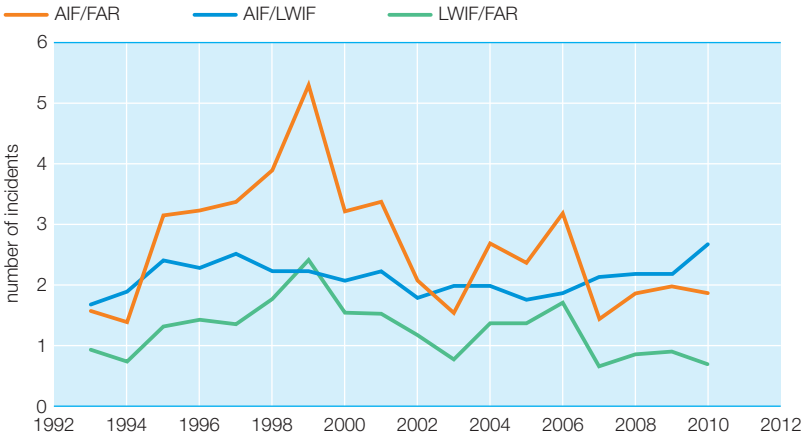


Figure 4 Lost Workday Injury Severity (LWIS) from 1993–2010 and the three-year rolling average in the European downstream oil industry

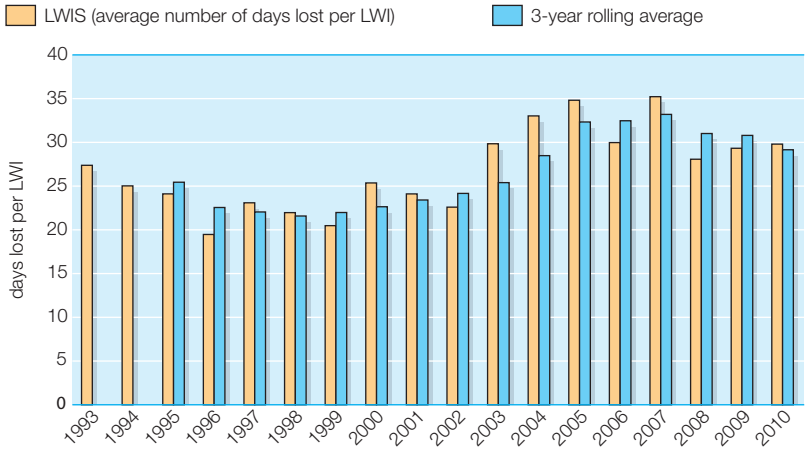
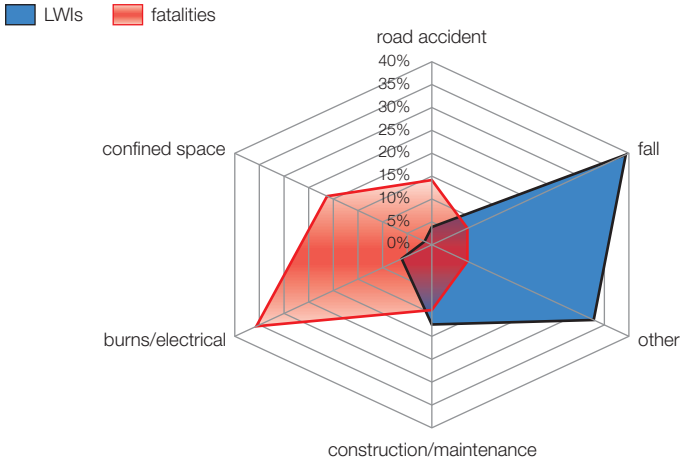


Figure 5 Reported causes on a percentage basis for LWIs and fatalities in 2010



cern and demonstrates that all companies must ensure that their contractor workforce is fully integrated into the company's safety awareness and monitoring systems.

The relationships between the AIF, LWIF and FAR are presented in Figure 3.

Although the number of fatalities per year has an impact on the two curves that are associated with FAR values, the figure shows relatively stable relationships among these indicators over time. Almost half of safety incidents are LWIs and there was approximately one regretted fatality for every 100 LWIs.

Although there have been positive trends in the LWIF and AIF indicators, the LWIS indicator, expressing the average number of days lost per LWI, increased in 2009. LWIS data and the three-year rolling average are shown in Figure 4. Although the LWIS results declined after peaking in 2005, the three-year rolling average still remains above the all-time LWIS average of 25.

Causes of fatalities and LWIs

For the first time in the 2010 survey, CONCAWE also gathered information on the causes of Lost Workday Injuries (LWI) in order to see how closely the LWIs could be related to the causes of fatalities. The LWIs were categorised by the six categories that were previously used to report fatalities. A total of 979 LWIs were reported in 2010 of which 696 (71%) were assigned to one of the 6 agreed categories by the reporting member company.

As can be seen from Figure 5, the percentage data for these LWIs in 2010 show that the distribution of LWI causes is quite different from those that resulted in fatalities.

Because these data are relatively new, there is no basis yet for a robust analysis of trends so CONCAWE will continue to collect these data in future years. It is expected that the results will reveal trends that can be analysed in greater depth, providing valuable data to member companies that can then be used to improve on-the-job safety for employees and contractors.