European downstream oil industry safety performance

Statistical summary of reported incidents – 2006

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ABSTRACT

The thirteenth such report by CONCAWE, this issue includes statistics on work-related personal injuries for the European downstream oil industry's own employees as well as contractors for the year 2006. Data was received from 20 companies representing over 80% of the European refining capacity. Trends over the last thirteen years are highlighted and the data is also compared to similar statistics from related industries.

KEYWORDS

Accidents, AIF, CONCAWE, FAR, fatality, incidents, injury, LWI, LWIF, marketing, oil industry, refining, RAR, RWI, safety, statistics.

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SUMMARY

The collection and analysis of accident data is an essential element of a modern safety management system and its importance is recognised throughout the oil industry.

CONCAWE started compiling statistical data for the European downstream oil industry fourteen years ago and this is the thirteenth report on this topic. This report covers data collected for 2006 and includes a full historical perspective from 1993. It also includes comparative figures from other related industry sectors. Data for 2006 was submitted by 20 companies, together accounting over 80% of the refining capacity of EU-27.

The results are reported mainly 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 branches of industry.

Accident frequencies in the downstream oil industry in Europe are at low levels, which have been maintained throughout the period of reporting. Overall, the 2006 performance appears slightly improved, in several areas, compared to previous years, confirming the trend observed previously. Standing at 2.5, the Lost Work Incident Frequency (LWIF) for 2006 is down from 3.9 in 2002 and the lowest recorded so far. The responsible management of safety in the oil industry has resulted in a low level of accidents despite the intrinsic hazards of the materials handled and the operations carried out. The fatal accident rate decreased recently, but road accidents continue to account for the highest percentage of fatalities at 70%, in 2006.

1. INTRODUCTION

The collection and analysis of accident data is an essential element of a modern safety management system and its importance is recognised throughout the oil industry.

CONCAWE started compiling statistical data for the European downstream oil industry fourteen years ago and this is the thirteenth report on this topic (see references of past reports in the reference list [1-12]). This report covers data collected for 2006 and includes a full historical perspective from 1993. It also includes comparative figures from other industry sectors.

The term “Downstream” represents all activities of the industry from receipt of crude oil to products sales, through refining, distribution and retail. Not all companies operate in both the manufacturing and marketing areas but all those who do, collect data separately for “Manufacturing” (i.e. refining) and “Marketing” (i.e. distribution and retail, also including “head office” staff) and this dichotomy has also been applied in the CONCAWE data. Additionally, the data is split between own personnel and contractors, the latter being fully integrated in all of the companies safety monitoring systems.

The purpose of collecting this information is two fold:

- To provide member companies with a benchmark to compare their performance against, so that they can determine the efficacy of their management systems, identify shortcomings and take corrective action;
- To demonstrate that the responsible management of safety in the downstream oil industry results in a low level of accidents despite the hazards intrinsic to its operations.

From the outset, the majority of CONCAWE member companies participated so that the sample always represented a large portion of the industry. By 1995 virtually all CONCAWE members participated, representing about 90% of the European refining capacity (somewhat less for distribution and retail). Over the years this level of participation has been maintained, although the actual number of participating companies fluctuated in line with the structural changes and mergers occurring in the industry and so did the percentage of the refining capacity represented. For 2006, 20 companies responded although not all companies could supply all the requested data.

The area of coverage is primarily the former EU-15 plus Norway and Switzerland and also includes Hungary and Slovakia. In addition some companies include data from their operations in other newer EU countries; such as Poland and the Czech Republic and, in some cases, Turkey.

A number of key performance indicators have been adopted by the majority of oil companies operating in Europe as well as by other industries. Although there are differences in the way different companies collect basic data, these fairly straightforward parameters allow an objective comparison. There are differences between companies in the precise definition or interpretation of metrics, so that direct comparison of data from different companies could lead to erroneous conclusions. For this reason we do not report individual company data but rather aggregates, averages and range of variation.

It is noteworthy that the majority of participating companies are willing to share their data openly with other companies. This indicates that they feel that safety is a non-competitive issue where all can learn from the experience of others and help other companies to improve.

2. PERFORMANCE INDICATORS

A number of safety performance indicators have become “standard” in the oil industry and in many other industry sectors. They are mostly expressed in terms of event frequency--the number of hours worked being the common denominator representing the level of activity. Such parameters have the advantage of relying on a small number of straightforward inputs, which allows meaningful statistical analysis even when the data sets are incomplete. The performance indicators considered in this report are:

- The number of work-related fatalities and the associated Fatal Accident Rate (FAR) expressed in number of fatalities per 100 million hours worked.
- The All Injury Frequency (AIF) including all recordable injuries and expressed in number of injuries per million hours worked.
- The Lost Workday Injury Frequency (LWIF) including all injuries leading to lost work time and expressed in number of lost workdays per million hours worked.
- Related to LWIF is the Lost Workday Severity (LWIS) expressing the average number of lost workdays per LWI.
- The Road Accident Rate (RAR) expressed in number of road accidents per million kilometres travelled.

A more complete set of definitions is given in **Appendix 1**.

There are, however, subtle differences in the way these parameters are used by different companies and how the data is collected and reported. The features, relevance and reliability of each indicator are further discussed below.

Fatalities and FAR

Because of their very low numbers, fatalities and therefore FAR are not reliable indicators of the safety performance of a company or industry. A single accident can produce several fatalities and cause the indicator to shoot up for a certain year. Conversely the lack of fatalities is certainly no guarantee of a safe operation. Indeed the well-known safety triangle indicates that fatalities are the long-term consequence of attitudes and practices that do not provide for appropriate reaction to near-misses, relatively minor incidents and more serious accidents.

LWIF and LWIS

This is the most common indicator in the oil and other industries and has been in use for many years. It is now common practice to include not only a company’s own staff but also contractors in the statistics and this is done almost universally in the oil industry. All companies without exception collect employee LWIF data for at least their own staff and this is therefore the most representative and reliable indicator of all.

Not all companies keep track of the number of lost days so that the overall LWIS has to be calculated taking account only of those companies that report such data.

AIF

As LWIF figures become progressively lower, they are less likely to change significantly year-to-year and are prone to wider variations in relative terms. Companies that have achieved very low LWIF levels therefore need a more meaningful indicator to monitor trends and detect improvements or deterioration of performance. AIF provides such an indicator since it records fatalities, restricted work injuries (RWI) and Medical Treatment Cases (MTC) in addition to LWIs. Although it is still less widely used then LWIF, reporting improves year by year with more companies turning to this indicator. It should also be noted that not all companies operate a restricted work system and also restricted working is not allowed in some countries, which is a potential cause of some distortion in the AIF data.

As the total number of injuries is not reported by all companies, only the worked hours for which this number is available is taken into account in the calculation of the overall AIF figure.

RAR

It is no surprise that road accidents are a major cause of both fatalities and lost time injuries, so a number of companies have taken to monitoring these separately. The data is still incomplete and there are also issues as to the precise definition of a road accident. The overall figures should therefore be considered as indicative only. For this reason, CONCAWE only reports RAR data for the whole downstream industry and all personnel involved (own staff and contractors), since the level of reporting is insufficient for the segmented data to be analysed. It must be noted, however, that the vast majority of road accidents occur in distribution and retail activities where both sales employees and truck drivers travel larger distances.

3. 2006 RESULTS

Table 1 summarises the number of submissions and illustrates some key aspects of the data that was not supplied by all companies.

Table 1 Completeness of submissions for 2006

No of companies	Manufacturing		Marketing	
	Own staff	Contractors	Own staff	Contractors
Submission	19	16	18	15
Including				
Road accidents	8	4	10	11
Distance traveled	8	4	11	10

Most companies submitted data for their own Manufacturing and Marketing staff (one company has no retail activity). Total own staff injuries are recorded by all companies, in the Manufacturing and/or Marketing categories, but this is not the case for lost days. A number of companies do not record road accidents separately and even fewer log the distance travelled. Contractor data is generally less complete.

The aggregated 2006 results per sector and for the whole of the European downstream oil industry are shown in **Table 2**. **Figure 1** shows the average performance indicators and their range of variability amongst reporting companies. For AIF and LWIF, which are the most universally used indicators, we also show the distribution per quartile for the different sectors (**Figure 2a/b**).

Table 2 Aggregated 2006 results for all reporting companies

Sector		Manufacturing			Marketing			Both Sectors		
Work Force		OS	CT	AW	OS	CT	AW	OS	CT	AW
Hours worked	Mh	93	97	190	178	109	287	272	206	477
Fatalities		0	2	2	0	5	5	0	7	7
Fatal Accident Rate	F/100 Mh	0.0	2.1	1.1	0.0	4.6	1.7	0.0	3.4	1.5
Lost work incidents	LWI	185	279	464	469	253	722	654	532	1,186
Lost time through LWI	days	5,136	8,777	13,913	10,908	4,878	15,786	16,044	13,655	29,699
LWI frequency	LWI/Mh	2.0	2.9	2.4	2.6	2.3	2.5	2.4	2.6	2.5
LWI severity	Lost Day/LWI	27.8	31.5	34.4	23.3	19.3	26.6	28.7	31.2	29.8
All recordable incidents	AI	472	660	1,132	661	412	1,073	1,133	1,072	2,205
All incidents frequency	AI/Mh	5.1	6.8	6.0	3.7	3.8	3.7	4.2	5.2	4.6
Distance travelled	Tm							311	246	557
Road Accidents	RA							558	316	874
Road Accident Rate	RA/Tm							1.8	1.3	1.57

OS: Own staff; CT; Contractors; AW: All workers

Figure 1 Average 2006 performance indicators with range of variability

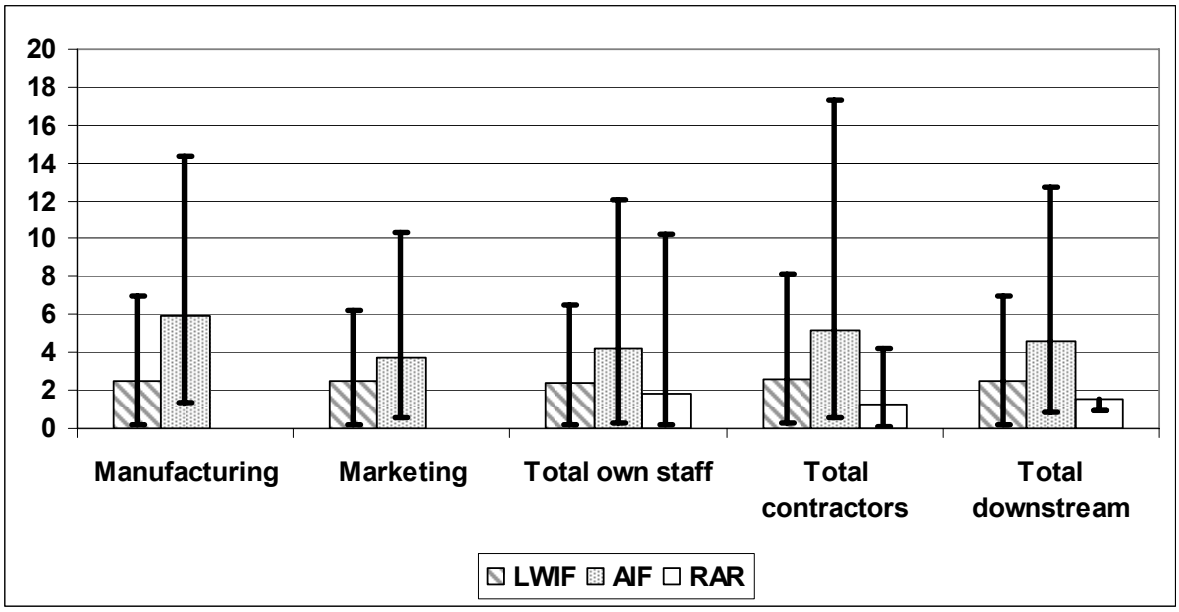


Figure 2a AIF distribution
Average value for each quartile

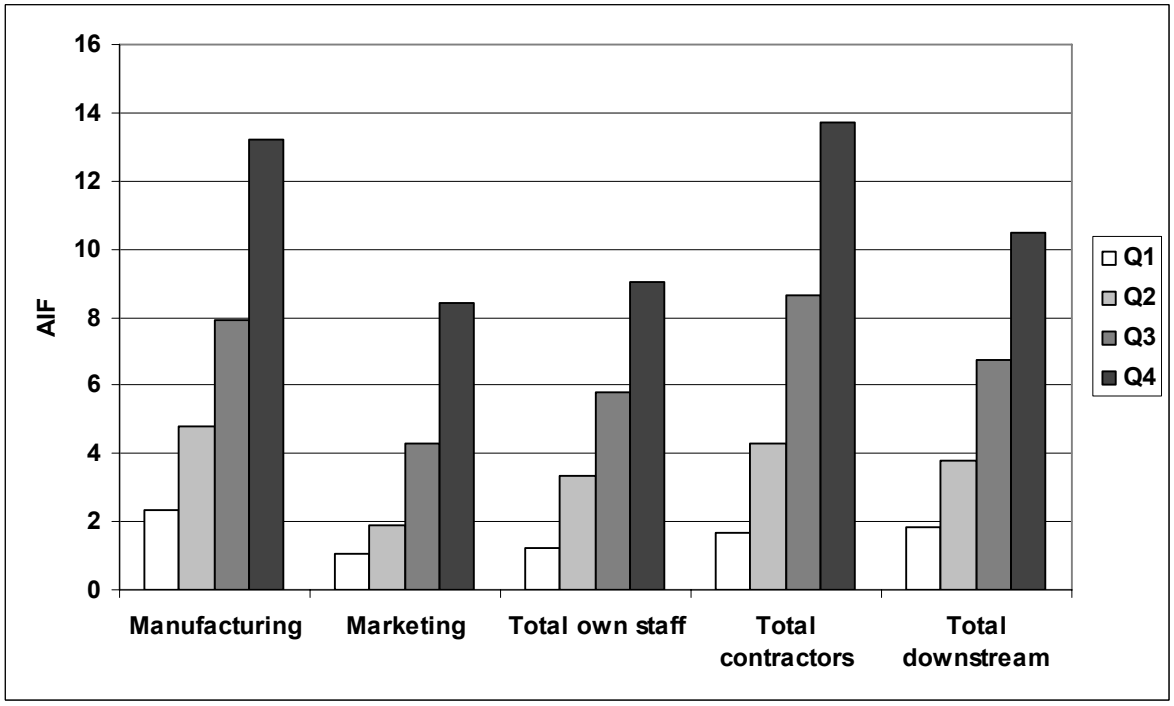
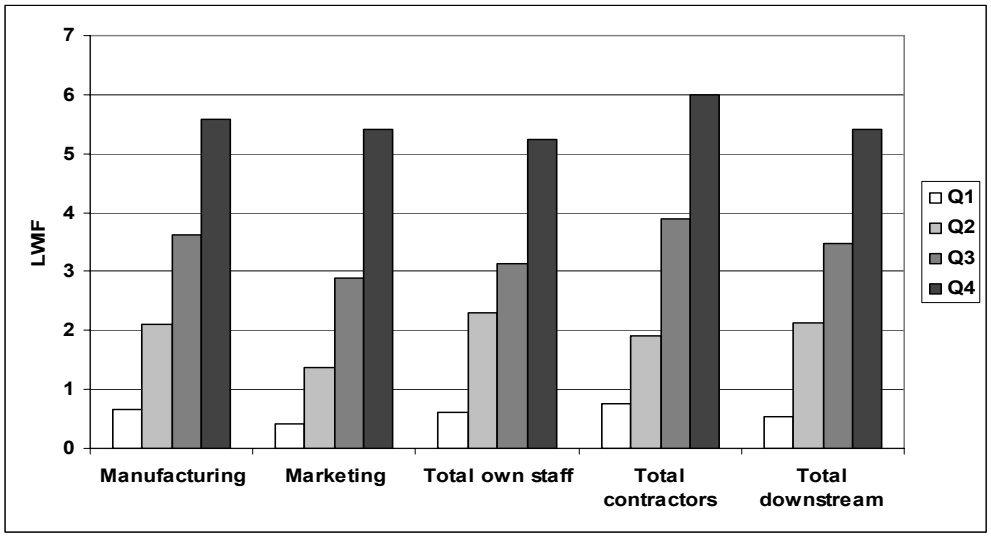
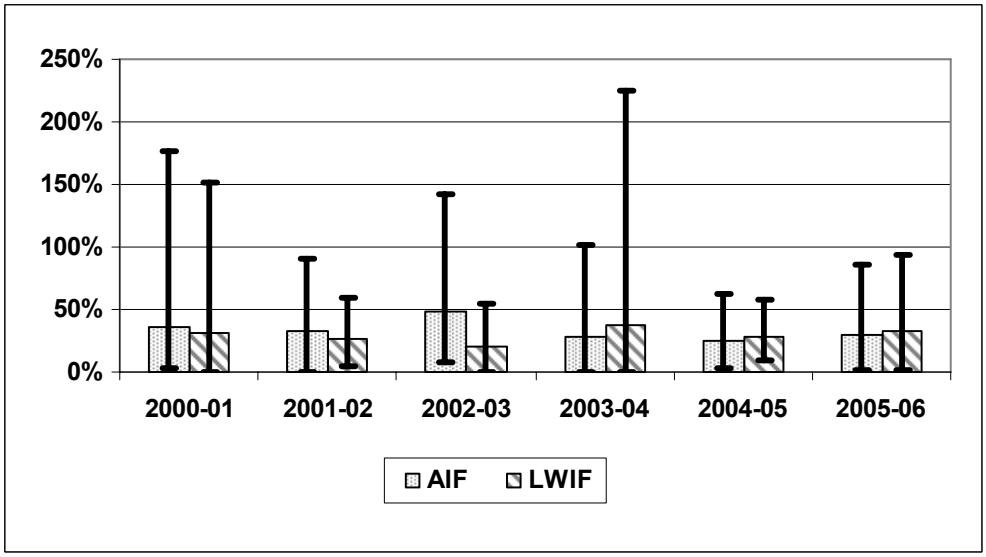


Figure 2b LWIF distribution
Average value for each quartile



The average performance indicator figures clearly hide a wide range of individual values, with a factor of up to 10 between reporting companies. **Figure 3** shows that the variability is significantly less when looking at year-on-year figures for each company individually.

Figure 3 Year-on-year performance indicator variations
Average for all reporting companies



In other words, there are large differences in reported figures between companies and these differences do not change much over the years. This reflects genuine levels of performance achieved by different organisations but also differences in the way they monitor and classify incidents and collect their data.

4. HISTORICAL TRENDS

The performance indicators are of particular interest when considering their evolution over the years. The historical trends for the European downstream oil industry as a whole are shown in **Figures 4a/b** and **Table 3**.

Figure 4a Historical evolution of main performance indicators
Yearly data for the whole European downstream industry

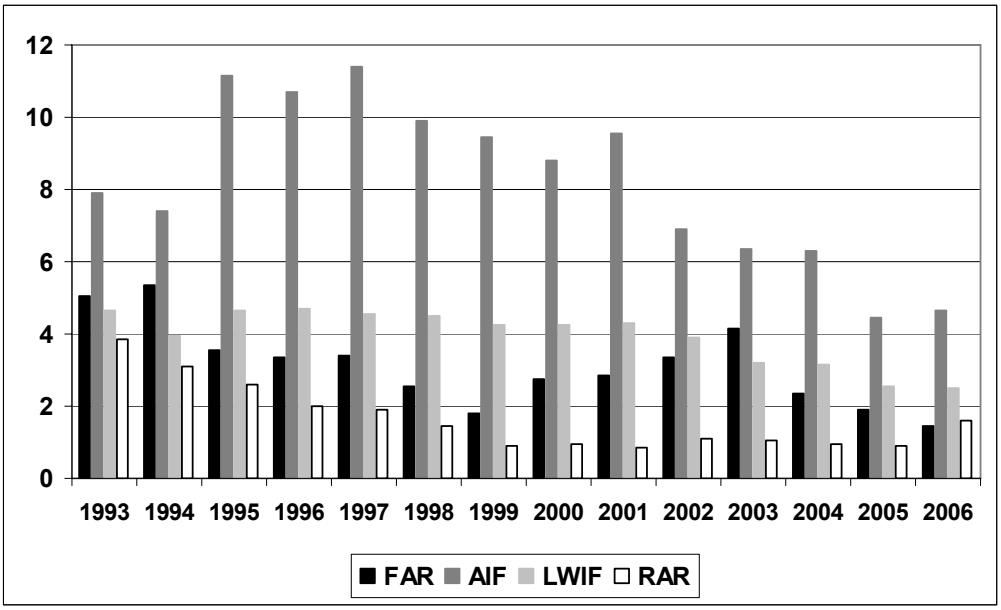


Figure 4b Historical evolution of main performance indicators
3-year rolling average for the whole European downstream industry

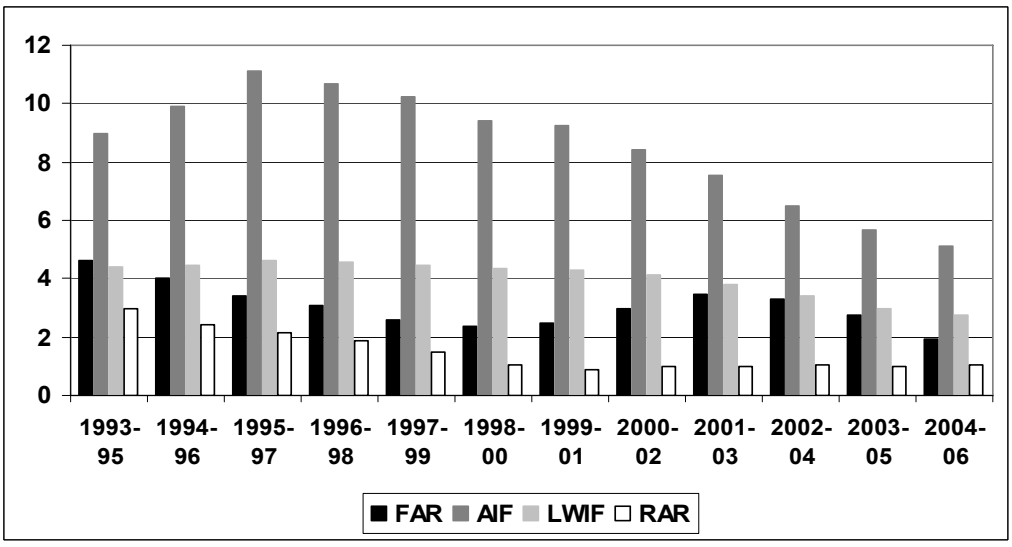
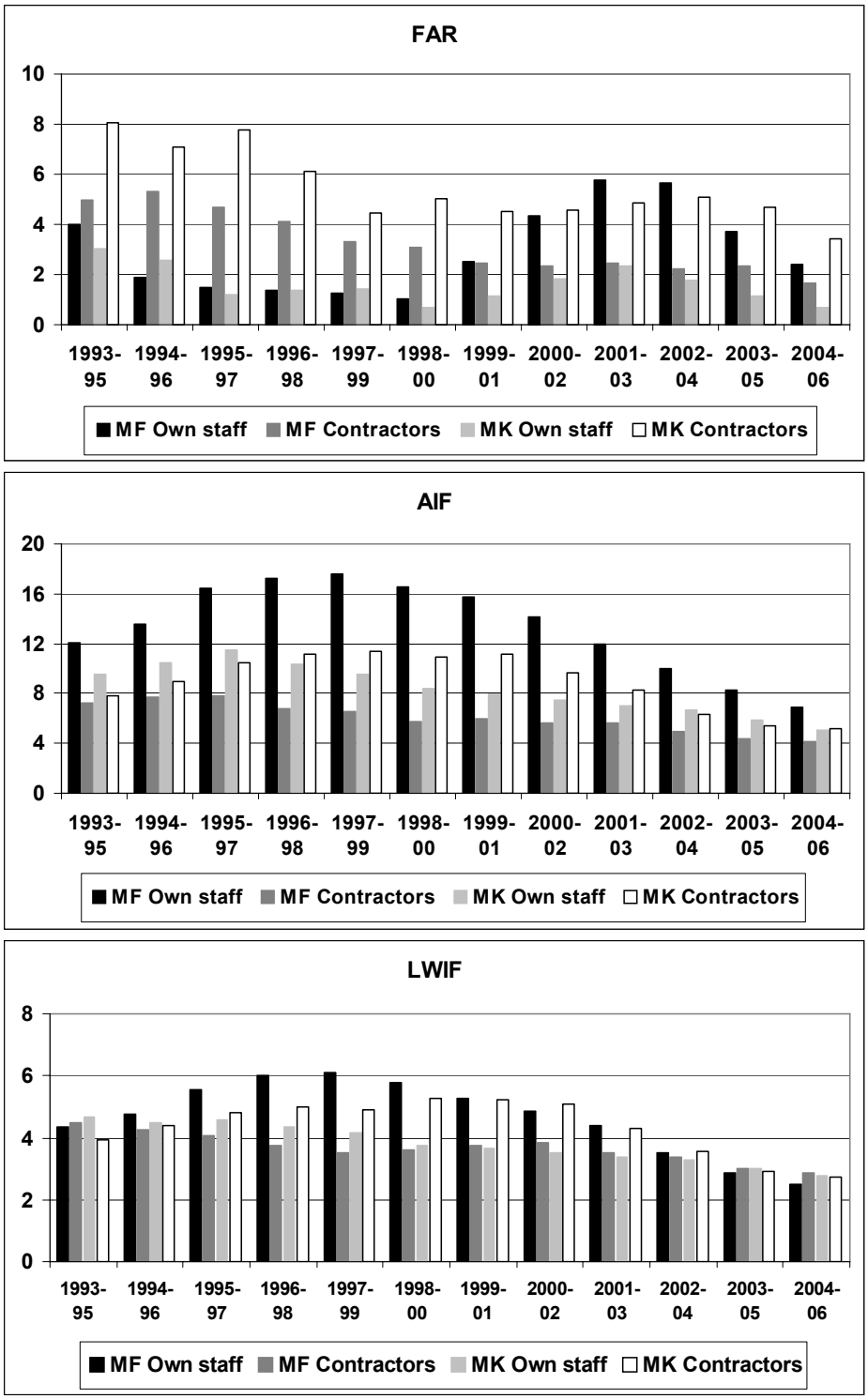


Table 3 Historical evolution of performance indicators

Year/	Fatalities	FAR	AIF	LWIF	LWIS	RAR
1993	18	5.0	7.9	4.7	27	3.8
1994	19	5.4	7.4	4.0	25	3.1
1995	13	3.5	11.2	4.6	24	2.6
1996	14	3.3	10.7	4.7	19	2.0
1997	15	3.4	11.4	4.6	23	1.9
1998	12	2.6	9.9	4.5	22	1.5
1999	8	1.8	9.4	4.3	21	0.9
2000	13	2.7	8.8	4.3	25	0.9
2001	14	2.8	9.5	4.3	24	0.8
2002	16	3.3	6.9	3.9	23	1.1
2003	22	4.1	6.3	3.2	30	1.0
2004	12	2.3	6.3	3.2	33	1.0
2005	11	1.9	4.5	2.6	35	0.9
2006	7	1.5	4.6	2.5	30	1.6
Averages						
1993-2006	14	3.0	8.0	3.9	25	1.3
3-year rolling average						
1993-95	17	4.6	8.9	4.4	25	3.0
1994-96	15	4.0	9.9	4.5	22	2.4
1995-97	14	3.4	11.1	4.6	22	2.2
1996-98	14	3.1	10.7	4.6	21	1.9
1997-99	12	2.6	10.3	4.4	22	1.5
1998-00	11	2.4	9.4	4.3	23	1.0
1999-01	12	2.5	9.3	4.3	23	0.9
2000-02	14	3.0	8.4	4.1	24	1.0
2001-03	17	3.5	7.6	3.8	25	1.0
2002-04	17	3.3	6.5	3.4	28	1.0
2003-05	15	2.8	5.7	3.0	32	1.0
2004-06	10	1.9	5.1	2.7	31	1.1

Figure 5 shows the 3-year rolling average for FAR, AIF and LWIF segmented into the Manufacturing and Marketing activities, each split between own staff and contractors.

Figure 5 Historical evolution of main performance indicators segmented 3-year rolling average
(MF: Manufacturing; MK: Marketing)



A total of 7 fatalities were reported for 2006. Following a steady downward trend during the 1990s, fatality numbers began to increase in the first year of this decade. The 2004 figure showed a reversing of this unfavourable trend and this is confirmed by the 2006 figure. The FAR has now returned to the level observed in the late 90s, but as discussed in chapter 3, it should be kept in mind that FAR is notoriously prone to large variations.

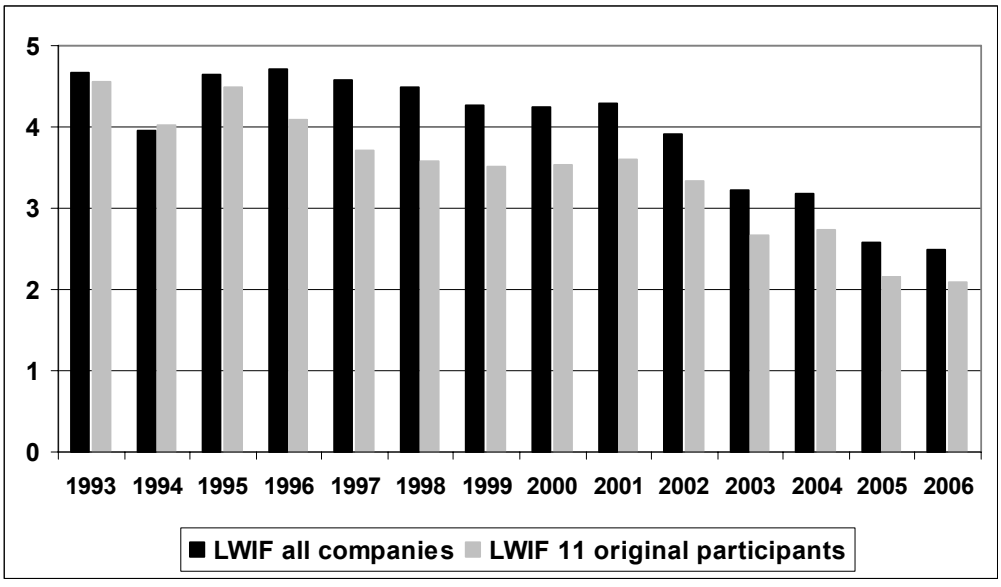
Overall the other indicators show a steady performance over the years with slow but steady reduction of LWIF which is under 3.0 for the second year running. This indicator initially had greater reductions in Manufacturing than in Marketing but the 2006 figures for the 4 categories continue to be very close.

The figures suggest that AIF peaked around the 1996-97 but this is likely the result of improved reporting standards. The trend is definitely on a downward slope and AIF figures have improved for all categories.

Road traffic accidents were tremendously reduced compared to the early years but the rate appears to have now reached a plateau. These accidents essentially occur in the Marketing activity where the bulk of the driving takes place.

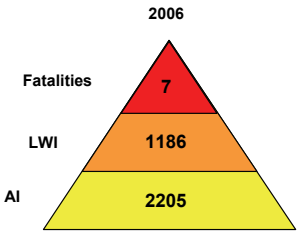
The number of reporting companies has changed over the years. Especially in view of the large differences observed between companies, it can be argued that the yearly figures are therefore not completely consistent. A similar analysis has been performed, restricting the data to the 11 companies that have reported since the original 1993 survey (including those companies that have merged). As an example **Figure 6** shows the LWIF for both sets. Although the values are somewhat lower for the original participating companies, the trends are generally similar.

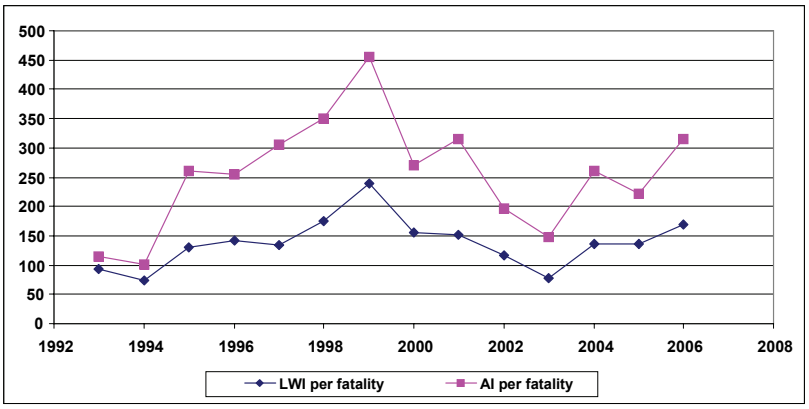
Figure 6 Comparison of LWIF evolution for all reporting companies and original participants



One point of particular interest is the “safety triangle” i.e. the relationship between the total number of recordable incidents or the number of LWIs and the number of fatalities. This is shown in **Figure 7**.

Figure 7 The safety triangle





The figure illustrates the declining number of fatalities until 1999 whereas the total number of incidents remained fairly constant. The period from 2000 to 2003 saw a steady increase in fatalities while both AI and LWI were still on a decreasing trend, resulting in a decrease of the ratios. The lower number of fatalities from 2004 to 2006 has reversed this trend.

Figure 8 details the causes of the 7 fatalities recorded in 2006 and **Figure 9** shows the percentage of the main causes over the last 6 years. In 2006 5 fatalities were due to road accidents, which average 40% over the last six years. The two other fatalities result from hazards directly associated with our industry maintenance and construction activities.

Over the last 5-year period road accidents and construction/maintenance activities remain the principal causes of fatalities.

Figure 8 Causes of fatalities in 2006

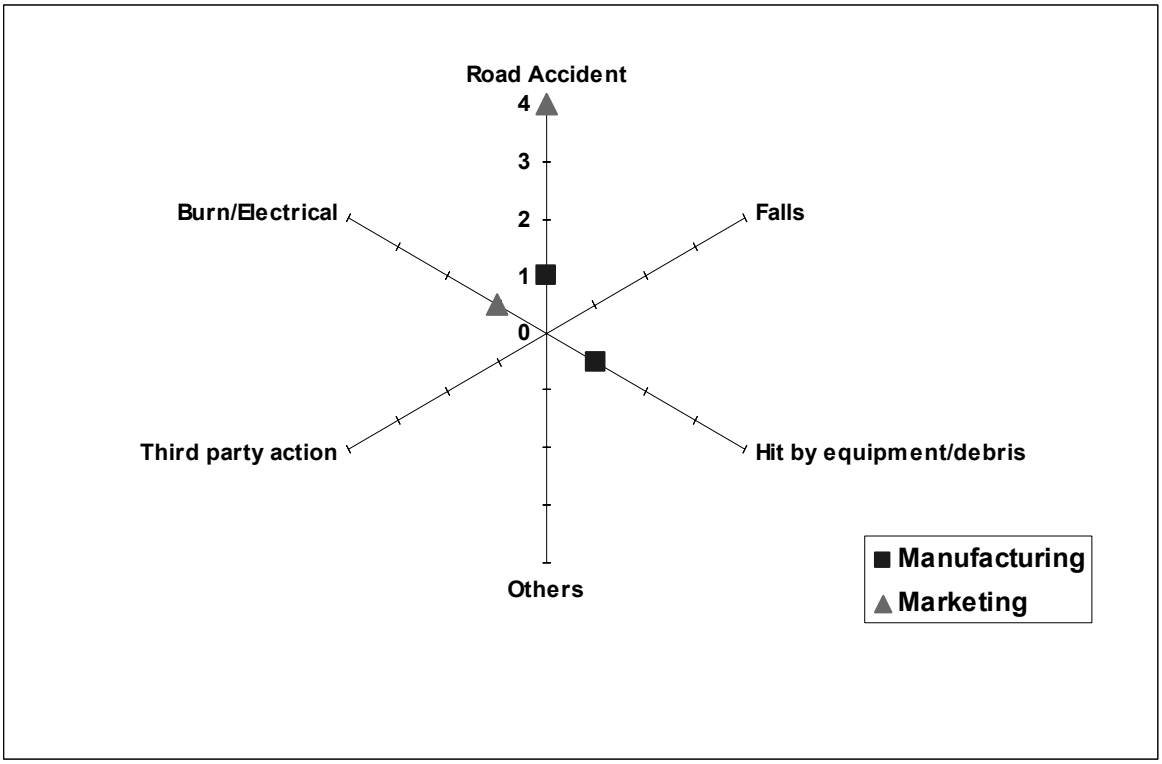
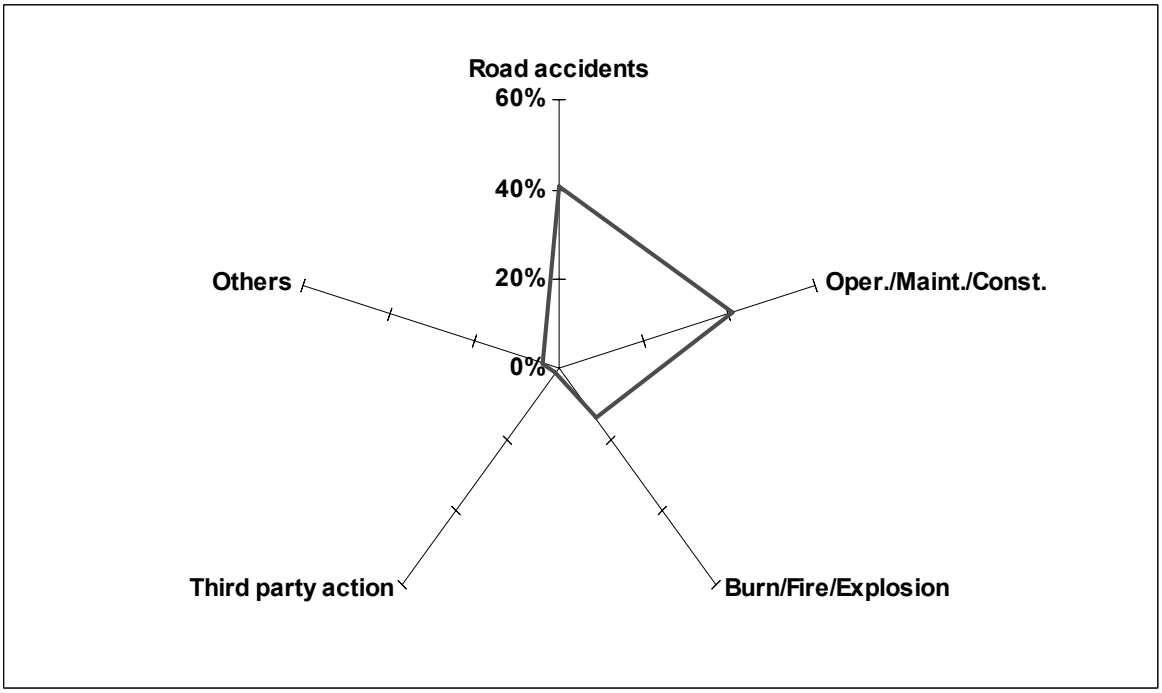


Figure 9 Causes of fatalities between 2001 and 2006



5. COMPARISON WITH OTHER SECTORS

Most of the safety performance indicators used in the oil industry, and particularly LWIF, have also been adopted in many other sectors so that meaningful comparisons are possible.

Table 4 Comparison of the safety performance of the downstream oil industry with other industry sectors

	CONCAWE 2006	OGP 2006[1]		CEFIC 2006
		Europe	World	
FAR	1.5	N.A.	3.9	0.93[2]
AIF	4.6	5.7	3.1	NA
LWIF	2.5	1.7	1.0	6.7

OGP Oil & Gas Producers

CEFIC Conseil Européen des Fédérations de l'Industrie Chimique

(1) Own staff and contractors

(2) Estimated from the figure of 1.7 fatalities per 100,000 workers reported by CEFIC (assuming 1800 h/a worked per worker)

The OGP statistics concern the “upstream” oil industry covering oil and gas exploration and production activities. This sector shows better AIF and LWIF performances than the downstream, on a global basis, which was also the case in previous years. But the World FAR and European AIF is higher than the downstream sector.

The chemical industry data, collected by CEFIC, are less favourable in terms of LWIF but continue to show a much lower fatality rate.

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APPENDIX 1 EUROPEAN OIL INDUSTRY STATISTICS DEFINITIONS AND GUIDING NOTES

1. Hours worked	Hours worked by employees and contractors. Estimates should be used where contractor data is not available.
2. Fatality	This is a death resulting from a work related injury where the injured person dies within twelve months of the injury.
3. LWI	Lost Workday Injury is a work related injury that causes the injured person to be away from work for at least one normal shift because he is unfit to perform any duties.
4. Total days lost	The number of calendar days lost through LWIs counting from the day after the injury occurred.
5. RWI	Restricted Workday Injury is a work related injury which causes the injured person to be assigned to other work on a temporary basis or to work his normal job less than full time or to work at his normal job without undertaking all the normal duties.
6. MTC	Medical Treatment Case is a work related injury which requires the attention of a medical practitioner. It excludes first aid treatment.
7. AIF	All Injury Frequency which is calculated from the sum of fatalities, LWIs, RWIs and MTCs divided by number of hours worked expressed in millions.
8. LWIF	Lost Workday Injury Frequency is calculated from the number of LWIs divided by the number of hours worked expressed in millions.
9. LWIS	Lost Workday Injury Severity is the total number of days lost as a result of LWIs divided by the number of LWIs.
10. Distance travelled	This is the distance, expressed in millions of kilometres, covered by company owned delivery vehicles and company cars whether leased or owned. It should also include kilometres travelled in employee's cars when on company business.
11. Road Accidents	Any accident involving any of the vehicles described above.
12. RAR	Road Accident Rate is calculated from the number of accidents divided by the kilometres travelled expressed in millions.
13. FAR	Fatal Accident rate is calculated from the number of fatalities divided by the number of hours worked expressed in hundred millions.

Statistics to be collected under two groupings: Manufacturing (refineries) and Marketing.

Marketing includes all non-refining activities including "Head Office" personnel.

Where data is not available the best estimate possible should be made.