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european downstream oil industry safety performance

statistical summary of reported incidents – 2002

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ABSTRACT

The ninth such report by CONCAWE, this issue includes statistical work accident data for the downstream oil industry's own employees as well as contractors for the year 2002. Data was received from 17 companies representing around 80% of the European refining capacity and essentially covering the EU, European Economic Area (EEA), and Hungary. Trends over the last ten years are highlighted and the data is also compared to similar statistics from related industries as well as general EU figures.

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 ten years ago and this is the ninth report on this topic (see references of past reports in the reference list [1-8]). This report covers data collected for 2002 and includes a full historical perspective from 1993. It also includes comparative figures from other industry sectors. Data for 2002 was submitted by 17 companies, together accounting around 80% of the refining capacity of Western Europe and Hungary.

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 Western Europe are now at low levels and have been maintained so throughout the period of reporting. Overall, the 2002 performance appears slightly improved compared to previous years confirming the trend observed in previous years. Standing at 3.9, the Lost Work Incident Frequency (LWIF) for 2002 is the lowest recorded so far. The responsible management of safety in the oil industry has resulted in a low level of accidents compared to other industries in Europe despite the intrinsic hazards of the materials handled and the operations carried out. The fatal accident rate has, however, somewhat increased in recent years.

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 ten years ago and this is the ninth report on this topic (see references of past reports in the reference list). This report covers data collected for 2002 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 and 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. In addition the data is split between own personnel and contractors, the latter being fully integrated in all companies safety monitoring systems.

The purpose of collecting this information is twofold:

- 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 member companies 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. For 2002, 17 companies responded although not all companies could supply all the requested data.

The area of coverage is primarily the EU plus Norway and Switzerland and also includes Hungary. In addition some companies include in their data other Eastern European 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 Western Europe as well as by other branches of industry. 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 basic parameters, 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 and averages with range of variation.

It is noteworthy that the majority of participating companies are willing for their data to be shared 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 performance indicators have become “standard” in the oil industry and in many other sectors. They are mostly expressed in terms of event frequency, the number of hours worked being the common denominator of activity. Such parameters have the advantage to rely on a small number of straightforward input parameters and to allow collection of meaningful statistics 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 hours worked.

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

There are, however, still 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 but 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 a number of relatively minor incidents and accidents when left unchecked and uncontrolled.

LWIF and LWIS

This is the most common indicator in our and other industries and has been in use for many years. It is now common practice to include not only own staff but also contractors in the statistics and this is done virtually 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. 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.

As the total number of injuries is not reported by all companies only the worked hours for which this number is reported must be counted in order to calculate the correct overall AIF figure.

RAR

It is no surprise that road accidents are a major cause of both fatalities and lost time injuries so that a number of companies have taken to monitoring these separately. The data is still patchy and there are also issues as to the precise definition of a road accident. The results should therefore be considered as indicative only. For this reason we only report RAR data for the whole downstream industry and all personnel involved (own staff and contractors) as we consider the level of reporting insufficient for the segmented data to be significant.

3. 2002 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 2002

No of companies	Manufacturing		Marketing	
	Own staff	Contractors	Own staff	Contractors
Submission	17	13	14	13
Including				
Lost days	15	10	11	9
All injuries	16	12	11	11
Road accidents	9	4	9	7
Distance travelled	6	2	8	6

All companies submitted data for Manufacturing own staff. Data on Marketing own staff is less complete. Total own staff injuries are recorded by all companies but lost days are not recorded by all companies. Relatively few companies record road accidents separately and even fewer log the distance travelled. Contractor data is generally patchier.

The aggregated 2002 results per sector and for the whole of the downstream oil industry are shown in **Table 2**. **Figure 1** shows the average performance indicators and their range of variability amongst reporting companies. For LWIF, which is the most universally used indicator, we also show the distribution per quartile for the different sectors (**Figure 2**).

Table 2 Aggregated 2002 results for all reporting companies

Sector		Manufacturing			Marketing			Both Sectors		
Work Force		OS	CT	AW	OS	CT	AW	OS	CT	AW
Hours worked	Mh	74	61	134	191	155	346	264	216	480
Fatalities		4	6	10	4	2	6	8	8	16
Fatal Accident Rate	F/100 Mh	5.4	9.9	7.5	2.1	1.3	1.7	3.0	3.7	3.3
Lost work incidents	LWI	217	383	600	688	587	1,275	905	970	1,875
Lost time through LWI	days	5,652	8,075	13,727	11,752	8,197	19,949	17,404	16,272	33,676
LWI frequency	LWI/Mh	2.9	6.3	4.5	3.6	3.8	3.7	3.4	4.5	3.9
LWI severity	LWI/lost day	28.3	24.7	26.1	22.0	20.2	21.1	24.1	22.1	22.9
All recordable incidents	AI	721	834	1,555	1,186	891	2,077	1,907	1,725	3,632
All incidents frequency	AI/Mh	9.9	14.7	11.9	6.6	4.0	5.1	8.0	7.3	7.6
Distance travelled	Tm							430	694	1123
Road Accidents	RA							678	575	1253
Road Accident Rate	RA/Mh							1.58	0.83	1.12

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

Figure 1 Average 2002 performance indicators with range of variability

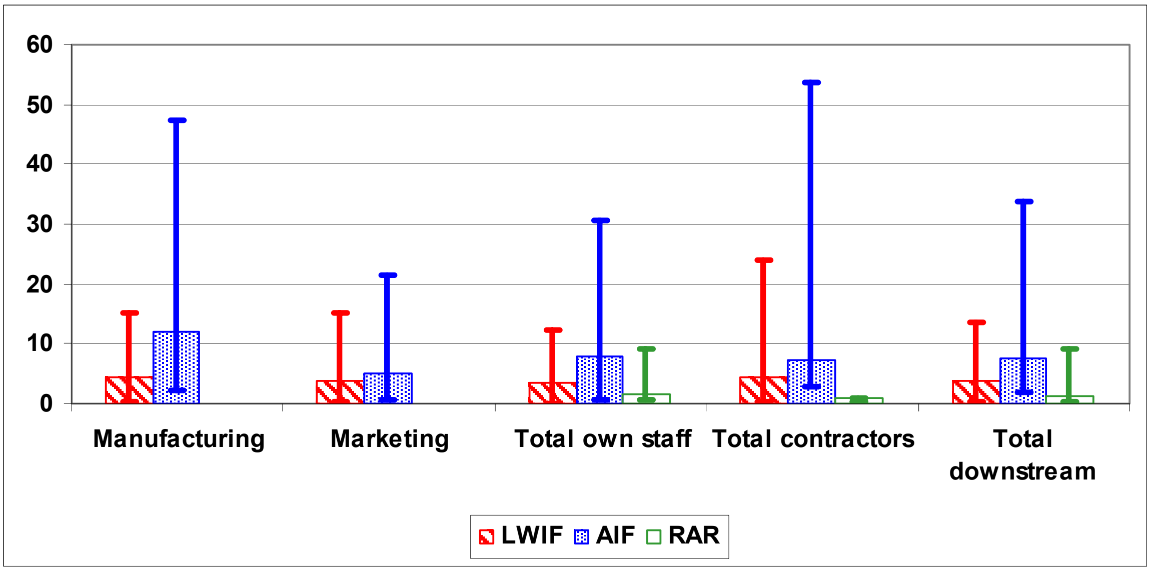
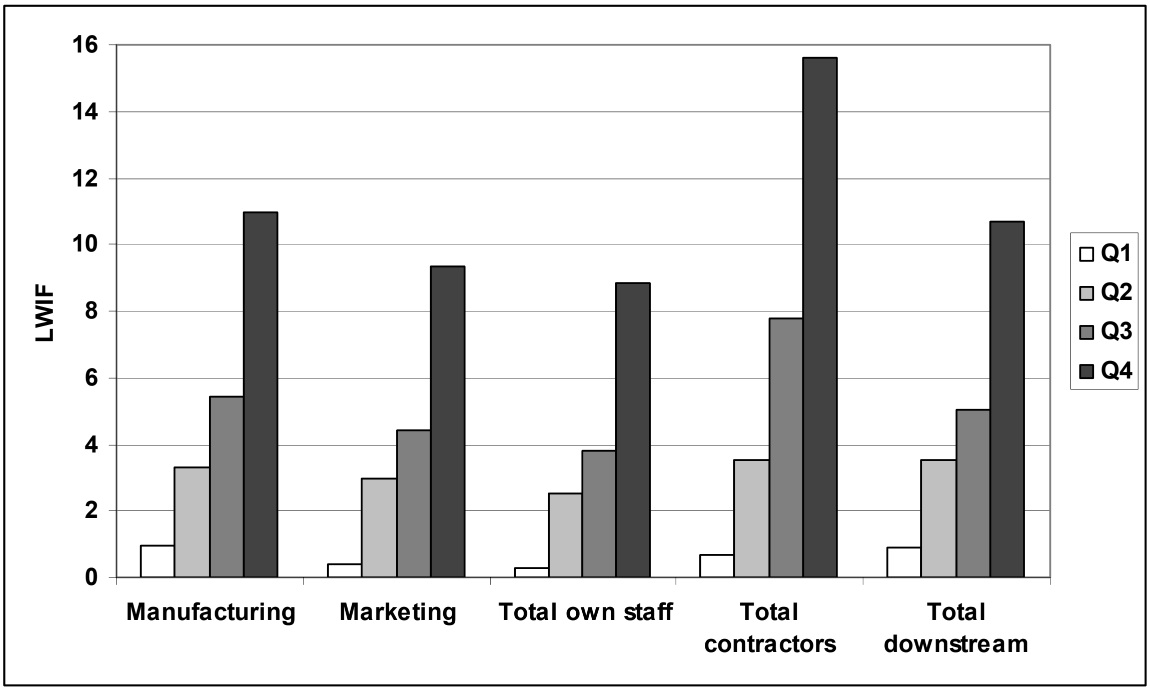
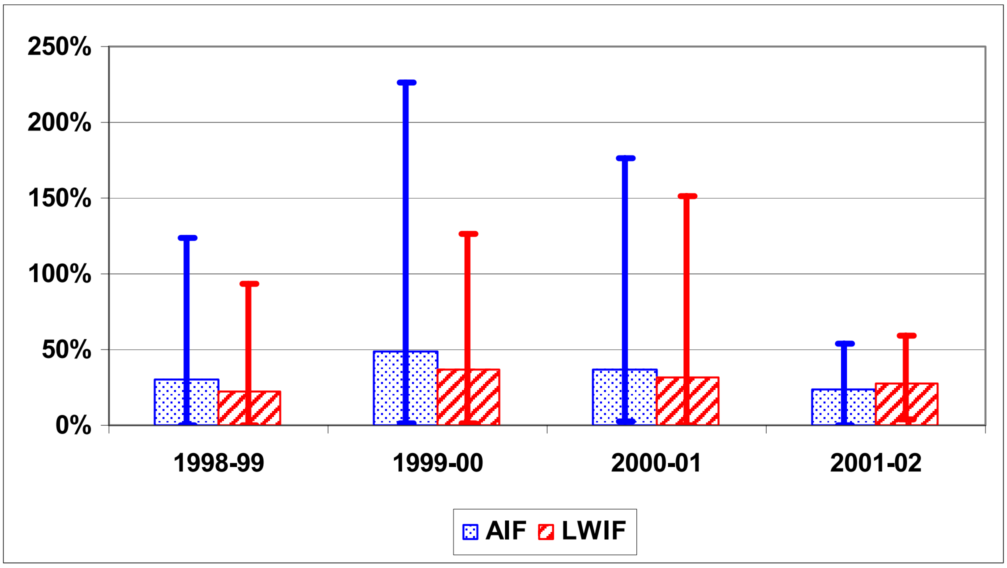


Figure 2 LWIF distribution
Average values for each quartile



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 much 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 from company to company and these differences do not change much over the years. This reflects genuine levels of performance achieved by different companies but also differences in the way companies 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 downstream oil 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 downstream industry

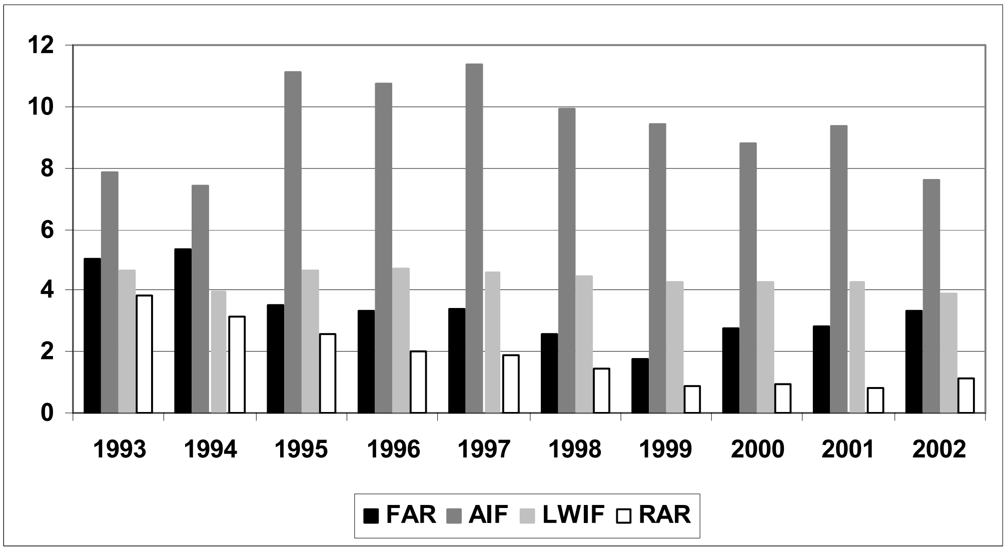


Figure 4b Historical evolution of main performance indicators
3-year rolling average for the whole downstream industry

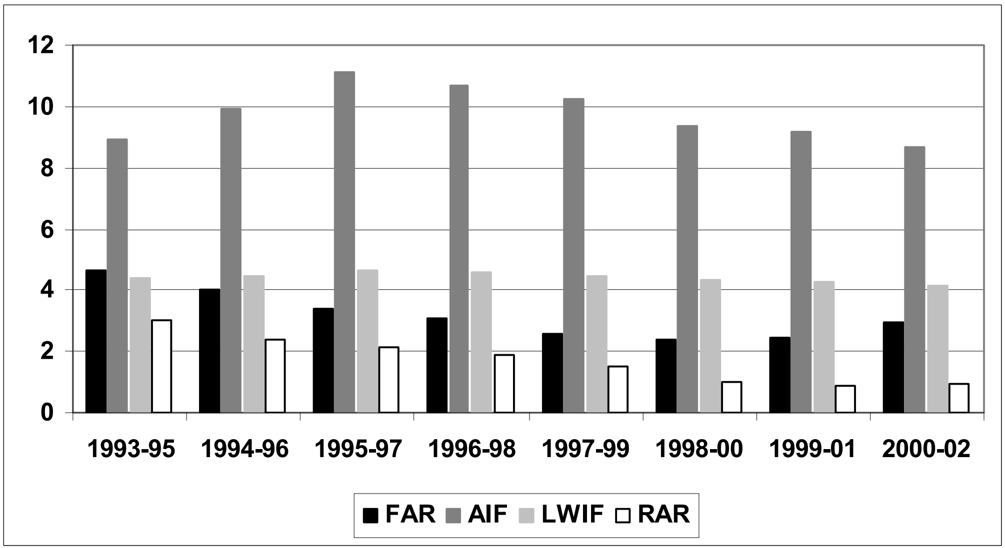
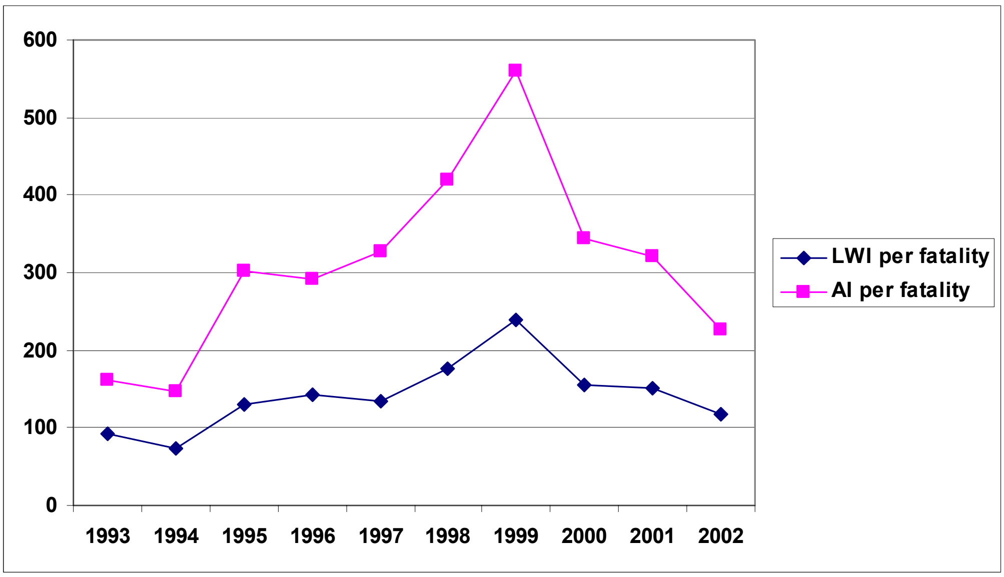


Table 3 Historical evolution of performance indicators

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	21	1.5
1999	8	1.8	9.4	4.3	19	0.9
2000	13	2.7	8.8	4.3	25	0.9
2001	14	2.8	9.3	4.3	24	0.8
2002	16	3.3	7.6	3.9	23	1.1
Averages						
1993-2002	142	3.3	9.5	4.4	23	1.5
3-year rolling average						
1993-95	50	4.6	8.9	4.4	25	3.0
1994-96	46	4.0	9.9	4.5	22	2.4
1995-97	42	3.4	11.1	4.6	22	2.2
1996-98	41	3.1	10.7	4.6	21	1.9
1997-99	35	2.6	10.3	4.4	21	1.5
1998-00	33	2.4	9.4	4.3	22	1.0
1999-01	35	2.5	9.2	4.3	23	0.9
2000-02	43	3.0	8.7	4.1	24	1.0

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 5**.

Figure 5 The safety triangle



The figure illustrates the declining number of fatalities until 1999 whereas the total number of incidents remained fairly constant. As mentioned before the fatality rate has been on the increase over the last few years.

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. As an example **Figure 6** shows the LWIF for both sets. Although the values are generally somewhat lower for the original participating companies, the trends are remarkably similar.

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

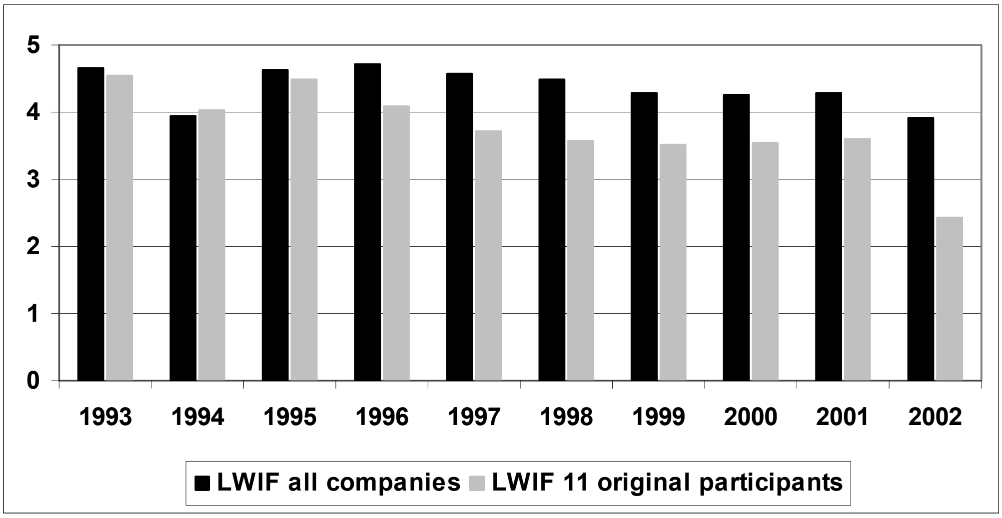


Figure 7 shows the 3-year rolling average for FAR, AIF and LWIF segmented into the Manufacturing and Marketing activities (for own staff as well as contractors) and also separately for own staff and contractors (both activities).

Overall the industry shows a steady performance over the years with a slow but steady progress in LWIF and a major improvement in road traffic accidents. The figures suggest that AIF peaked around the 1996-97 but this is more probably the result of improved reporting standards. Since then the trend is definitely on a downward slope. **Figure 7** suggests that the improvement in LWIF is mainly to be ascribed to own staff, particularly in Manufacturing whereas contractor figures are less favourable. AIF figures have improved for all categories.

Fatality numbers have been disappointing in recent years now back up to mid 90's level after a low point in 1999. As discussed in chapter 3 FAR is notoriously prone to large variations but the trend is still clearly unfavourable. It is clear from **Figure 7** that the deterioration comes from own staff fatalities, particularly in Manufacturing. The relatively high figure for Marketing contractors is a reflection of the prominence of road accidents, more likely to occur in Marketing because of the type of activity.

Figure 7 Historical evolution of main performance indicators segmented 3-year rolling average

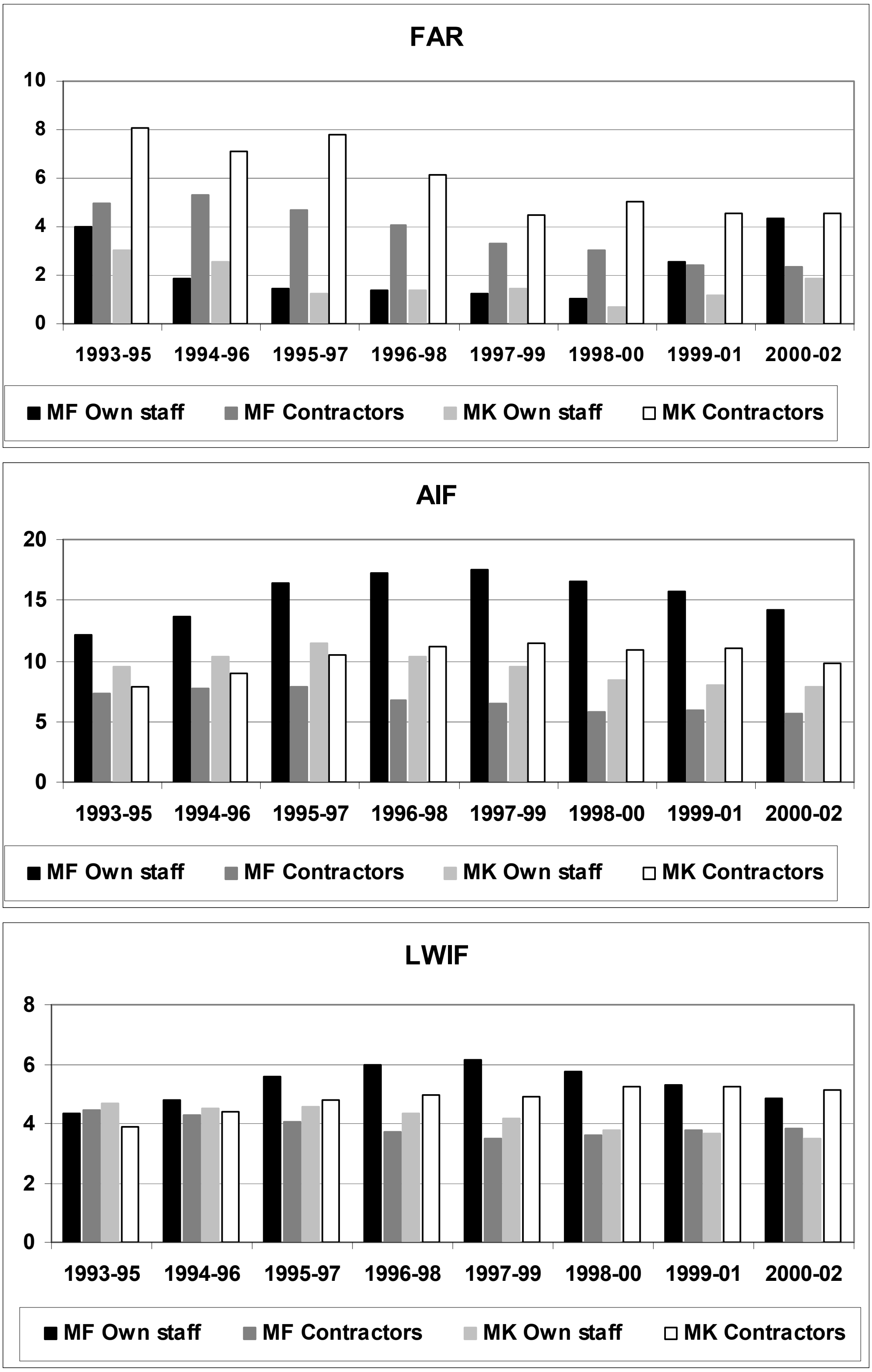
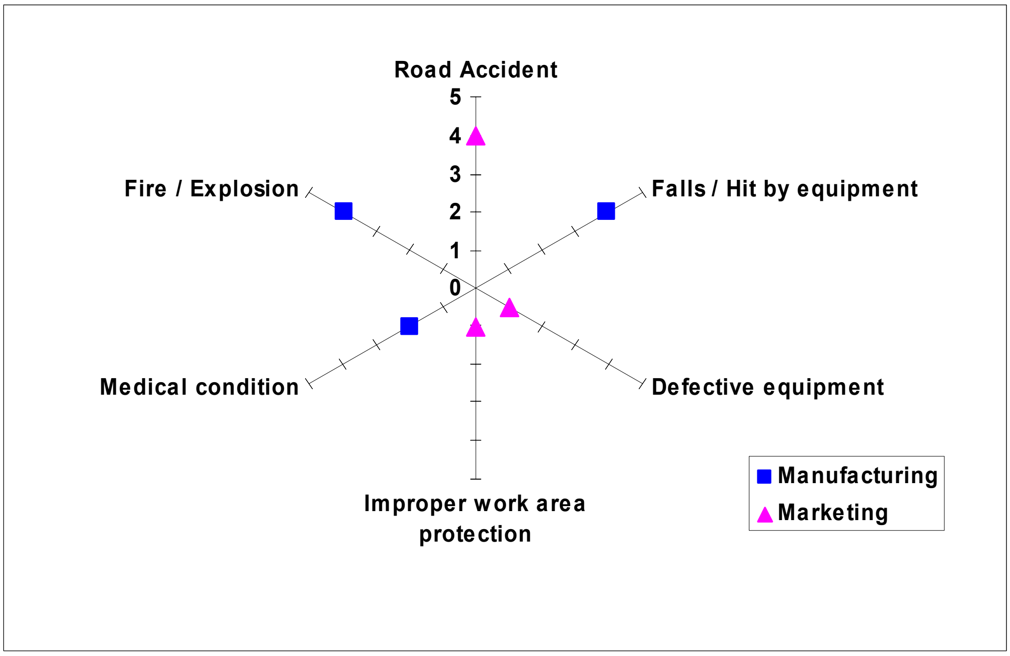


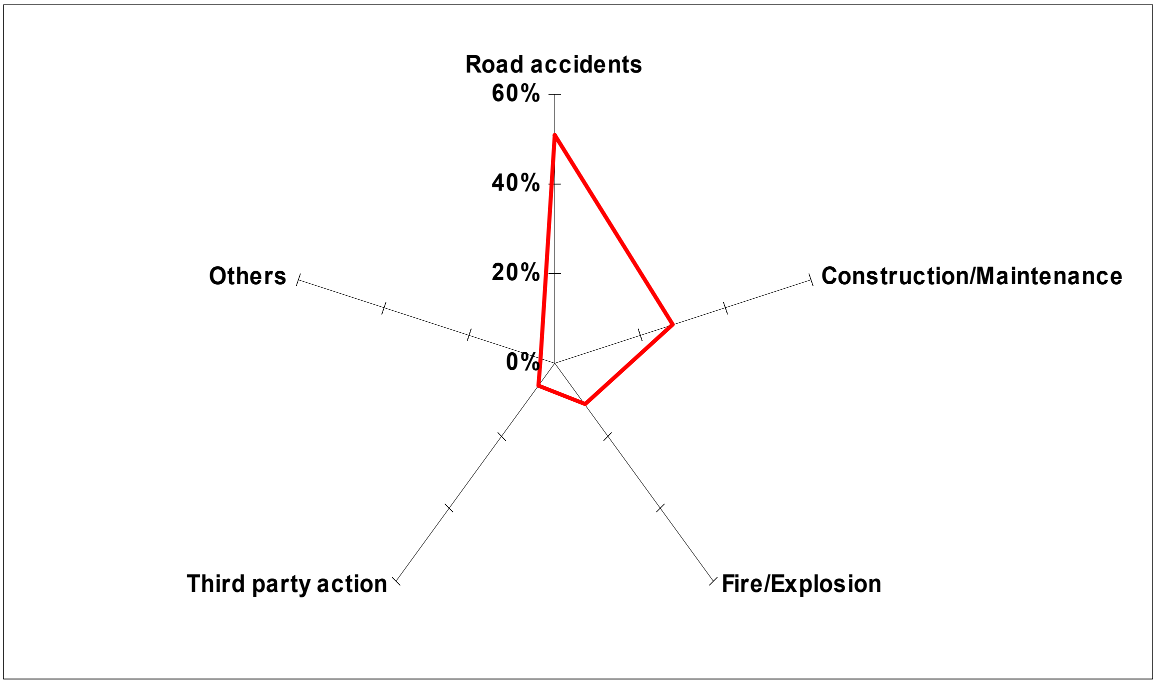
Figure 8 details the causes of the 16 fatalities recorded in 2002 whereas **Figure 9** shows the percentage of the main causes over the last 5 years. In 2002 “only” 4 fatalities were due to road accidents compared to 5 out of 14 in 2001 and 11 out of 13 in 2000. Maintenance activities now account for the largest number of fatalities in 2002 (7 in total). Also there were four deaths related to fires and explosions, hazards associated to our industry, whereas this had not been the case for several years.

Figure 8 Causes of fatalities in 2002



There has been a significant improvement in the road accident rate. As mentioned in previous chapters, these figures must, however, be taken with caution as the sample is smaller than for other metrics (many companied do not report this information) and there may be a lack of consistency in the definition. Nevertheless the figures bear witness to the efforts made by many companies in recent years to focus attention on road accidents.

Figure 9 Causes of fatalities between 1998 and 2002



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 2002	OGP 2002		CEFIC 2001	EU all branches 1999
		Europe	World		
FAR	3.3	NA	3.9 (1)	NA	8.0 (2)
AIF	7.6	7.0	3.6	NA	NA
LWIF	3.9	2.0	1.1	10.5	19.6 (2)

OGP: International Association of Oil & Gas Producers [9]
CEFIC: Conseil Européen des Fédérations de l'Industrie Chimique [10]
(1) Own staff and contractors only, third party excluded
(2) European social statistics [11,12]

The OGP statistics concern the "upstream" oil industry covering oil and gas exploration and production activities. This sector shows a better performance than the downstream, which was also the case in previous years.

The chemical industry data, collected by CEFIC, are clearly much less favourable.

Data for the EU, covering all sectors of economic activities have been collected from EUROSTAT. EUROSTAT only reports the number of workers involved so that the corresponding number of work hours had to be estimated to arrive at the LWIF figure shown. The oil industry is clearly well ahead.

6. REFERENCES

1. CONCAWE (1996) European downstream oil industry safety performance. Statistical summary of reported incidents – 1993 & 1994. Report No. 1/96. Brussels: CONCAWE

2. CONCAWE (1996) European downstream oil industry safety performance. Statistical summary of reported incidents – 1995. Report No. 3/96. Brussels: CONCAWE

3. CONCAWE (1997) European downstream oil industry safety performance. Statistical summary of reported incidents – 1996. Report No. 4/97. Brussels: CONCAWE

4. CONCAWE (1998) European downstream oil industry safety performance. Statistical summary of reported incidents – 1997 and overview 1993 to 1997. Report No. 4/98. Brussels: CONCAWE

5. CONCAWE (1999) European downstream oil industry safety performance. Statistical summary of reported incidents – 1998. Report No. 1/99. Brussels: CONCAWE

6. CONCAWE (2000) European downstream oil industry safety performance. Statistical summary of reported incidents – 1999. Report No. 1/00. Brussels: CONCAWE

7. CONCAWE (2001) European downstream oil industry safety performance. Statistical summary of reported incidents – 2000. Report No. 3/01. Brussels: CONCAWE

8. CONCAWE (2002) European downstream oil industry safety performance. Statistical summary of reported incidents – 2001. Report No. 2/03. Brussels: CONCAWE

9. OGP (2003) Safety performance of the global E&P industry 2002. Report No. 345. London: International Association of Oil & Gas Producers

10. CEFIC (2003) Responsible care status report Europe 2002. Brussels: Conseil Européen des Fédérations de l'Industrie Chimique

11. EU (2002) European social statistics. Accidents at work and work-related health problems. Data 1994-2000. Luxembourg: Eurostat

12. EU (2002) EUROSTAT year book 2002. Data 1994-2000. Luxembourg: Eurostat

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.