

european downstream oil industry safety performance

statistical summary of reported
incidents - 1999

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ABSTRACT

This report is the sixth by CONCAWE reviewing the safety performance of the downstream oil industry in Europe. The area of coverage is primarily the EU, EEA and Hungary, but for some companies the data for other European countries such as Poland, Czech Republic, Turkey, etc. are included. The report includes the results of 21 companies which together represent a large majority of the oil refining capacity in the region. This is six less companies than last year and results from five companies not being able to supply usable data and the merger of two others. Of the 21 companies, 17 gave data for both contractors and employees. It is therefore a representative sample of the industry. However, as the data for some companies is incomplete, all results are quoted as frequencies.

The data covers the year 1999 and is compared with the averages for the previous five year period 1994 to 1998. Overall, the reported hours worked by company staff and contractors combined were about 450 million with an average Lost Workday Injury Frequency (LWIF) of 4.3. This is slightly lower than the average for the years 1994 to 1998 which was 4.5. It is also lower than for any of the figures reported for previous years apart from 1994 when only 17 companies reported.

A range of other measures of safety performance are also reported. 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. In addition, all the fatalities reported were unconnected with these hazardous properties and resulted from road accidents or construction and maintenance activities.

In general, the safety performance for the companies reporting was slightly better in 1999 than the performance reported previously for 1993 to 1998. In particular, the number of fatalities reported was at the all time low of eight.

KEYWORDS

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

NOTE

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CONTENTS		Page
SUMMARY		IV
1.	INTRODUCTION	1
2.	RANGE OF STATISTICS COLLECTED	2
3.	FINDINGS – 1999	3
3.1.	HOURS WORKED	4
3.2.	LOST WORKDAY INJURY FREQUENCY (LWIF)	4
3.3.	LWI SEVERITY (LWIS)	4
3.4.	ALL INJURY FREQUENCY (AIF)	5
3.5.	ROAD ACCIDENT RATE (RAR)	5
3.6.	FATALITIES	5
4.	RESULTS FOR COMPANIES WHO HAVE REPORTED ALL YEARS	7
5.	COMPARISON WITH OTHER SECTORS	8
6.	REFERENCES	9
APPENDIX 1	EUROPEAN OIL INDUSTRY STATISTICS DEFINITIONS AND GUIDING NOTES	10
APPENDIX 2	GRAPHS SHOWING SPREAD OF DATA	11

SUMMARY

The importance of collecting and analysing accident data to measure safety performance is recognised throughout the oil industry. A number of key statistics have been identified which are measured by the majority of oil companies operating in Western Europe.

This year, 21 companies operating in the downstream oil industry in Western Europe submitted statistics for this CONCAWE report on safety performance. These companies represent a large majority of the refining capacity in the area. The data cover the year 1999 and are for both the Manufacturing (Refining) and Marketing sectors of the industry. The area of coverage is primarily the EU, EEA and Hungary, but for some companies the data for other European countries such as Poland, Czech Republic, Turkey, etc. are included.

Not all companies operate in both the manufacturing and marketing areas, nor do they all collect the full range of data requested. To allow for this fact, nearly all the data is reported in terms of incident frequencies. The figures therefore, provide a reasonably representative measure of downstream industry safety performance.

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 1999 performance appears somewhat improved over the average performance for the previous five years.

From the data submitted it is apparent that there are considerable variations in the results reported by individual companies. Such variations provide a valuable pointer for member companies to identify areas for improvement.

1. INTRODUCTION

This report represents statistical data relating to safety performance in the downstream oil industry in Western Europe collected by CONCAWE. The purpose of collecting the information was twofold:

- to allow member companies to compare their performance against industry norms (*ie* benchmark) so that they can determine the efficacy of their management systems and highlight any deficiencies so that corrective action can be taken.
- 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.

This report is the sixth annual report on this subject. The first report ¹ covered the years 1993 and 1994, further reports covered 1995, ² 1996, ³ 1997, ⁴ and 1998. ⁵ The 1997 report also gave an overview for the five years 1993 to 1997. The 1998 report also gave a comparison with overall safety performance in the EU. This report covers 1999 performance and compares it with that for the previous five years 1994 to 1998. The questionnaire used to collect the data was similar to that used for the previous surveys. As last time, a simple explanation of the causes of fatalities was also asked for.

The definitions of the terms used in the survey on were unchanged. Although it was recognised that not all companies use exactly the same methods at present, companies were encouraged to report what information they had available even if the definitions they used were not identical. Such differences are believed to be not significant when the statistics are aggregated. However, care needs to be taken when comparing companies as the assumptions used may not be the same.

21 member companies responded this time. This is six less than last year as five companies could not report data in the necessary format and two companies had merged and this year returned a combined report. The report still includes the majority of the CONCAWE membership which operate refineries and a large majority of the Western European refining capacity. It was notable that the majority of these companies were willing for their data to be shared openly with other companies. This free exchange indicates that they felt that they could both learn from the experience of others and help other companies even though they are competitors.

This year, the results for 1998 have also been compared with those from the upstream oil industry and the European chemical industry. Results for the latter for 1999 were not yet available.

2. RANGE OF STATISTICS COLLECTED

Not all companies measure their safety performance in the same way or collect the same statistics. To take account of the fact that not all companies could supply data in all of the sections the results are expressed in terms of frequencies per hours worked. The safety performance statistics collected (for definitions see **Appendix 1**) were :

- Lost Workday Injury Frequency (LWIF)
- LWI Severity (days lost per accident) (LWIS)
- All Injury Frequency (AIF)
- Road Accident Rate (RAR)
- Fatalities

The data survey provided a detailed breakdown of key safety statistics. These were split between:

- employees
- contractors

and also between:

- manufacturing (refining)
- marketing including all non refining activities including “Head Office” staff.

The request form was similar to that used in previous surveys except that this year, companies were also asked for brief descriptions of fatal accidents. The area of coverage is primarily the EU, EEA and Hungary, but for some companies the data for other European countries such as Poland, Czech Republic, Turkey, etc. are included.

3. FINDINGS – 1999

Accident frequencies in the downstream petroleum industry are at low levels when compared to other industries.⁴ With the low level of incidents, the differences year on year are probably not significant, particularly when the changes in the number of companies reporting over the period is considered. The figures for 1999 show some improvement over the average for the five years 1994 to 1998. This improvement is more marked if only those companies (now 14) which have participated throughout the seven years of the survey are considered (see **Section 4**).

A summary of the 1999 results compared to those from the previous 5 year average is provided in **Table 1**. This year, a total of 21 companies reported usable data. This is six less than last year as five companies could not report the data in usable form and two companies had merged and returned a combined report.

In **Table 1**, the All Injury Frequency (AIF) is only calculated for those companies who reported either or both of Restricted Work Injuries (RWI) or Medical Treatment Cases (MTC). Similarly, LWIS figures exclude data where number of days lost was not recorded.

Table 1 Comparison of Representative Data for 1993 to 1999

Year - No of Companies	Fatalities	FAR	LWIF	LWIS	AIF	RAR
1993 - 17 companies	18	5.0	4.7	25.7	8.0	3.8
1994 - 17 companies	20	5.4	4.0	24.4	8.3	3.1
1995 - 22 companies	13	3.6	4.6	24.0	11.2	2.6
1996 - 28 companies	14	3.3	4.7	19.5	10.8	2.0
1997 - 27 companies	15	3.4	4.6	22.8	11.4	1.9
1998 - 27 companies	12	2.6	4.5	21.2	9.9	1.5
1999 - 21 companies	8	1.8	4.3	19.3	9.4	0.9
1994-1998 average	14.8	3.6	4.5	22.3	10.3	2.1

The aggregated accident data collected from CONCAWE members for 1999 is summarised below in **Table 2**. The range of results expressed in graphical format is shown in **Appendix 2**. It should be noted that in these figures, a zero result usually means that no data was reported for this determinant. However, in a few cases, there were no incidents so that the frequency was actually zero. These cases are indicated on the figures (LWIF only). In each case, the 1999 figures are compared to the average for the previous five years, or for as many years as the company has submitted data. It can be observed that in some cases there are wide differences between the 1999 data and the averages for the years 1994-1998. These mainly represent areas where only a small number of man-hours were recorded when a small change in the number of incidents gives a disproportionate change in the frequency.

3.1. HOURS WORKED

In 1999, the total reported hours worked (**Table 2**) by employees and contractors at 448 million were about 22 million less than for 1998 mainly resulting from the reduction in the number of companies reporting. There was a decrease in all the sectors apart from the manufacturing contractor sector which increased by 3 million.

Table 2 Aggregated Results for the Twenty-one Companies which Reported in 1999

Sector	Manufacturing			Marketing			Both Sectors		
	Own Staff	Contractor	All Workers	Own Staff	Contractor	All Workers	Own Staff	Contractor	All Workers
Work Force									
Total hours worked (million)	92	57	149	178	121	299	271	178	448
Number of fatalities	0	2	2	2	4	6	2	6	8
Number of LWIs	411	461	872	654	391	1,045	1,065	852	1,917
Total days lost through LWIs	7,917	7,948	15,865	10,764	5,189	15,953	18,681	13,137	31,818
Number of RWIs	94	155	249	95	30	125	189	185	374
Number of MTCs	933	636	1,569	366	253	619	1,299	889	2,188
AIF	12.5	24.5	17.4	6.5	5.6	6.1	8.3	11.0	9.4
LWIF	4.5	8.1	5.9	3.7	3.2	3.5	3.9	4.8	4.3
LWI Severity (Days/LWI)	15.5	19.5	17.5	22.7	18.5	21.1	19.5	19.1	19.3
Distance travelled (million km)									474
Number of Road Accidents									429
Road Accident Rate									0.9

Note: The values for AIF and LWIS are calculated after excluding the hours for companies which do not record these data. Therefore, they cannot be calculated from the figures in this table.

3.2. LOST WORKDAY INJURY FREQUENCY (LWIF)

All companies without exception collect employee LWIF data for at least their own staff and this is therefore the most representative statistic of all. In 1999, the LWIF (**Table 1**) calculated overall was 4.3, a slightly improved performance over 1998 and which can be compared to 4.6 in 1997, 4.7 in 1996, 4.6 in 1995, 4.0 in 1994 and 4.7 in 1993. It was therefore the lowest recorded for all the years of the survey apart from 1994 when only 17 companies reported. The average for the previous five years was 4.5.

The performance of individual companies varied widely as shown in **Figures 1 to 3** and **Figures 7 to 9**. The overall figure for contractors (all companies) was slightly higher (**Table 2**) than for employees (4.8 as against 3.9) but the difference was less than in previous years. Again, contractors operating in refineries had an LWIF (8.1) well above that of company employees in refineries (4.5). The differences are becoming less marked however. In the marketing sector, contractors (3.2) and staff (3.7) recorded a similar LWIF.

3.3. LWI SEVERITY (LWIS)

LWI Severity as measured by the number of days lost per incident has shown a consistently improving trend falling from 27.4 days in 1993 to 19.3 days in 1999 (**Table 1**). Most, but not all companies (19 in 1999) record the number of days lost per incident. This figure is reasonably consistent across all the sectors reported varying from 15.5 to 22.7 days per incident. These figures are calculated excluding the results from those companies that do not record the number of days lost. As a result, the values for LWIS cannot be calculated from the figures in **Table 2**.

3.4. ALL INJURY FREQUENCY (AIF)

All Injury Frequency becomes a more meaningful measure of safety performance as LWIF declines to the low levels now experienced. AIF enables us to get a better picture of the total safety performance of the industry since it records fatalities, restricted work injuries (RWI) and Medical Treatment Cases (MTC) in addition to LWI. In the first three years of the survey, the AIF increased from 8.0 in 1993 to 11.2. It is believed that this did not represent an increase in the number of incidents, but rather better reporting of minor incidents. Each year, more companies have reported either or both RWI and MTC.

This year, 18 companies reported such data. It should be noted that not all companies operate the restricted work system and restricted working is not allowed in some countries, but as last year, the AIF figures in the tables were calculated using data from only those companies who reported either RWI or MTC data or both. As a result, the value for AIF cannot be calculated from the figures in **Table 2**.

The overall AIF recorded this year (**Table 1**) was 9.4, which is lower than the last four years and below the average for the years 1994 to 1998 (10.3).

Again, the performance between the various companies varied widely as shown in **Figures 4,5,6** and **10,11,12**. It should be noted that the criteria for defining MTC vary between companies. In these figures, the results of all companies are shown, whether or not they reported both RWI and MTC data. For companies who do not report either RWI or MTC, the AIF shown are the same as the LWIF in the corresponding figures.

3.5. ROAD ACCIDENT RATE (RAR)

Road Accident Rate data was supplied by only ten companies this year, the same number as in 1998. Of those that did respond for this measure, very few companies recorded RAR for either the manufacturing or contractor sectors. Therefore, only the combined RAR data are reported in **Table 2** and **Figure 14**.

There has been a steady reduction in RAR from 3.8 in 1993 to 0.9 accidents per million kilometres in 1999. Although comparison of these data should be made with caution because of the small size of the database and changes in its composition over the years, the ten companies who reported this time recorded that their vehicles (own and contractor) travelled 474 million kilometres in 1999 and were involved in 429 accidents ranging from minor to major. Compared to 1998, this represents a 26% decrease in accidents despite a 29% increase in the number of vehicle kilometres.

3.6. FATALITIES

There were 8 fatalities reported in 1999 (2 employees, 6 contractors) in 8 separate incidents in five different companies. This was four less fatalities than in 1998 (12 fatalities, 4 employees, 8 contractors) and was the lowest number recorded since the start of these surveys. As the reported number of hours worked has increased considerably over the period, the Fatal Accident Rate (FAR) has decreased from 5.1 fatalities per 100 million man-hours in 1993, to 1.8 in 1999, the lowest frequency recorded and a reduction to nearly a third of the 1993 rate.

Because of the small numbers, fatalities are not a reliable indicator of safety performance. It has been noted in previous reports that transport-related accidents were a consistent feature in all years since the causes have been recorded. Companies were again asked to give a brief description of the causes of fatalities and these have been categorised as shown in **Table 3**. It can be seen that no fewer than six of the fatalities (75%) were due to road accidents. The other two fatalities (25%) occurred in construction or maintenance activities, one involving a fall and the other when a worker was crushed by a falling piece of pipework during assembly. There were no fatalities resulting from fire or explosion and therefore related to the hazardous nature of the materials handled.

Table 3 Causes of Fatalities in 1999

	Manufacturing	Marketing	Combined	Percentage
Road Accident		6	6	75%
Construction/ Maintenance	2		2	25%
Fire			0	0%
Total	2	6	8	

4. RESULTS FOR COMPANIES WHO HAVE REPORTED ALL YEARS

This is the seventh year that CONCAWE has collected data on the incidence of accidents in the downstream oil industry. Over the years, the number of companies responding to the survey increased from 17 to 27 but this year it has decreased again to 21. The change in the numbers of companies reporting has tended to obscure the improvement in the safety performance of those companies who have reported from the first year who now number 14.

The results for 1999 for these 14 companies are presented in **Table 4** and the summarised results for these same companies for the whole 7 years of the survey in **Table 5**. This table also compares the results for these companies with those for the complete set of 21 companies which reported in 1999.

The results show that the average LWIF and AIF are both lower for the original companies in 1999 than those for the averages of all the 22 companies. Only the FAR and LWIS figures are slightly higher. What is more, there is a clear improvement over the years in nearly all the figures. This is shown more clearly in **Figure 16**. The picture for AIF is somewhat more complicated in that for this measure, the numbers increased from 1993 to 1995 but have reduced steadily since then. It is believed that the initial increase was due to better reporting in these companies, but that the decrease since then is due to an improvement in safety performance.

Table 4 1999 Results for those Fourteen Companies Which Have Reported in All Years

Sector	Manufacturing			Marketing			Both Sectors		
	Own Staff	Contractor	All Workers	Own Staff	Contractor	All Workers	Own Staff	Contractor	All Workers
Work Force									
Total hours worked (million)	67	51	118	148	121	269	216	172	387
Number of fatalities	0	2	2	2	4	6	2	6	8
Number of LWIs	170	362	532	441	387	828	611	749	1,360
Total days lost through LWIs	3,478	6,397	9,875	5,991	5,178	11,169	9,469	11,575	21,044
Number of RWIs	62	109	171	81	30	111	143	139	282
Number of MTCs	241	392	633	298	252	550	539	644	1,183
AIF	8.1	18.1	11.7	7.3	5.9	6.7	7.6	8.8	8.1
LWIF	2.5	7.1	4.5	3.0	3.2	3.1	2.8	4.4	3.5
LWI Severity (Days/LWI)	23.3	20.7	21.6	22.6	18.7	20.6	22.9	19.8	21.0
Distance travelled (million km)									443
Number of Road Accidents									384
Road Accident Rate									0.9

Table 5 Results for the First Seventeen (now 14) Companies Compared with All Companies

Year	FAR	LWIF	LWIS	AIF	RAR
1993	5.1	4.7	25.7	8.0	3.8
1994	5.6	4.0	24.4	8.3	3.1
1995	3.8	4.5	20.7	11.1	2.4
1996	3.7	4.1	19.5	9.6	2.0
1997	4.0	3.7	22.0	9.3	1.7
1998	2.9	3.6	24.0	8.1	1.1
1999	2.1	3.5	21.0	8.1	0.9
1999 - 21 companies	1.8	4.3	19.3	9.4	0.9

5. COMPARISON WITH OTHER SECTORS

It is interesting to compare the results of the CONCAWE survey with the results of other related industry sectors. Comparisons have previously been made with the results published by OGP (Association of Oil & Gas Produces, previously E&P Forum). Recently, the European chemicals association CEFIC has also published safety statistics. As the most recent year available is 1998, the data for FAR and LWIF from OGP and CEFIC are compared with the CONCAWE figures for 1998 in **Table 6**. These comparisons are only indicative as the reporting criteria, although similar are not identical.

Table 6 Comparison of CONCAWE results (1998) with those from OGP and CEFIC

	CONCAWE	OGP	CEFIC
LWIF	4.5	2.4	12.1
FAR	2.6	12.6 (6.8)	2.2

Considering the LWIF figures, the figures for OGP companies who are involved in oil and gas exploration and production are somewhat lower than those reported by CONCAWE member companies, whereas those reported by CEFIC are considerably higher. For fatalities, the differences are reversed with CEFIC reporting a slightly lower figure than CONCAWE whereas those from OGP are much higher. However, the latter were inflated by an air crash involving 65 fatalities. If these are removed, the OGP FAR falls to 6.8, closer to, but still higher than the CONCAWE FAR.

It is noteworthy that even in the oil and gas exploration business, OGP report that the most common cause of fatalities (18 %) were vehicle accidents. The proportion was even higher in the CONCAWE data (42 % in 1998, 75 % in 1999). CEFIC did not publish a breakdown on the causes of fatalities.

6. REFERENCES

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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

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/she 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/her normal job less than full time or to work at his/her 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 : 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.

APPENDIX 2 GRAPHS SHOWING EUROPEAN DOWNSTREAM OIL INDUSTRY SPREAD OF DATA

Figure 1 LWIF For Company Employees (Manufacturing and Marketing)

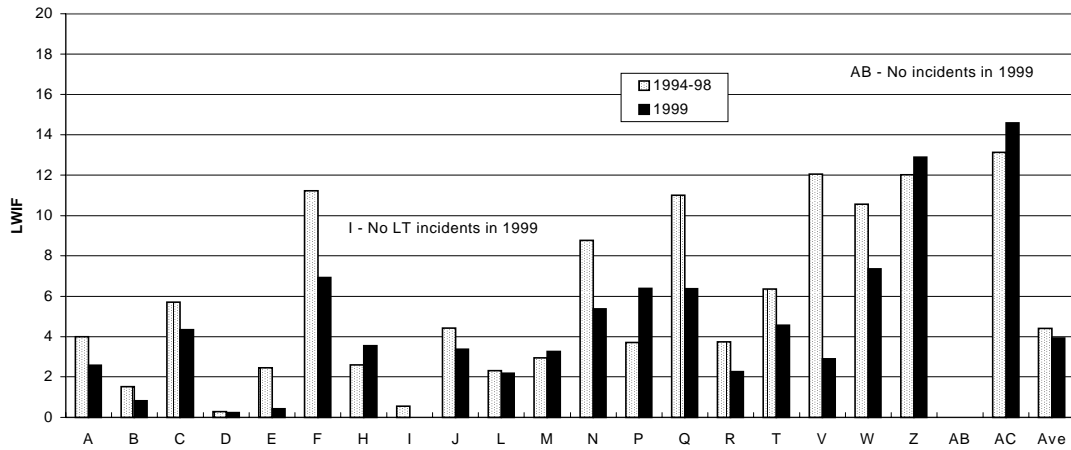


Figure 2 LWIF For Company Employees (Manufacturing)

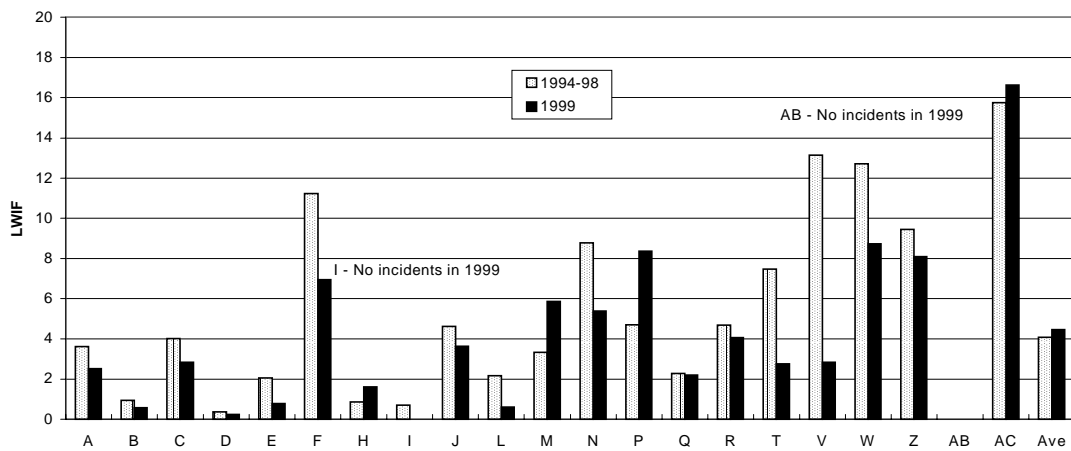
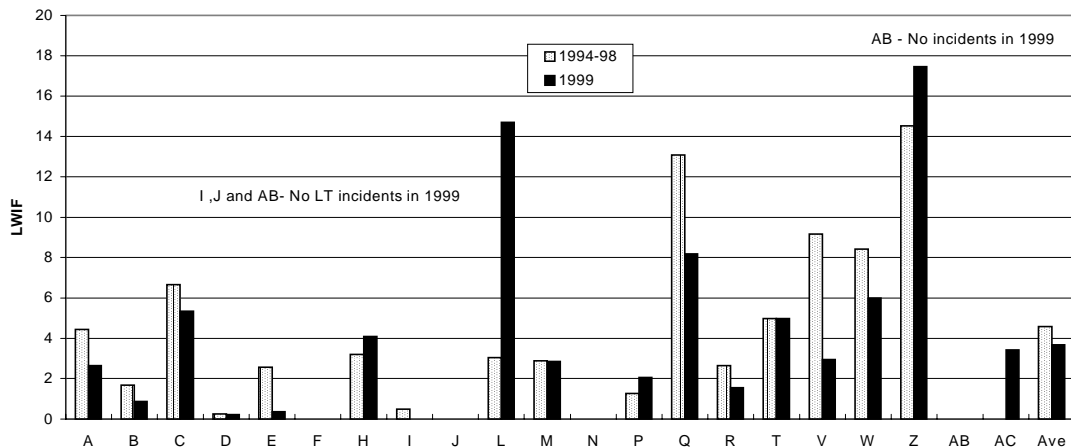


Figure 3 LWIF For Company Employees (Marketing)



APPENDIX 2 *cont'd*

Figure 4 AIF* For Company Employees (Manufacturing and Marketing)

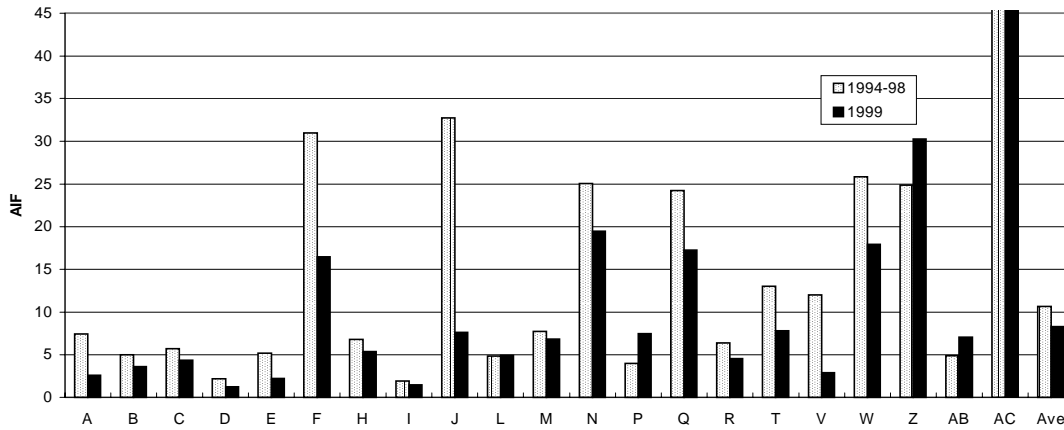


Figure 5 AIF* For Company Employees (Manufacturing)

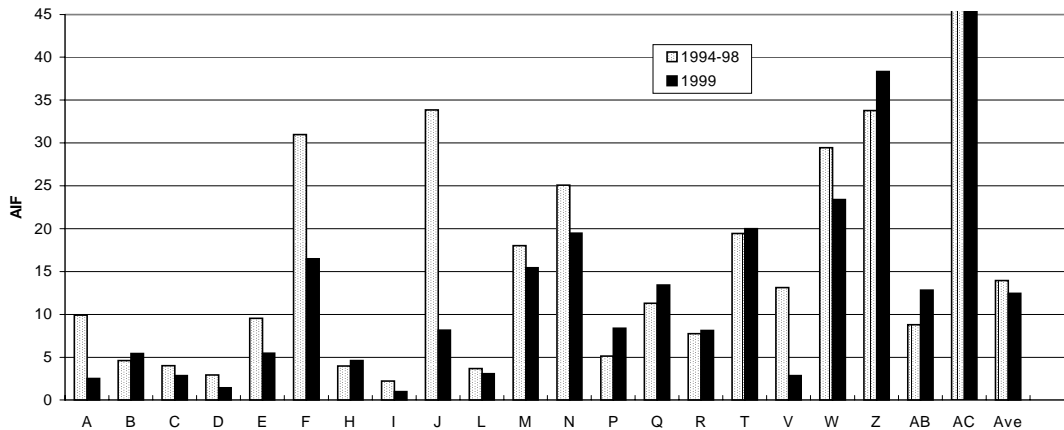
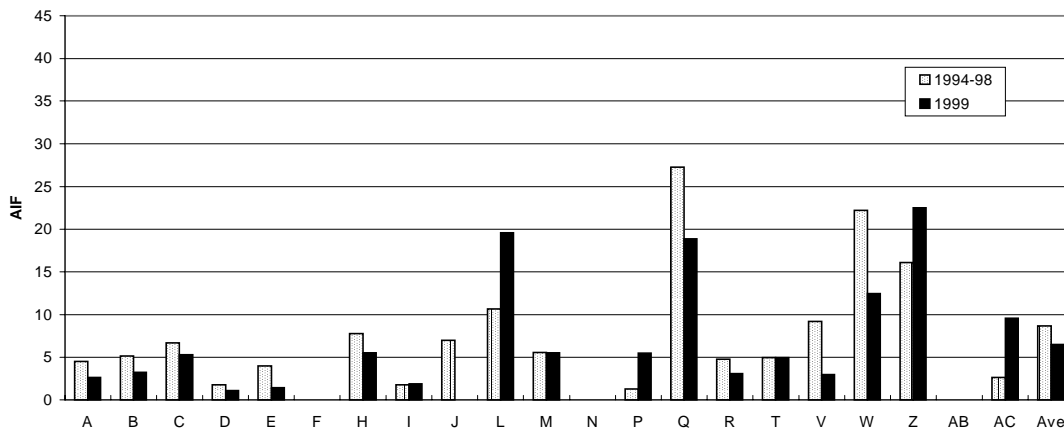


Figure 6 AIF* For Company Employees (Marketing)



* Note that in these figures an AIF is recorded even if the company did not report any RWI or MTC. In these cases, the AIF is the same as the LWIF.

APPENDIX 2 *cont'd*

Figure 7 LWIF For Contractors (Manufacturing and Marketing)

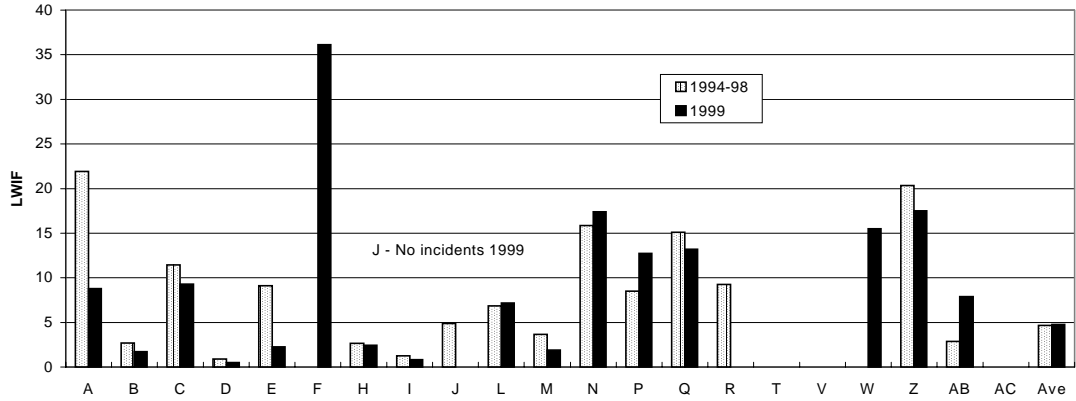


Figure 8 LWIF For Contractors (Manufacturing)

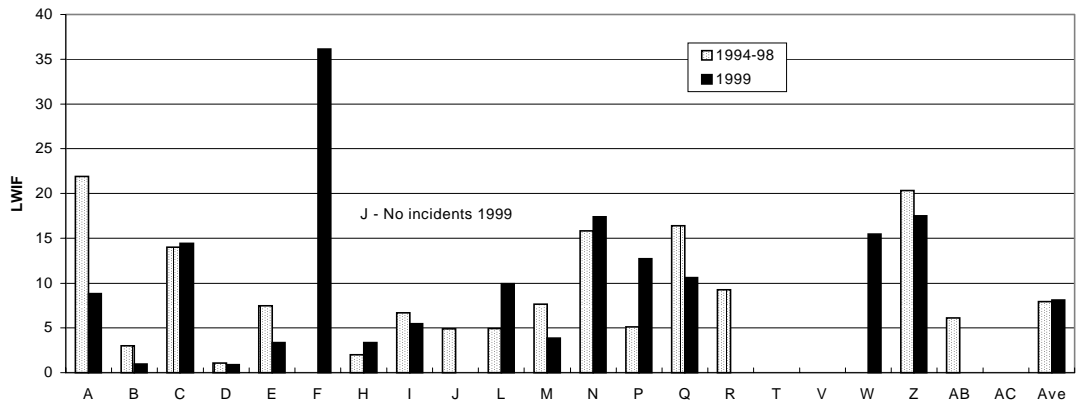
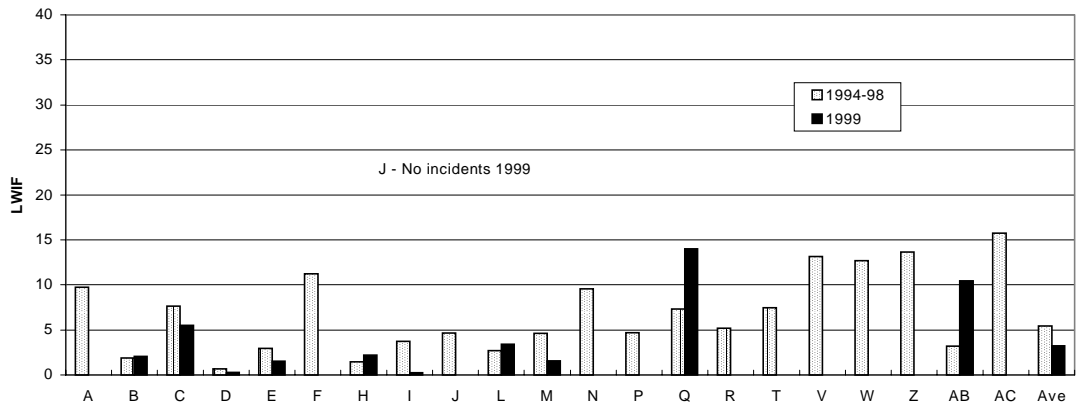


Figure 9 LWIF For Contractors (Marketing)



APPENDIX 2 *cont'd*

Figure 10 AIF* For Contractors (Manufacturing and Marketing)

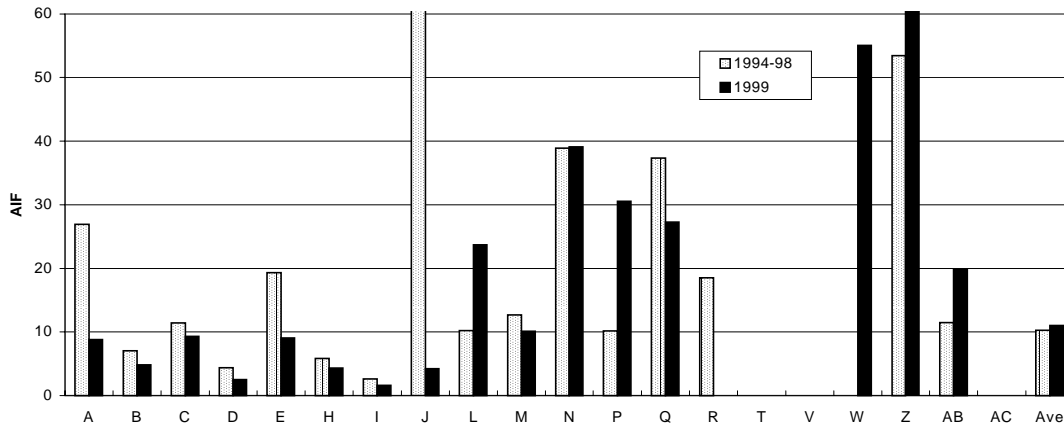


Figure 11 AIF* For Contractors (Manufacturing)

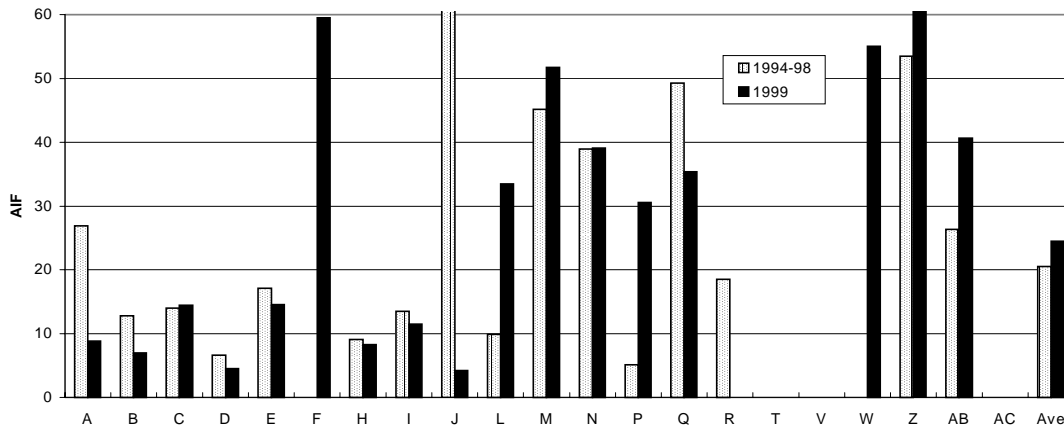
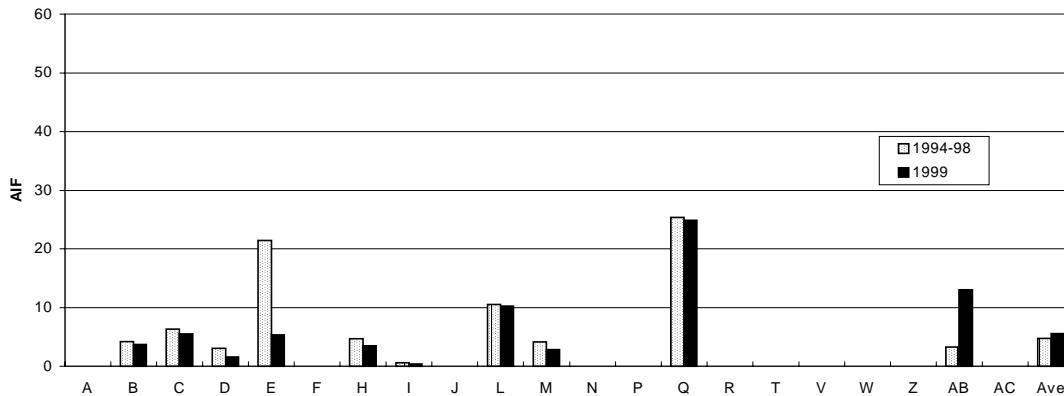


Figure 12 AIF* For Contractors (Marketing)



* Note that in these figures an AIF is recorded even if the company did not report any RWI or MTC. In these cases, the AIF is the same as the LWIF.

APPENDIX 2 *cont'd*

Figure 13 LWIS For Employees in European Oil Industry (Both Sectors)
(Days Lost per Incident)

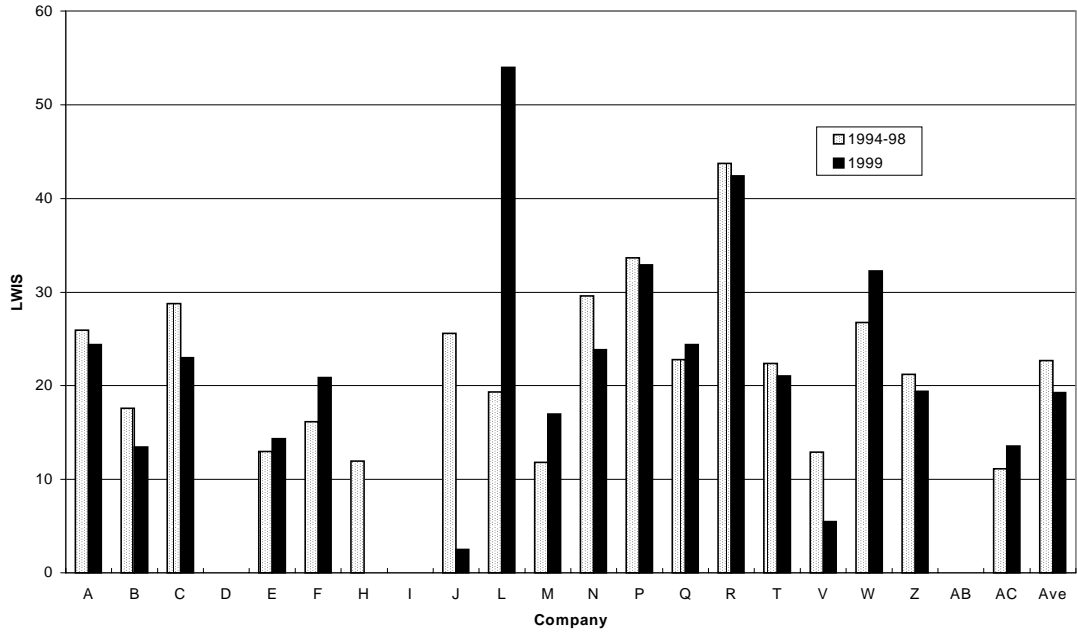
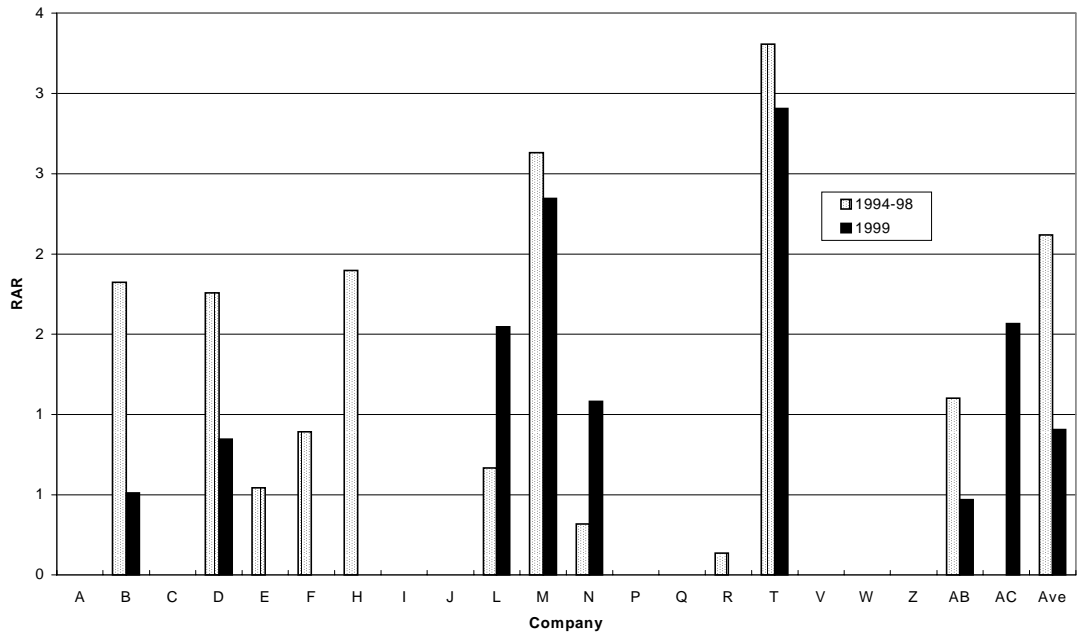


Figure 14 Road Accident Rate
(Accidents per Million Kilometres)



APPENDIX 2 *cont'd*

Figure 15 Fatalities for All Workers in European Oil Industry (Both Sectors)

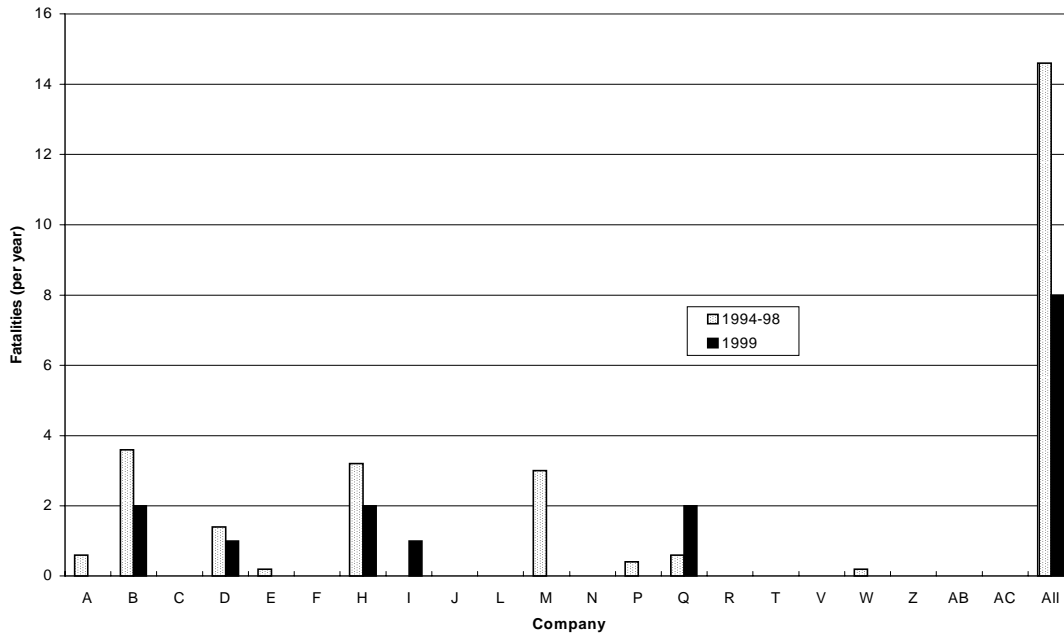


Figure 16 Seven Year Data (1993-1999) for Companies which have Reported in All Seven Years of the Survey.

