european downstream oil industry safety performance

statistical summary of reported incidents – 2000

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ABSTRACT

The seventh such report by CONCAWE, this issue includes own employees as well as contractor data for the year 2000 from 20 companies (representing some 90% of the European refining capacity) and primarily covers the EU, EEA and Hungary. The data is reported in terms of Lost Workday Injury Frequency (LWIF) as well as a range of other metrics. It is compared with the averages for the previous five-year period 1995 to 1999 and also to similar statistics from related industries as well as general EU figures. The improvement trend continues as illustrated by the 2000 Lost Workday Injury Frequency (LWIF) which at 4.2 is slightly lower than the average for the years 1995 to 1999 (4.5). 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.

KEYWORDS

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

INTERNET

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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, 20 companies operating in the downstream oil industry in Western Europe submitted statistics for this CONCAWE report on safety performance. These companies represent over 90% of the refining capacity in the area. The data cover the year 2000 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. is 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 2000 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 presents 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 (i.e. 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 seventh annual report on this subject. The first report [1] covered the years 1993 and 1994, further reports covered 1995 [2], 1996 [3], 1997 [4], 1998 [5] and 1999 [6]. The 1997 report also gave an overview for the five years 1993 to 1997. This report covers 2000 performance and compares it with that for the previous five years 1995 to 1999 and the whole period of 1993 to 2000. It also compares CONCAWE data with that collected for the oil Exploration and Production business, the European Chemical Industry and with overall safety performance in the EU. The questionnaire used to collect the data was similar to that used for the previous surveys.

The definitions of the terms used in the survey and hence reported 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.

20 member companies responded this time. This is one less than last year, but no less than five companies have disappeared due to mergers within the industry and hence this year returned combined reports. However, four companies who did not report last year did so this year so the report again includes virtually all the CONCAWE membership which operate refineries and over 90% of the Western European refining capacity. It was notable that the majority of these were willing to openly share their data with other companies. This free exchange indicates that they felt that they could both learn from the experience of others and help other companies in the area of safety, even though they are competitors.

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. is included.

3. FINDINGS - 2000

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 LWIF figure for 2000 shows some improvement over both the long-term average for the years 1993 to 2000 and the five-year average for 1995 to 1999. This improvement is more marked if only those 12 companies which have participated throughout the seven years of the survey are considered (see **Section 4**).

A summary of the 2000 results compared to those from both the long-term average and the previous 5-year average is also provided in **Table 1**. This year, a total of 20 companies reported usable data. This is one less than last year as five companies had merged and returned a combined report but four companies which did not report for 1999 did so for 2000.

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 from companies where the number of days lost was not recorded.

Table 1 Comparison of representative data for 1993 to 2000

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
2000 – 20 companies	12	2.5	4.2	25.4	8.7	0.9
1995-1999 average	12.4	2.8	4.5	22.0	10.2	1.6
1993-2000 average	16.0	3.3	4.4	22.9	9.7	1.8

The aggregated accident data collected from CONCAWE members for 2000 is summarised below in **Table 2**. The results expressed in graphical format are 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 (for LWIF only). In each case, the 2000 figures are compared to the average for the previous five years, or for as many of these years as the company had submitted data. It can be observed that in some cases there are wide differences between the 2000 data and the averages for the years 1995-1999. These mainly represent areas where only a small number of man-hours were recorded which results in a small change in the number of incidents giving a disproportionate change in the frequency.

3.1. HOURS WORKED

In 2000, the total reported hours worked (**Table 2**) by employees and contractors at 471 million were about 23 million more than for 1999. This is almost the same figure as for 1998 and mainly results from those companies which did not report in 1999 reporting this time.

Table 2 Aggregated results for the twenty companies which reported in 2000.

Sector	Manufacturing			Marketing			Both Sectors		
Work Force	Own Staff	Contractor	All Workers	Own Staff	Contractor	All Workers	Own Staff	Contractor	All Workers
Total hours worked (million)	96	63	159	199	113	312	295	177	471
Number of fatalities	0	1	1	0	11	11	0	12	12
Number of LWIs	303	499	802	731	461	1192	1034	960	1994
Total days lost through LWIs	8726	10,372	19,098	16,741	5104	21,845	25,467	15,476	40,943
Number of RWIs	55	91	146	131	22	153	186	113	299
Number of MTCs	951	671	1622	338	176	514	1289	847	2136
AIF	14.1	21.1	16.9	4.5	2.8	3.9	8.0	10.0	8.7
LWIF	3.2	7.9	5.0	3.7	4.1	3.8	3.5	5.4	4.2
LWI Severity (Days/LWI)	29.9	22.1	25.2	30.1	17.3	25.7	30.0	20.2	25.4
Distance travelled (million km)									1054
Number of Road Accidents									918
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 2000, the LWIF (**Table 1**) calculated overall was 4.2, a slightly improved performance over 1999. This was the lowest recorded for all the years of the survey apart from 1994 when only 17 companies reported. It was also lower than the average for the previous five years which was 4.5 and the average for all the years of the survey at 4.4.

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 again slightly higher (**Table 2**) than for employees (5.4 as against 3.5) and the difference was greater than for the previous year. Again, contractors operating in refineries had an LWIF (7.9) well above that of company employees in refineries (3.2), but this differences was less marked than in previous years. In the marketing sector, this time, contractors (4.1) and staff (3.8) recorded a similar LWIF. In previous years, marketing contractors have recorded a lower LWIF than staff.

3.3. LWI SEVERITY (LWIS)

LWI Severity as measured by the number of days lost per incident has until this year shown an improving trend falling from 27.4 days in 1993 to 19.3 days in 1999 (**Table 1**). However, this year the LWIS has increased to 25.4. The reason for this is unknown but the number of companies recording this figure has decreased to 15 in 2000. The differences in sectors have also become more marked varying from 17.3 to 30.1 days per incident. In particular, there is a wide difference between the staff figure (30.1) and the contractor figure (20.2). These figures are calculated

using only the results from companies that 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 in the oil industry. AIF enables companies to get a better picture of their total safety performance 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 11.4 in 1997. 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, 16 companies reported such data. It should be noted that not all companies operate the restricted work system and also 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 8.7. This is lower than for all years of the survey apart from the first two, and also lower than both the long-term average, and the average for the last five years.

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 for 1999. 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 was a steady reduction in RAR from 3.8 in 1993 to 0.9 accidents per million kilometres in 1999. For 2000, the rate has remained unchanged at 0.9. However, 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 1054 million kilometres in 2000 and were involved in 918 accidents ranging from minor to major. Compared to 1999, both the distance covered and the number of accidents reported were approximately doubled in 2000. This mainly resulted from one large company reporting these data for 2000 but not in 1999.

3.6. FATALITIES

There were 12 fatalities reported in 2000. All of these were contractors. This was four more fatalities than in 1999 (8 fatalities, 2 employees, 6 contractors). As a result the Fatal Accident Rate (FAR) also increased from 1.8 fatalities per

100 million man-hours in 1999, to 2.5 in 2000. Even with this increase, the FAR is still lower than either the long-term average (3.3) or the average for the previous five years (2.8).

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 in 2000, all but one fatality were due to road accidents. The other one occurred in a construction / maintenance activity when two men were working in a cage suspended from a crane. The cage collapsed, killing one of the men. For the second year running, there were no fatalities resulting from fire incidents and therefore all were unrelated to the hazardous nature of the materials handled.

Table 3 Causes of fatalities in 2000.

	Manufacturing	Marketing	Combined	Percentage
Road Accident	1	10	11	92%
Construction/ Maintenance		1	1	8%
Fire			0	0%
Total	1	11	12	

As has been noted above, a large proportion of the fatal accidents was road traffic-related and this proportion has increased over the last few years. It is interesting to see what the trend in fatalities was without road accidents. The causes of fatal accidents have been recorded since 1997 and the FAR from other causes is shown in **Table 4**.

Table 4 Fatalities in 2000 not related to road accidents

Year	Total	Road Accident	Other Causes	FAR for Others
1997	15	6	9	2.0
1998	12	5	7	1.5
1999	8	6	2	0.5
2000	12	11	1	0.2

It can be seen from the table that the FAR for accidents not involving road transport have declined tenfold over the last four years and this year is at the very low level of 0.2. However, as stated above, fatalities are not a good indicator of safety performance.

4. RESULTS FOR COMPANIES WHO HAVE REPORTED ALL YEARS

This is the eighth 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 first increased from 17 to 27 but since then has decreased to 20 because of mergers between CONCAWE Member Companies. These changes in the numbers of companies reporting has tended to obscure the improvement in the safety performance of those 12 companies that have reported every year from the first survey.

The results for 2000 for these 12 companies are presented in **Table 5** and the summarised results for these same companies for the whole eight years of the survey in **Table 6**.

The results show that the average LWIF and AIF are both lower for the original companies in 2000 than those for the averages of all the 20 companies (**Table 1**). 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 a real improvement in safety performance.

Table 5 2000 Results for those twelve companies which have reported in all years.

Sector	Manufacturing			Marketing			Both Sectors		
Work Force	Own Staff	Contractor	All Workers	Own Staff	Contractor	All Workers	Own Staff	Contractor	All Workers
Total hours worked (million)	61	49	110	162	113	275	224	162	385
Number of fatalities	0	1	1	0	11	11	0	12	12
Number of LWIs	141	315	456	448	461	909	589	776	1365
Total days lost through LWIs	4296	6829	11,125	10,044	5104	15,148	14,340	11,933	26,273
Number of RWIs	51	91	142	131	22	153	182	113	295
Number of MTCs	333	408	741	225	176	401	558	584	1142
AIF	8.6	17.8	12.6	3.4	2.8	3.2	6.5	7.7	6.1
LWIF	2.3	6.4	4.1	2.8	4.1	3.3	2.6	4.8	3.5
LWI Severity (Days/LWI)	33.0	24.1	27.0	36.8	17.3	26.7	35.6	20.6	26.8
Distance travelled (million km)									1006
Number of Road Accidents									789
Road Accident Rate									0.8

Table 6 Results for the 12 companies that have reported in all years.

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
2000	3.1	3.5	26.8	6.1	0.8

5. COMPARISON WITH OTHER SECTORS

Comparisons have previously been made with the results published by OGP (the HSE organisation for the upstream oil industry world-wide) and CEFIC (the European Chemicals Producers Association). Similar comparisons are made this year while data for work-related accidents for the EU as a whole are also considered. The most recent year's data available from CEFIC is for 1999 [7] whereas data from OGP for 2000 [8] are available. Therefore the data for CEFIC should be compared with the CONCAWE 1999 figures and the OGP data compared with the CONCAWE figures for 2000 in **Table 7**. OGP publish regional breakdowns (apart from FAR) and both those for Europe and the whole world are presented here. These comparisons are only indicative as the reporting criteria, although similar are not identical.

Table 7 Comparison of CONCAWE results (1999 and 2000) with those from OGP (2000) and CEFIC (1999) and EU (all activities) (1998/9)

	CONCAWE 2000	OGP Europe	OGP World	CONCAWE 1999	CEFIC 1999	EU 1998/9
LWIF	4.2	2.7	1.9	4.3	9.8	22.9 (99)
FAR	2.5	na	4.7	1.8	0.6	2.7 (98)
AIF	8.7	10.6	5.7	9.4	na	na
LWIS	25.4	30.5	27.9	19.3	na	na

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 for both Europe and the world. However, those reported by CEFIC are considerably higher. For fatalities, the differences are reversed with CEFIC reporting a lower figure than CONCAWE whereas those from OGP are higher. For AIF, the CONCAWE figures are between those for OGP world-wide and Europe.

It is noteworthy that even in the oil and gas exploration and production business, OGP report that the most common cause of fatalities (26.1%) was vehicle accidents. The proportion was even higher in the CONCAWE data (75% in 1999, 92% in 2000). CEFIC do not publish a breakdown on the causes of fatalities.

Data have also been published for accidents at work in the EU as a whole. [9]. These are also compared with the CONCAWE data in **Table 7**. These show that the LWIF for CONCAWE Member Companies is only about one fifth of the frequency for employment as a whole in the EU. However the FAR for 1998 are similar.

6. REFERENCES

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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 : 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 SPREAD OF DATA

Figure 1 LWIF For Company Employees in European Oil Industry (Both Sectors)

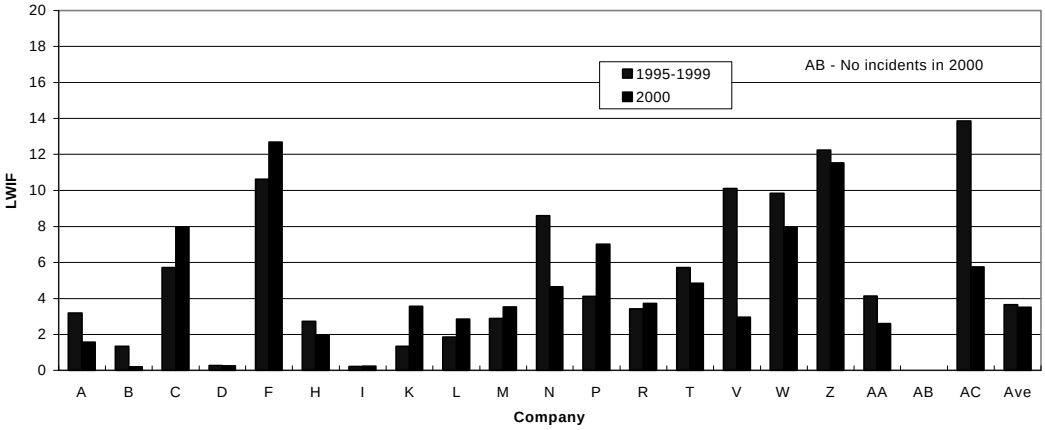


Figure 2 LWIF For Company Employees in European Oil Industry (Manufacturing)

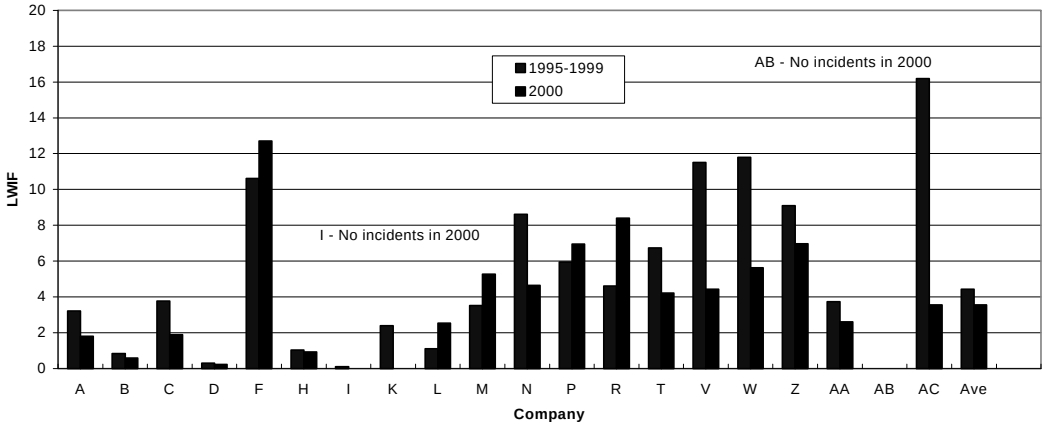


Figure 3 LWIF For Company Employees in European Oil Industry (Marketing)

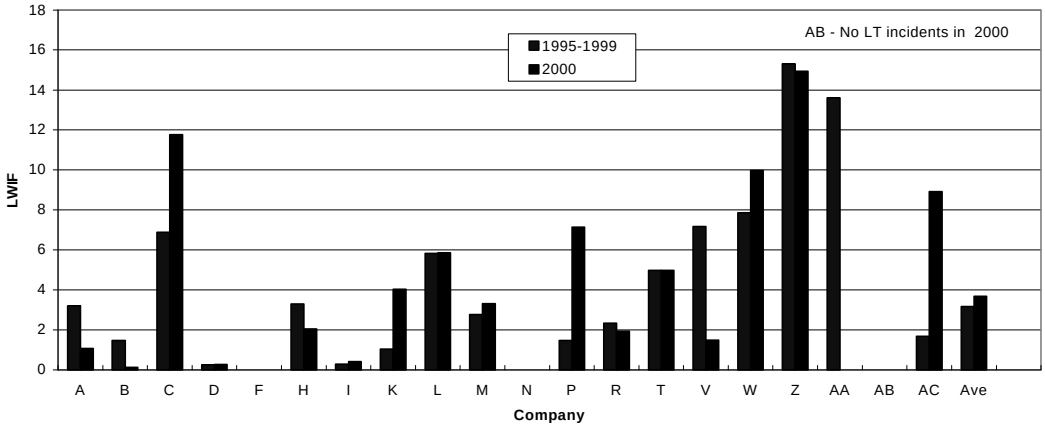


Figure 4 AIF* For Company Employees in European Oil Industry (Both Sectors)

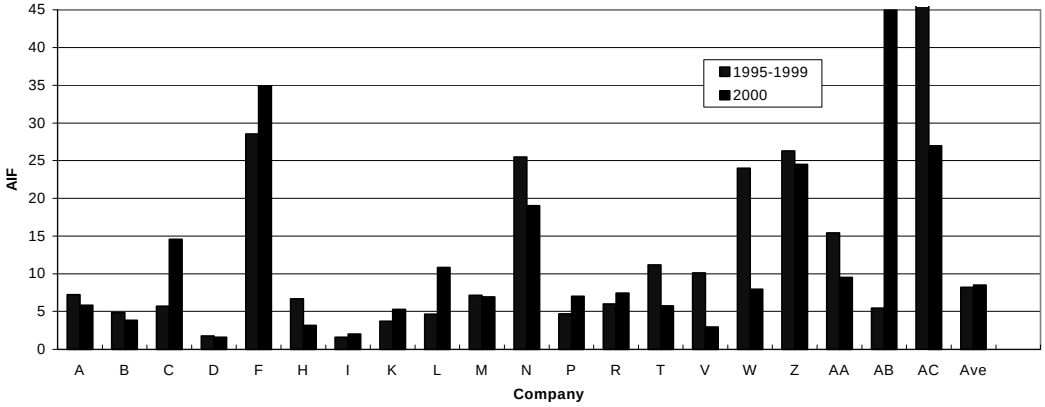


Figure 5 AIF* For Company Employees in European Oil Industry (Manufacturing)

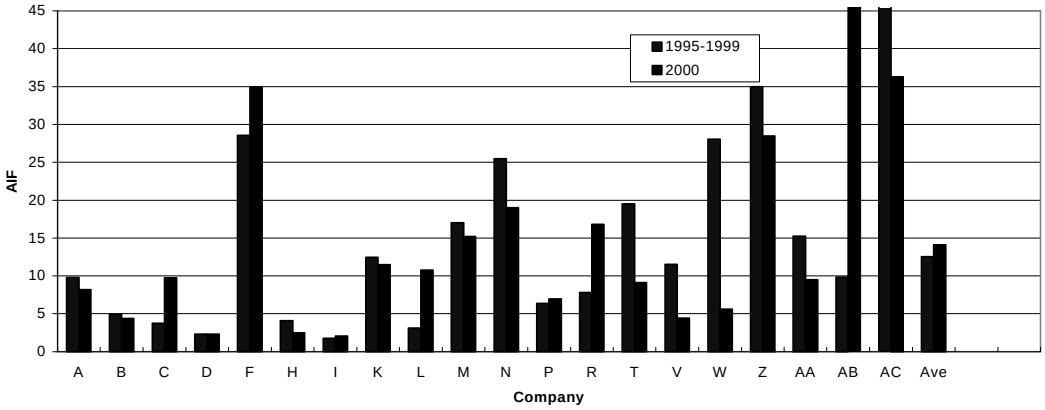
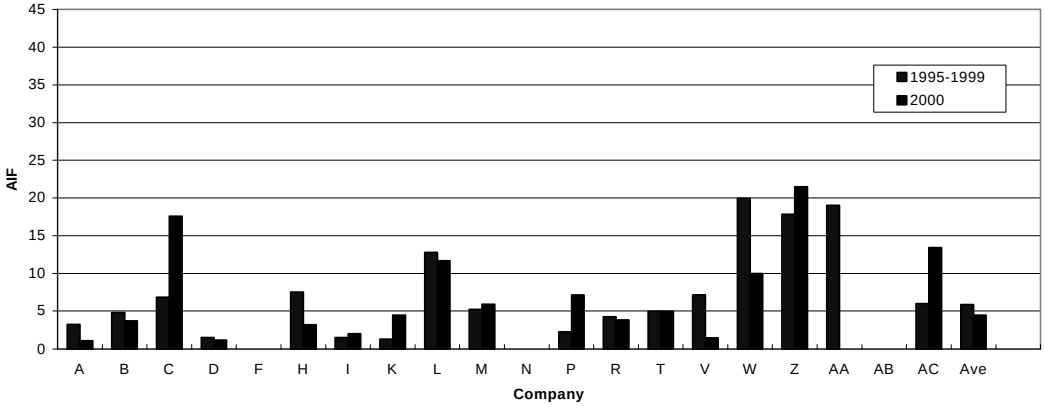


Figure 6 AIF* For Company Employees in European Oil Industry (Marketing)



***** 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.

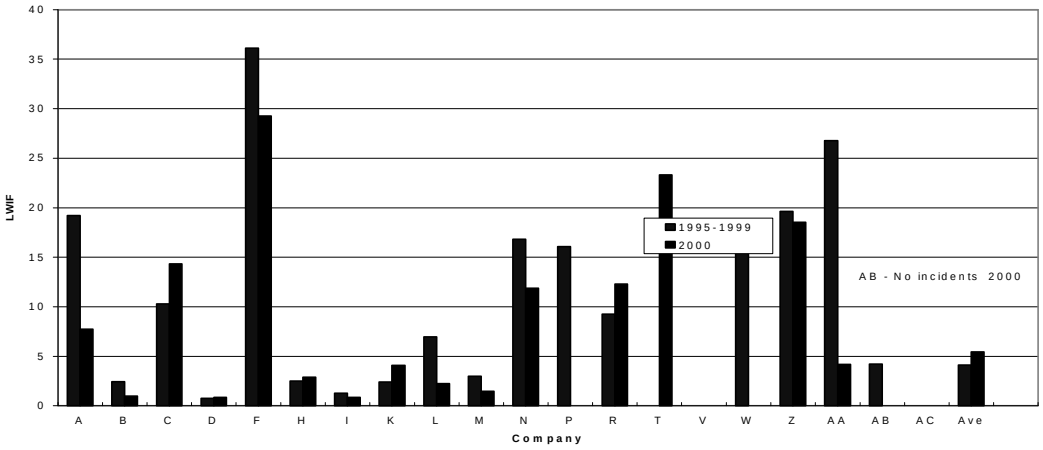


Figure 7 LWIF For Contractors in European Oil Industry (Both Sectors***)***

Figure 8 LWIF For Contractors in European Oil Industry (Manufacturing*)*

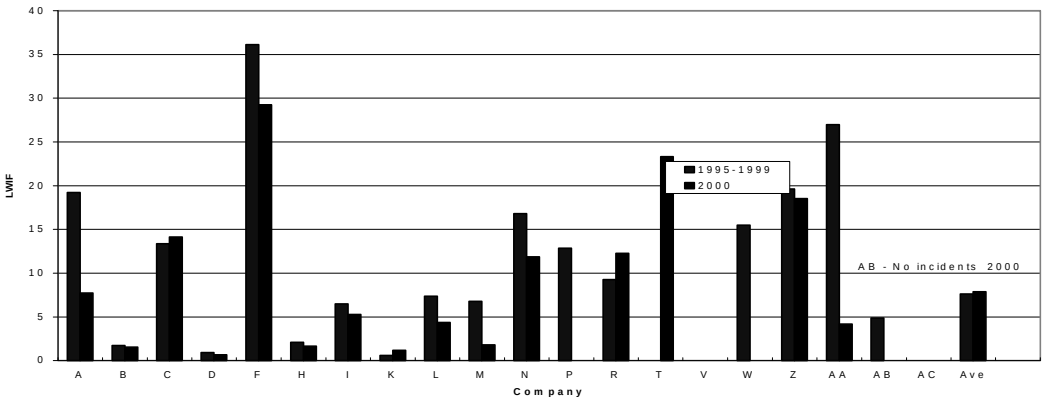


Figure 9 LWIF For Contractors in European Oil Industry (Marketing)

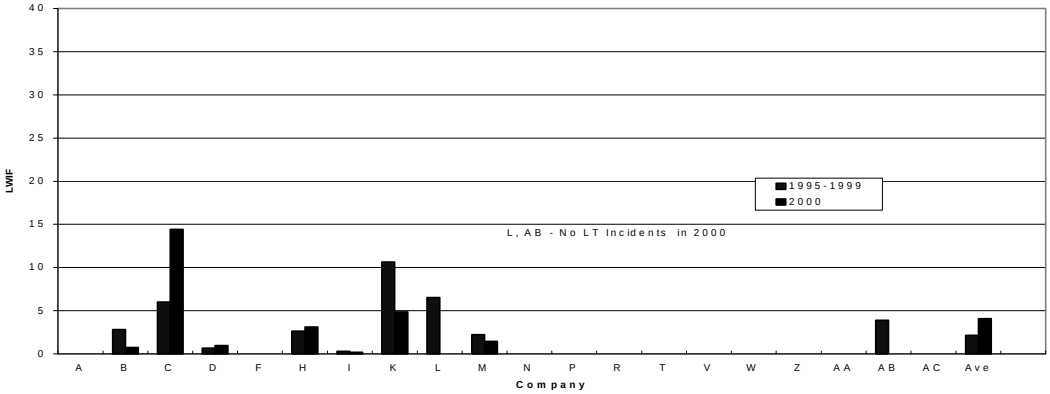


Figure 10 AIF* For Contractors in European Oil Industry (Both Sectors)

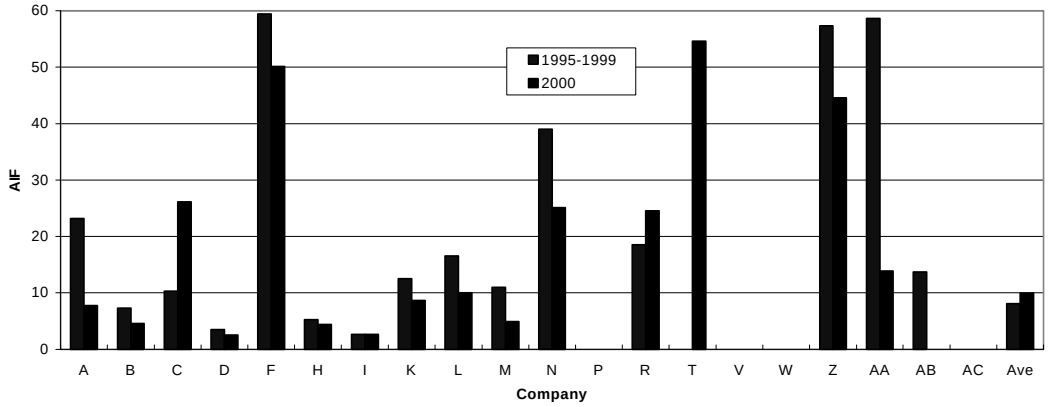


Figure 11 AIF* For Contractors in European Oil Industry (Manufacturing)

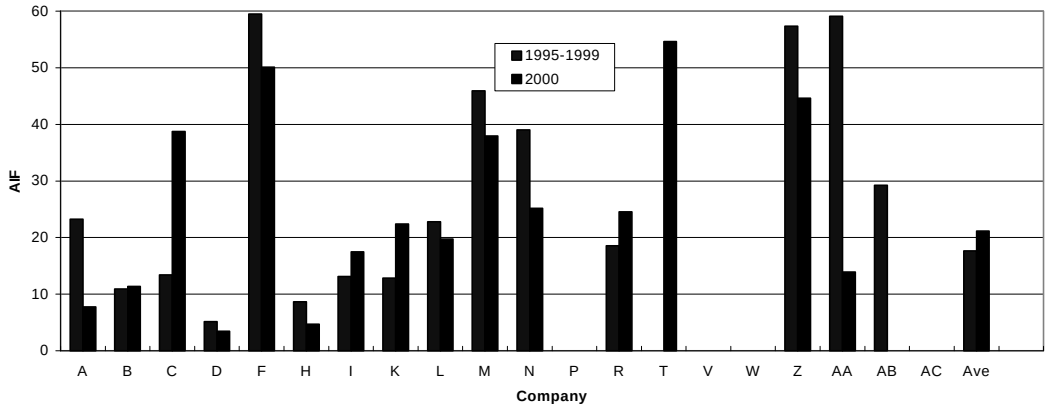
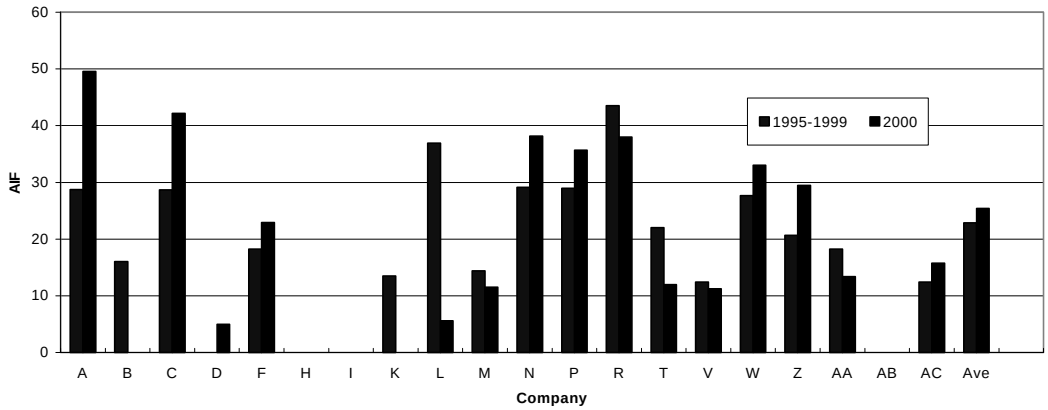


Figure 12 AIF* For Contractors in European Oil Industry (Marketing)



***** 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.

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

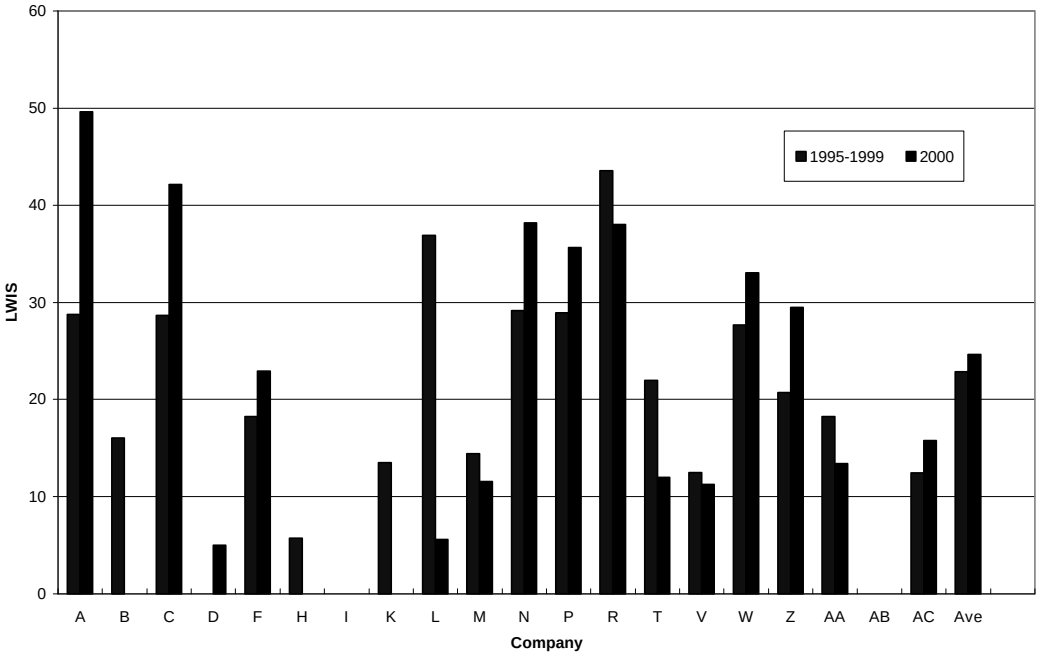


Figure 14 Road Accident Rate
(Accidents per million km)

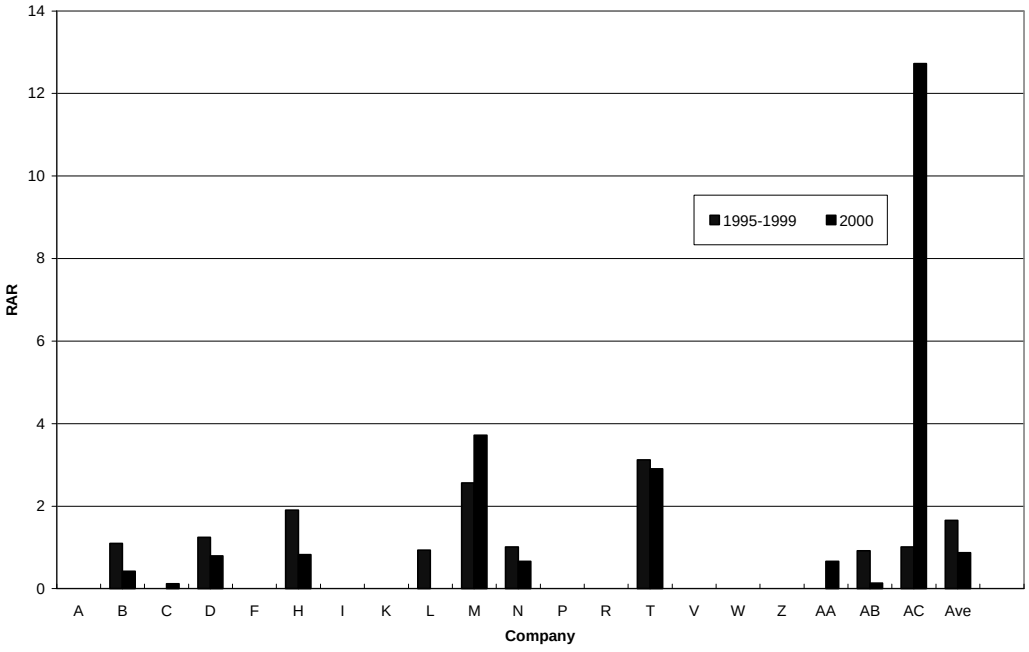


Figure 15 Fatalities for All Workers in European Oil Industry (Both Sectors)

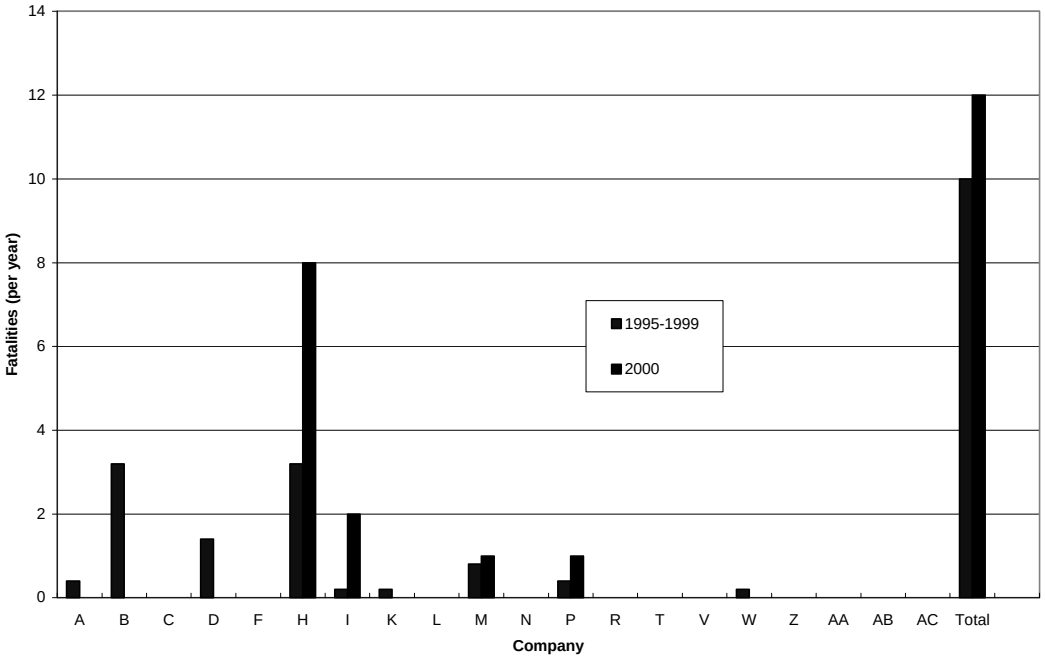


Figure 16 Eight Year Data (1993-2000) for Companies That Have Reported in All Years of the Survey