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european downstream oil industry safety performance

statistical summary of reported
incidents – 1997
and overview 1993 to 1997

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ABSTRACT

This report is the fourth by CONCAWE reviewing the safety performance of the downstream oil industry in Western Europe. It includes the results of 27 companies which together represent over 90% of the oil refining capacity in the region. Of the 27 companies, 18 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, the most important results are quoted as frequencies.

The data covers the year 1997 and is also aggregated for the five year period 1993 to 1997. Overall, the reported hours worked by company staff and contractors combined were about 440 million with an average Lost Workday Injury Frequency (LWIF) of 4.6 which is very similar to those reported in previous years which ranged from 4.0 to 4.7. 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 general, the safety performance for the companies reporting was similar in 1997 to the performance reported previously for 1993 to 1996.

KEYWORDS

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

NOTE

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This report does not necessarily represent the views of any company participating in CONCAWE.

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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, twenty-seven companies operating in the downstream oil industry in Western Europe submitted statistics for this CONCAWE report on safety performance. These twenty-seven companies represent over 90% of the refining capacity in the area. The data cover the year 1997 and are for both the Manufacturing (Refining) and Marketing sectors of the industry. Amalgamated data for the years 1993 to 1997 is also presented.

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 1997 performance appears similar to that for the previous four years and accident frequencies are shown to be lower than the average for European workers.

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 fourth annual report on this subject. The first report ¹ covered the years 1993 and 1994, further reports covered 1995, ² and 1996. ³ This report covers 1997 performance and compares it with the previous four years. Aggregated results for all five years are also reported. The questionnaire used to collect the data was similar to that used for the previous surveys. This time, a simple explanation of the causes of fatalities was also asked for.

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.

Twenty-seven member companies responded this time (one less than last time owing to closure), which is nearly all of the CONCAWE membership and represents over 90% of the Western European refining capacity. It was notable that the majority of these 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.

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.

3. FINDINGS - 1997

Accident frequencies in the downstream petroleum industry are at low levels when compared to other industries (see **Section 5.2**). With the low level of incidents, the differences year on year are probably not significant, particularly when the increase in companies reporting over the period is considered. The figures for the five years 1993 to 1997 are in general similar (see **Section 4**).

A summary of the 1997 results compared to those from previous years is provided in **Table 1**. This year, a total of 27 companies reported who all also reported for 1996. The one company that did not report this year had ceased operating in Europe.

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 1997

Year - No of Companies	Fatalities	LWIF	LWIS	AIF	RAR
1993 - 17 companies	18	4.7	25.7	8.0	3.8
1994 - 17 companies	20	4.0	24.4	8.3	3.1
1995 - 22 companies	13	4.6	24.0	11.2	2.6
1996 - 28 companies	14	4.7	19.5	10.8	2.0
1997 - 27 companies	15	4.6	22.8	11.4	1.9

The aggregated accident data collected from CONCAWE members for 1997 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 (LWIF for 1997 only) are indicated on the figures.

3.1. HOURS WORKED

In 1997, the total reported hours worked (**Table 2**) by employees and contractors at about 440 million were about 20 million more than for 1996 despite there being one less company reporting. The increase is mainly in the Marketing Contractor sector and reflects more companies reporting for this sector.

Table 2 Aggregated Results for the Twenty-seven Companies which Reported in 1997.

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)	114	56	170	167	105	272	281	161	442
Number of fatalities	2	1	3	4	8	12	6	9	15
Number of LWIs	544	495	1,039	769	212	981	1,313	707	2,020
Total days lost through LWIs	13,138	10,669	23,807	15,306	2,051	17,357	28,444	12,720	41,164
Number of RWIs	109	120	229	185	73	258	294	193	487
Number of MTCs	962	878	1,840	494	64	558	1,456	942	2,398
AIF	15.1	28.4	19.5	8.6	3.4	6.5	11.3	11.6	11.4
LWIF	4.8	8.8	6.1	4.6	2.0	3.6	4.7	4.4	4.6
LWI Severity (Days/LWI)	23.7	22.7	23.2	22.6	19.7	22.3	23.1	22.2	22.8
Distance travelled (million km)									720
Number of Road Accidents									1374
Road Accident Rate									1.9

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 1997, the LWIF calculated overall was 4.6 compared to 4.7 in 1996, 4.6 in 1995, 4.0 in 1994 and 4.7 in 1993. The performance of individual companies varied widely as shown in **Figures 1 to 3 and 7 to 9**. The overall figure for contractors (all companies) was slightly lower than for employees (4.4 as against 4.7) but as in previous years, contractors operating in refineries had an LWIF (8.8) nearly twice that of employees (4.8). This trend is reversed in the case of marketing contractors who recorded a lower LWIF (2.0) than employees (4.6).

3.3. LWI SEVERITY (LWIS)

LWI Severity as measured by the number of days lost per incident has shown a slightly improving trend falling from 27.4 days in 1993 to 22.8 days in 1997 (**Figure 13**). This figure is reasonably consistent across all the sectors reported varying from 19.7 to 23.7 days per incident.

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. Over the years, the AIF has increased from 8.0 in 1993 to 11.4 in 1997. It is likely that this does 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, 24 companies reported such data, two more than for 1996. It should be noted that not all companies operate the restricted work system and restricted working is not allowed in some countries.

As last year, the AIF figures in the tables were calculated using data from only those companies who reported RWI or MTC data. 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 varies between companies.

In these figures, the results of all companies are shown, whether or not they reported RWI and MTC data. For companies who do not report 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 eleven companies, two more than for 1996. Very few companies recorded RAR for either the manufacturing or contractor sectors. Therefore, only the combined RAR data is reported in **Table 2** and **Figure 14**. There has been a steady reduction in RAR from 3.8 in 1993 to 1.9 accidents per million kilometres in 1997. However, comparison of these data should be made with caution because of the small size of the database and changes in its composition. The eleven companies who reported this time recorded that their vehicles (own and contractor) travelled 720 million kilometres in 1997 and were involved in 1374 accidents ranging from minor to major.

3.6. FATALITIES

15 (6 employee, 9 contractor) fatalities occurred in 1997 in 14 separate incidents in seven different companies. This was one more fatality than 1996 (14 fatalities, 2 employees, 12 contractors) and was similar in number to previous years. 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 3.4 in 1997.

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 three years. For the first time, companies were 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 6 of the fatalities (40%) were due to road accidents and 3 more were shipping related. Thus over half of the fatalities were transport related. All the fire incidents in the manufacturing sector were caused by small fires involving only the person fatally injured.

Table 3 Causes of Fatalities in 1997.

	Manufacturing	Marketing	Combined	Percentage
Road Accident		6	6	40%
Construction/ Maintenance		2	2	13%
Shipping Accident		2	2	13%
Shipping Maintenance		1	1	7%
Fire	3	1	4	27%
Total	3	12	15	100%

4. FIVE YEAR OVERVIEW 1993 TO 1997

This is the fifth year that CONCAWE has collected data on the incidence of accidents. It is therefore an appropriate time to compare the performance year on year and to calculate average frequencies for the whole period. The results for the five year period are compared in **Figure 16** which shows that overall, the results for all five years are very similar. The only measure which shows a consistent trend is the road accident rate which has halved from 3.8 to 1.9 over the five years. However, as stated previously (**Section 3.5**), this is based on a comparatively small number of company returns.

The aggregated results for the years 1993 to 1998 are presented in **Table 4**. Considering the similarity in the figures for the five individual years, this overview is considered to give a reliable picture of the safety performance of the Western European downstream oil industry with any individual year fluctuations smoothed out. These data are based on nearly 2000 million man-hours of work.

Table 4 Aggregated Results for the Years 1993 to 1998.

Sector	Manufacturing			Marketing			Both Sectors		
	Own Staff	Contractor	All Workers	Own Staff	Contractor	All Workers	Own Staff	Contractor	All Workers
Total hours worked (millions)	461	259	720	837	399	1,235	1,298	657	1,955
Number of fatalities	8	14	22	22	36	58	30	50	80
Fatal Accident Rate	1.7	5.4	3.1	2.6	9.0	4.7	2.3	7.6	4.1
LWIF	3.9	7.0	5.0	5.0	2.5	4.2	4.6	4.3	4.5
LWI Severity (Days/LWI)	30.6	22.8	27.0	21.4	19.0	21.0	24.2	21.5	23.4
AIF	13.4	18.6	15.2	8.9	4.1	7.2	10.6	9.3	10.1
Distance travelled (million km)	72		72	2228	229	2458	2301	229	2530
Number of Road Accidents	43		43	5882	174	6056	5925	174	6099
Road Accident Rate	0.6		0.6	2.6	0.8	2.5	2.6	0.8	2.4

5. COMPARISONS WITH OTHER INDUSTRIES AND AREAS

5.1. COMPARISON WITH U.S. DATA

The CONCAWE figures are compared with those from the American Petroleum Institute (API) ⁴ in **Table 5** (company employees only – the API does not collect contractor data). This shows that overall, the accident frequencies are in the same range. The E&P Forum statistics have not been included this year as they were not available at the time of publication. In previous years, their overall statistics were also similar to the CONCAWE data.

Table 5 Comparison of CONCAWE Data with U.S. Data

Area	Sector	Exposure	LWIF	LWIS	AIF	Fatalities	FAR
CONCAWE	Manufacturing	113.9	4.8	23.7	15.1	2	1.8
	Marketing	166.9	4.6	22.6	8.6	4	2.4
	Combined	280.8	4.7	23.1	11.3	6	2.1
API	Refining	94.1	2.9	19.5	12.2	1	1.1
	Marketing	114.8	3.1	14.7	16.0	3	2.6
	Combined	208.9	3.0	16.8	14.3	4	1.9

Exposure = millions of man hours worked. Company employees only.

5.2. COMPARISON WITH EUROPEAN DATA FOR OTHER INDUSTRIES

This year, the EU has published limited statistics of industrial accidents rates across the EU. ⁵ These cover accidents at work in the EU in 1993. These statistics are not complete in that they do not cover all areas of economic activity and in a number of EU Member States, they are estimated from partial reporting. Nevertheless, they are considered to be representative, covering as they do 122.4 million employees and over 4 million accidents. They do not however include agriculture or transport activities. The latter sector is responsible for over half of the fatal accidents in the oil industry (**Table 3**).

The statistics are compared in **Table 6** with those from the oil industry covered in this report. For comparison, the aggregated oil industry results for the five years 1993 to 1997 (**Section 4**) have been used to smooth out any annual differences. The criteria for the European Incident Frequency is accidents leading to a lost time of three days or more, rather than the one shift or more used in this report. It therefore ignores some more minor incidents included in the oil industry statistics. However, given that the average number of lost days per incident in the oil industry is over 20 days (**Section 4**), the effect of this is unlikely to be great.

The EU statistics are reported as incidents per 100,000 employees, rather than per million man-hours. The oil industry figures in **Table 5** have been converted to the same basis assuming that an average year's work consists of 1840 hours. The oil industry sectors manufacturing and marketing correspond approximately to the manufacturing and wholesale and retail sectors in the EU figures but it is probably safer to compare the combined figures. These reveal that lost work injuries in the oil industry are approximately five times less frequent than for EU industry as a whole. However, the incidence of fatalities is similar.

Table 6 Comparison of Oil Industry Accident Statistics with EU statistics (1993)

Industrial Sector	European Incidence*		Oil Industry Incidence*	
	LWI	Fatalities	LWI	Fatalities
Manufacturing	5054	5.0	921	5.6
Construction	9885	17.0		
Wholesale & Retail trade etc.	2868	3.3	777	8.6
Financial Intermediation etc.	1827	3.5		
Combined**	4505	6.1	830	7.5

* Incidence = No. of incidents / fatalities per 100,000 employees

** Combined = Sum of all above sectors

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. API (1998) Summary of US occupational injuries, illnesses, and fatalities in the petroleum industry - as reported to the API - covering US petroleum and petrochemical operations of reporting companies for 1997. Washington DC: American Petroleum Institute
5. Eurostat (1997) Accidents at work in the European Union in 1993 - initial results. ISSN 1024-4352. 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 : 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)

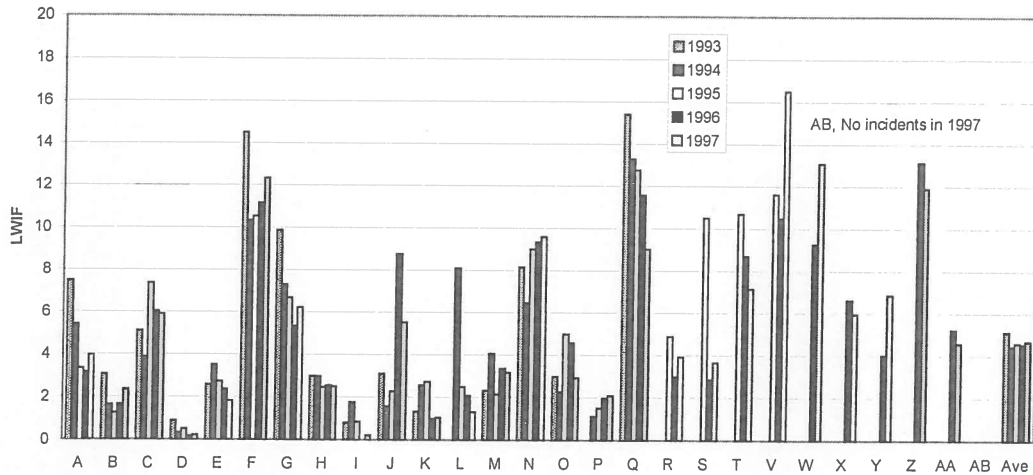


Figure 2 LWIF For Company Employees in European Oil Industry (Manufacturing)

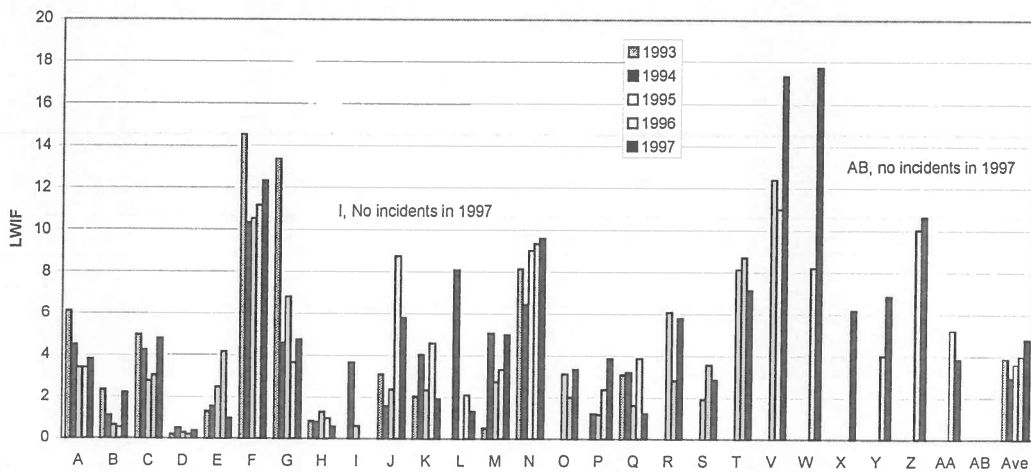


Figure 3 LWIF For Company Employees in European Oil Industry (Marketing)

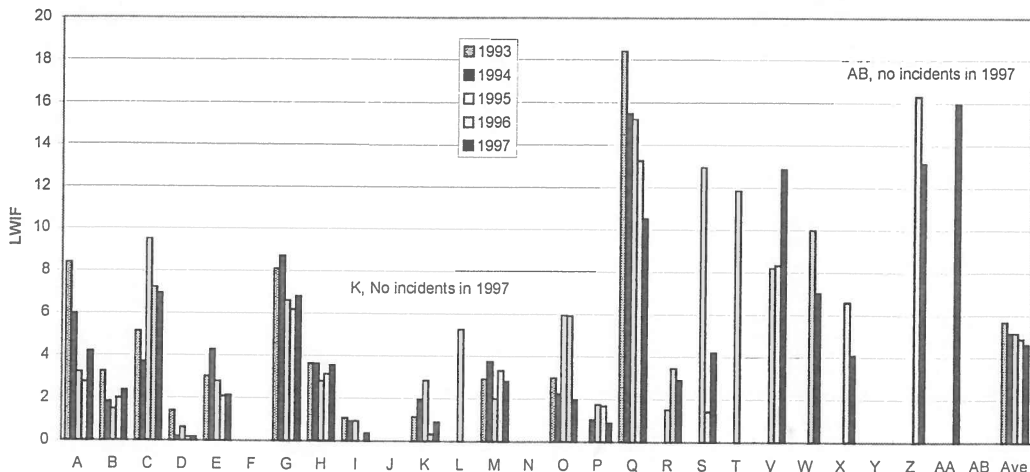


Figure 4 AIF* For Company Employees in European Oil Industry (Both Sectors)

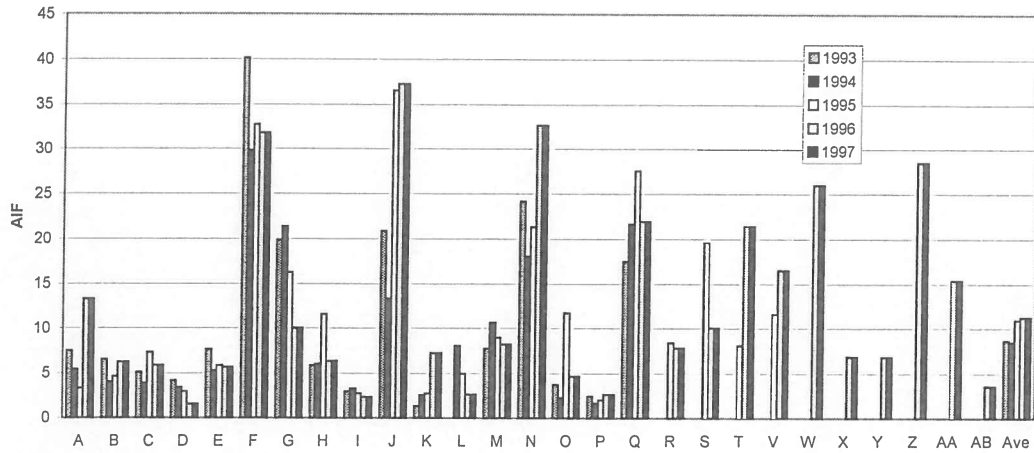


Figure 5 AIF* For Company Employees in European Oil Industry (Manufacturing)

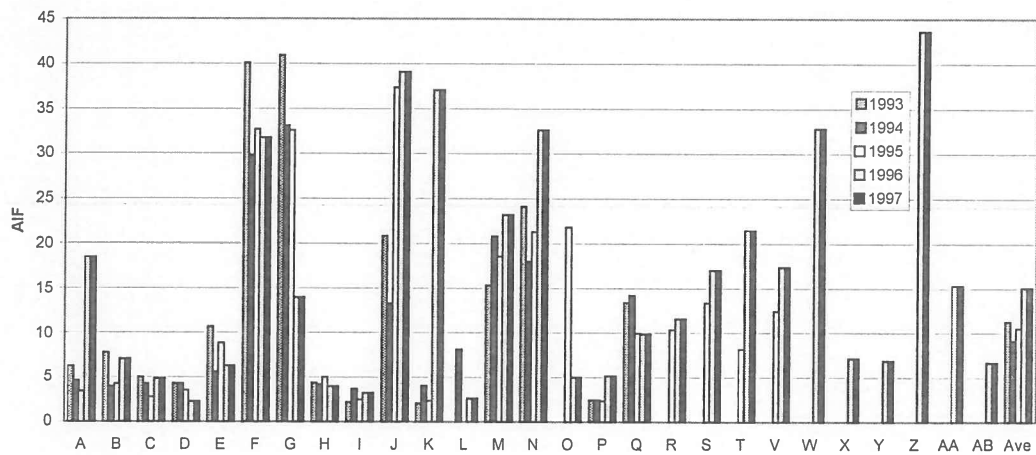
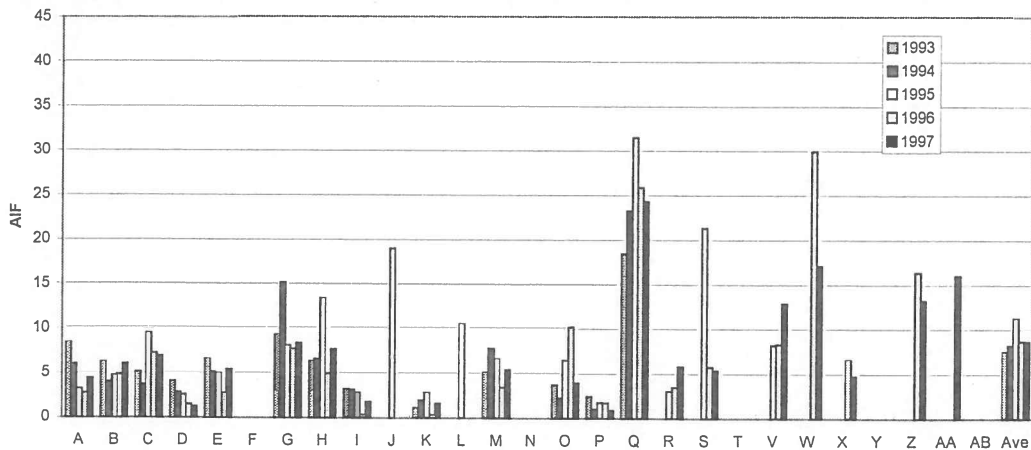


Figure 6 AIF* For Company Employees in European Oil Industry (Marketing)



* 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)

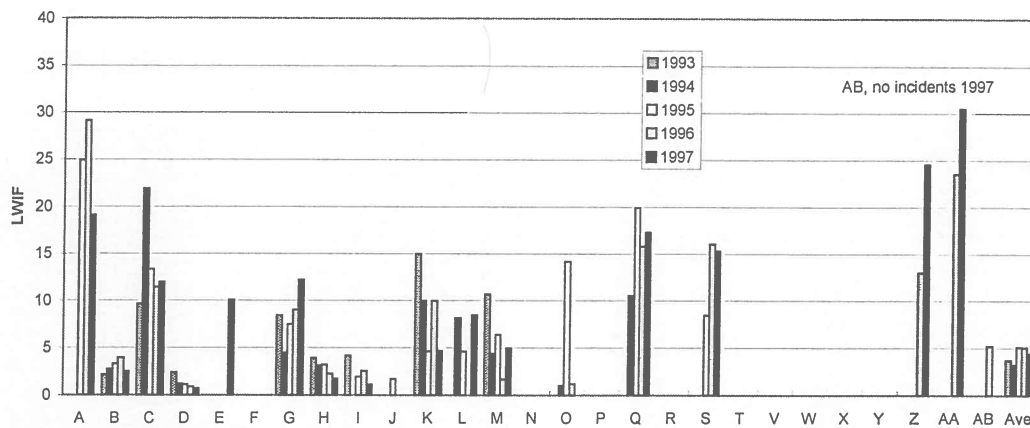


Figure 8 LWIF For Contractors in European Oil Industry (Manufacturing)

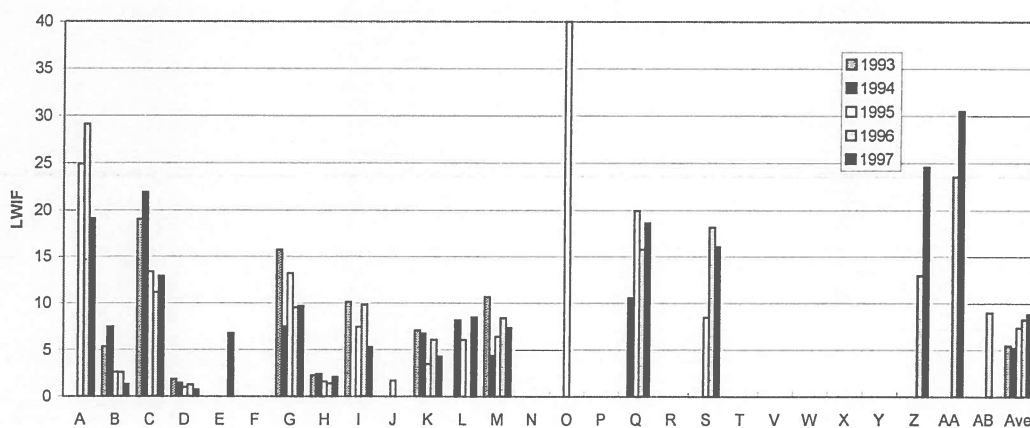


Figure 9 LWIF For Contractors in European Oil Industry (Marketing)

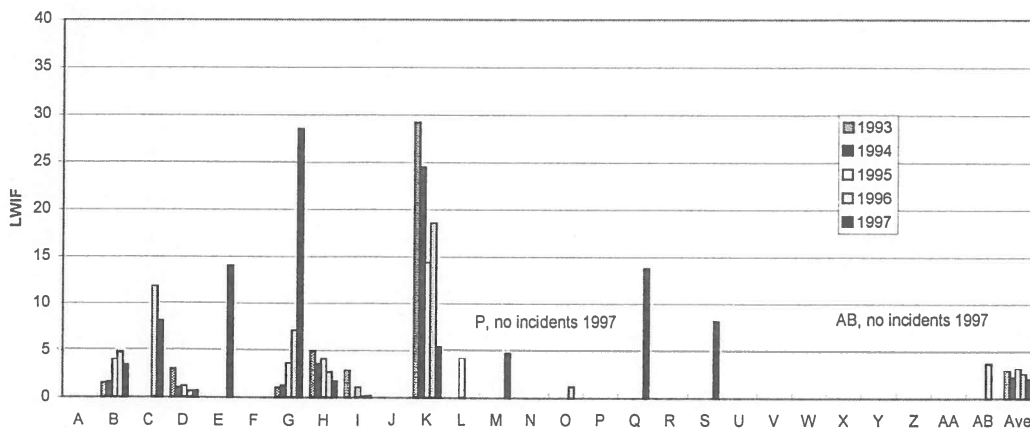


Figure 10 AIF* For Contractors in European Oil Industry (Both Sectors)

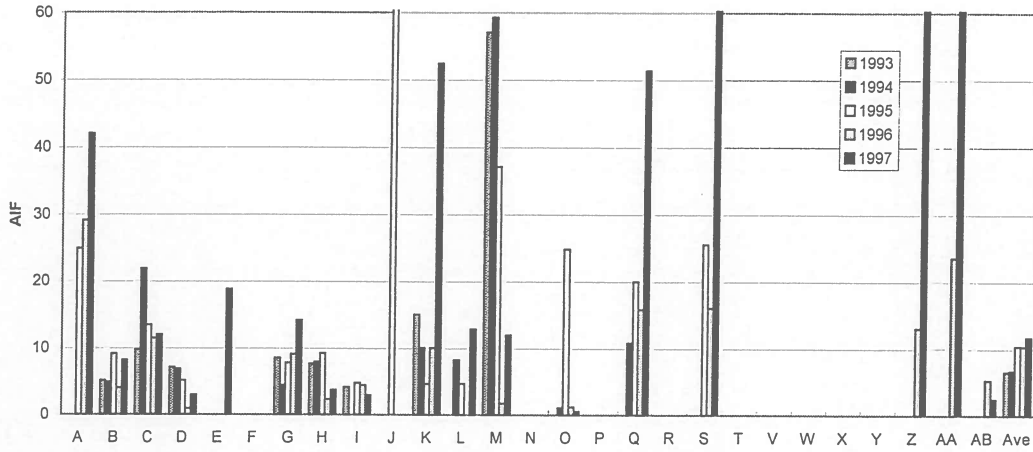


Figure 11 AIF* For Contractors in European Oil Industry (Manufacturing)

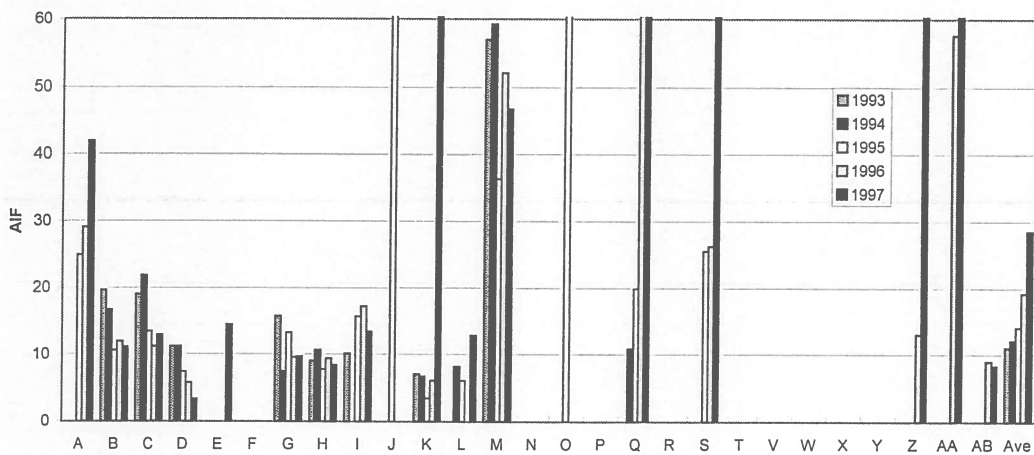
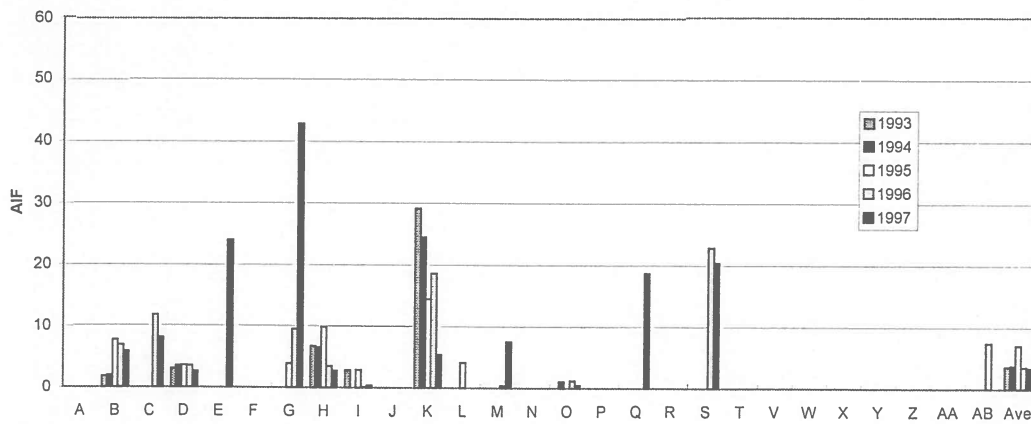


Figure 12 AIF* For Contractors in European Oil Industry (Marketing)



* 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)

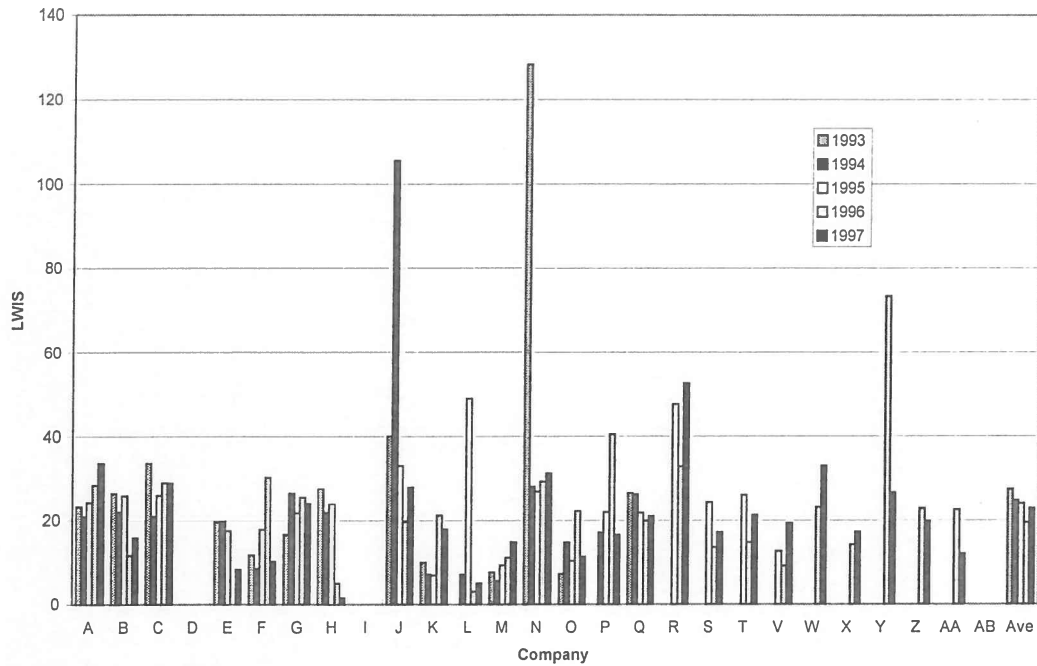


Figure 14 Road Accident Rate
(Accidents per Million Kilometres)

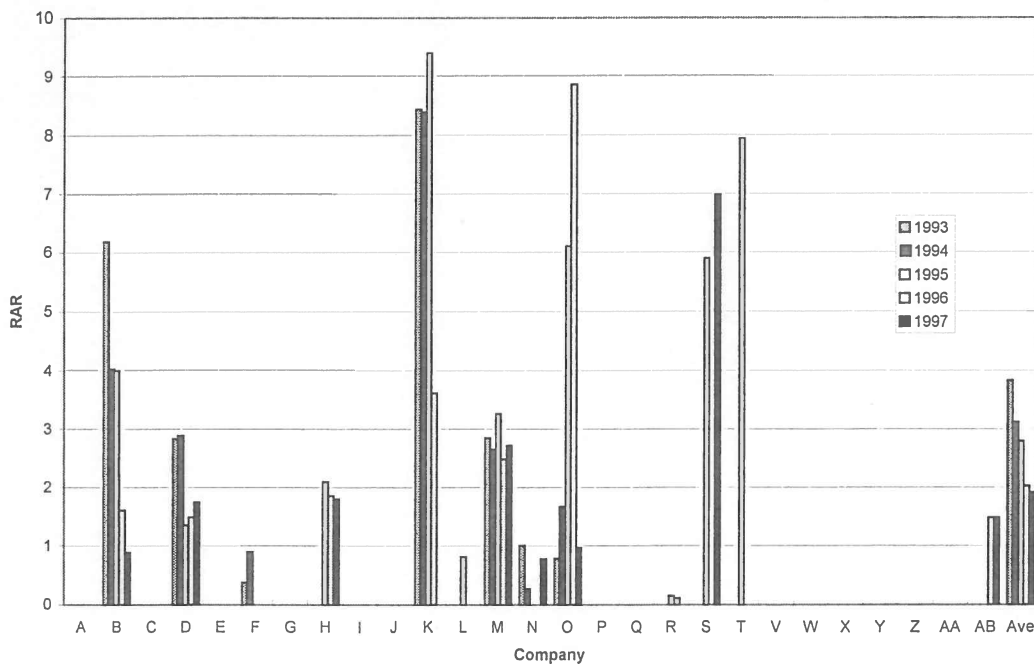


Figure 15 Fatalities for All Workers in European Oil Industry (Both Sectors)

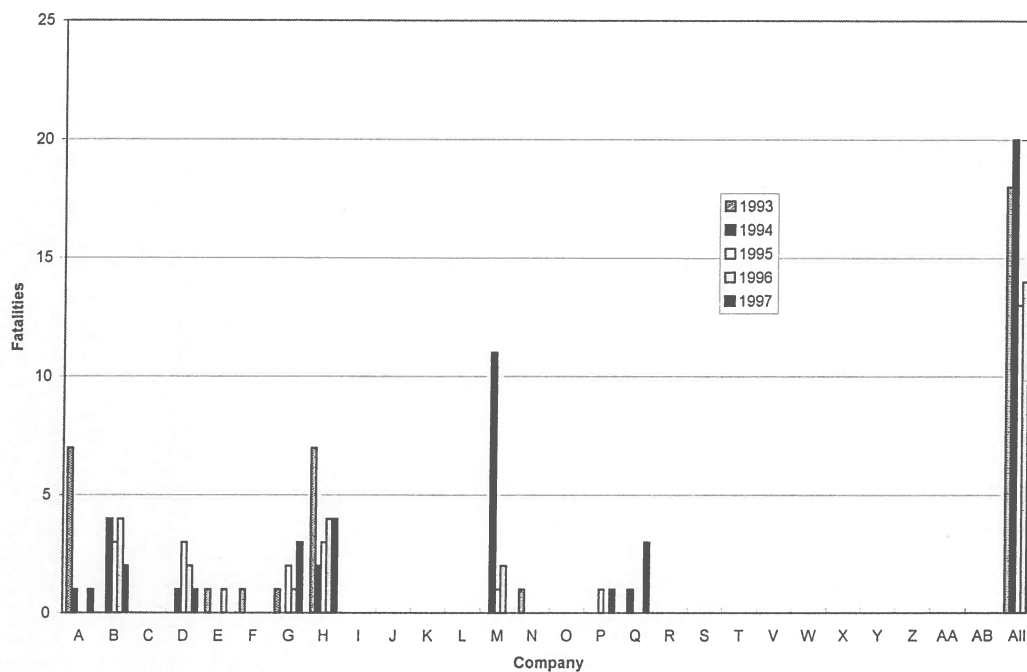


Figure 16 Comparison of Five Year Data (1993-1997)

