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European downstream oil industry safety performance

Statistical summary of reported incidents 2024

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ABSTRACT

The 2024 annual report on European downstream oil industry safety performance presents work-related personal injuries for the industry's own employees and contractors and process safety performance indicators. Information was received from 40 Concawe Member Companies and two Joint Ventures (comprised of member companies) reported separately, together representing more than 94% of the European refining capacity. Total work hours reported (585 million) were 1% lower in 2024 than in 2023. In 2024, there were eight fatalities reported by the industry, seven Manufacturing contractors and one Marketing contractor. The number of Lost Workday Injuries recorded in 2024 (572) is 13% lower than those in 2023 (655). The combined number of Tier 1 and 2 process safety events across Manufacturing and Marketing in 2024 is 204, 9% less than in 2023 (224). There were 18% less Tier 1 events reported in 2024 (65) than in 2023 (79).

Note that 2023 data in this report has been revised based on new member company information received in the 2024 data collection. This report therefore provides the most accurate and up to date details of both 2023 and 2024 data.

This report is available as an Adobe pdf file on the Concawe website (www.Concawe.eu).

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EXECUTIVE SUMMARY

For 2024, information was received from 40 Concawe Member Companies and two Joint Ventures (comprised of Member Companies) reported separately, together accounting for greater than 94 % of the available refining capacity in the EU-27, UK, Norway and Switzerland. The purpose of collecting this data is to provide Member Companies with a benchmark against which to compare their performance, so that they can determine the efficacy of their safety management systems, identify shortcomings, and take corrective actions. Data also serve 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.

The aggregated 2024 results for Manufacturing, Marketing and the combined downstream oil industry are shown in the table below.

All reporting companies									
Sector	**Manufacturing**			**Marketing**			**Both Sectors**		
Workforce	**OS**	**CT**	**AW**	**OS**	**CT**	**AW**	**OS**	**CT**	**AW**
Hours worked Mh*	111	177	289	130	166	297	242	344	585
Fatalities	0	7	7	0	1	1	0	8	8
FAR - FA/100Mh	0.00	3.95	2.43	0.00	0.60	0.34	0.00	2.33	1.37
LWI	150	181	331	124	117	241	274	298	572
Lost time through LWI - Days	5,438	8,371	13,809	2,886	3,661	6,547	8,324	12,032	20,356
LWIF - LWI/Mh	1.35	1.02	1.15	0.95	0.70	0.81	1.13	0.87	0.98
LWIS** - Lost days/LWI	37.76	48.11	43.42	29.15	34.21	31.78	34.26	42.82	38.85
AI	287	376	663	165	147	312	452	523	975
AIF - AI/Mh	2.58	2.12	2.30	1.27	0.88	1.05	1.87	1.52	1.66
Distance travelled - million km	27	40	67	236	394	630	263	434	697
RA	25	12	37	37	108	145	62	120	182
RAR***	0.86	0.28	0.51	0.16	0.26	0.22	0.23	0.27	0.25
T-1 PSE			56			9			65
T-2 PSE			128			11			139
T-1 PSER PSI/Mh reported			0.19			0.04			0.12
T-2 PSER PSI/Mh reported			0.44			0.04			0.26
Total PSER PSI/Mh reported			0.64			0.08			0.38

OS: Own staff; CT: Contractors; AW: All workers
*Total hours recorded in millions, rounded to whole number (rates below use data before rounding for hours associated with those companies/sectors reporting incidents)
** LWIS is calculated for those LWI where number of lost days are reported
*** RAR is calculated only when both Road accidents and Distance travelled are reported

There were eight fatalities reported for 2024, seven Manufacturing contractors and one Marketing contractor. Five Manufacturing contractors were fatally injured in a single explosion during tank loading. One Manufacturing contractor died following unauthorised entry in a confined space. One Manufacturing contractor and one Marketing contractor died as a result of entrapment between equipment in separate incidents. The number of annual fatalities in 2024 is the third highest in the last ten years (eleven fatalities were recorded in 2022 and ten in 2018).

In addition to fatalities Lost Workday Injuries (LWI) are also studied to identify further opportunities for continuous safety performance improvement. A total of 572 LWI were reported in 2024 (655 in the previous year) with a 2024 LWIF of 0.98, compared with 1.10 in 2023. As in previous years, a relatively small number of categories contribute to most LWI reported. In order of frequency (highest first) slips & trips (same height), struck by, cut, puncture or scrape, falls from height and caught in under or between together account for 68% of all LWI reported in 2024 across Manufacturing and Marketing.

For 2024, 41 companies submitted Process Safety Event (PSE) data for the Manufacturing operations and 21 submitted Marketing PSE data. The combined number of Tier 1 and 2 process safety events across Manufacturing and Marketing in 2024 (204) is 9% lower than in 2023 (224). Tier 1 Manufacturing process safety events (56 in 2024) decreased by more than 24% compared with 2023 (74) and Tier 2 Manufacturing process safety events (128 in 2024) are slightly more than in 2023 (126). The number of Marketing Tier 1 events in 2024 (nine) is 80% higher than in 2023 (five) and Marketing Tier 2 events decreased 42% from 19 to 11 events in 2024. Five out of eight fatalities (63%) and 18 out of 572 LWI (3%) in 2024 were related to Tier 1 process safety events, this is higher than in 2023 (43% fatalities and 2% LWI). This underlines the importance of high technical standards and strict procedures in process safety.

Note that 2023 data in this report has been revised based on new member company information received in the 2024 data collection. This report takes into account the following revision in 2023 data:

- an increase in the originally reported work hours for Marketing staff from 140 million in Concawe 2023 report [29] to 142 million in this report.

This report therefore provides the most accurate and up to date details of both 2023 and 2024 data.

1. INTRODUCTION TO 2024 REPORT

The collection and analysis of incident data is widely recognised by the downstream oil refining industry as an essential element of an effective safety management system. Concawe started compiling statistical data for the European downstream oil industry in 1993 and this is the thirty-first report on this topic (see references of past reports in the reference list [1-30]. This report covers data collected for 2024 as well as a full historical perspective from 1993. It also includes comparative figures from other industry sectors where available.

For 2024, information was received from all forty Concawe Member Companies and 2 Joint Ventures comprised of Member Companies when information has not been submitted by the Member Company partners. These submissions in 2024 represent more than 94% of the European Refining capacity. From the outset, most Concawe Member Companies have participated so that the report has always represented a large portion of the industry and by 1995 the report represented ~93% of European refining capacity (somewhat less for distribution and retail). Over the years, the level of representation has fluctuated in line with the structural changes and mergers occurring in the industry. In the last ten years, the average representation was around 97% of the European refining capacity.

The term “downstream” represents all activities of the industry from receipt of crude oil to products sales, through refining, distribution, and retail. Not all companies operate in both the Manufacturing and Marketing areas and not all companies are able to supply all the requested data. All those who do, collect data separately for “Manufacturing” (i.e., refining) and “Marketing” (i.e., distribution (transport), retail and “head office” staff) and this split has been applied in the report. The data is also split between company and contractor staff as contractor statistics are normally fully integrated into the companies’ safety monitoring systems. Some companies do not record road accidents separately from other incidents. All companies record own staff injuries against the Manufacturing and/or Marketing categories, but this is not always the case for lost days. Contractor data is in general, less complete than company staff data. Where data are not available directly, Members are requested to present the best estimate possible.

The purpose of collecting this data is twofold

- To provide Member Companies with a benchmark against which to compare their performance, so that they can determine the efficacy of their safety management systems, identify shortcomings, and take corrective actions
- 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.

Several safety key performance indicators have been adopted by most oil companies operating in Europe as well as by other industries. Although there are differences in the way Member Companies collect base data these common indicators allow for an objective comparison at the industry level. The differences in precise definitions used and in local interpretation of metrics means that direct comparison of data from individual companies could lead to erroneous conclusions. For this reason, Concawe does not report individual company data but rather aggregates the data at the membership level.

In 2009, Concawe began to compile Process Safety Performance Indicator (PSPI) data. These describe the number of Process Safety Events (PSE) expressed as unintended Loss of Primary Containment (LOPC). The 2024 Manufacturing PSE data represents 41 out of 42 of the Manufacturing companies and 94 % of European refining capacity.

In 2013, the Concawe membership agreed to adopt 16 incident categories to describe both fatalities and Lost Workday Injury (LWI) in an attempt to learn more from the actual incidents. These categories

allow for better benchmarking and alignment with other industry organisations, particularly the IOGP that represents the upstream sector of the oil and gas industry. The Concawe categorization of fatalities and LWI are further explained in Appendix 1.

In 2014, Concawe decided to commence collecting additional information in relation to the nature of Marketing retail operations. Companies have been asked to indicate if they have no retail activity and to describe their retail operations as either Company Owned Company Operated (COCO), Company Owned Dealer Operated (CODO), Dealer Owned Company Operated (DOCO) or Dealer Owned Dealer Operated (DODO). Concawe would like to improve the report in the data coverage for retail and transport contractors.

As from 2018, additional information was gathered regarding the causal factors of Lost Workday Injuries. This information is in line with the requirements of API RP 754 (2016) [31]. This data is presented in table format in Appendix 3. Over time this will allow assessment of the main factors contributing to Lost Workday Injuries from which approaches to address incident prevention can be developed.

In 2019, the possibility to link reported Tier 1 Process Safety Events with Lost Workday Injuries was provided with the intention to build an understanding of the types of Process Safety Events and their causal factors that lead to direct injury.

In 2021, the opportunity to record the number of RWIs and/or MTCs linked to each Tier 2 Event was provided.

Since 2022, it has been possible to record for each LWI and fatality, the type of permit to work (PTW) issued at the time of the incident and for each LWI, the number of days absent from work. This information may help Member Companies build a strong management system in conjunction with their PTW procedure.

In 2023, Concawe introduced mandatory reporting of more detailed Tier 1 process safety event information to enable focus on Tier 1 events in five categories: Fire with damage greater than or equal to $100,000 of direct cost; Explosion with damage greater than or equal to $100,000 of direct cost; An officially declared community evacuation or community shelter-in-place, (including precautionary); Engineered pressure relief that results in one or more of four consequences (rainout, discharge to a potentially unsafe location, on on-site shelter-in-place or on-site non- precautionary evacuation and/or public measures (including precautionary)) and Upset Emission from a Permitted or Regulated Source that results in one or more of the same four consequences.

A new set of causal factors with revised definitions was introduced in 2023 (see Appendix 1) in an attempt to understand more about the causes of incidents. The causal factor "human factors" has been widely reported, but this rarely informs the root cause of the incident and it is possible that Member Companies have different definitions of human factors. Causal factors are still described in alignment with API RP 754 (2021) [32] and multiple factors may be recorded per LWI.

In 2024, Concawe introduced a number of modifications to enhance learning from the data collected. These included the ability to report >180 days absence from work, the alignment of PSE Tier 1 and Tier 2 consequence reporting with API RP 754, the modification of permit to work definitions and the link of fatal incidents to the IOGP Life Saving Rules [33] involved.

Table 1 summarises the number of submissions and illustrates some key aspects of the data supplied by the companies.

Table 1 Number of companies submitting data for 2024

No Of Companies	Manufacturing			Marketing		
	Own Staff	Contractors	All Workers	Own Staff	Contractors	All Workers
Submission	42	41		24	22	
Including						
Lost Days	39	37		21	18	
All Injuries	34	38		12	15	
Road Accidents	37	36		18	16	
Distance Travelled	27	25		14	13	
Process Safety			41			21
Retail Operations						
No Retail						5
COCO						14
CODO						15
DOCO						8
DODO						10

Several Companies do not report their Road accidents and related exposure hours separately. These incidents are included in their overall statistics in cases where relevant criteria (LWI, AI) are met.

2. 2024 PERSONAL SAFETY PERFORMANCE RESULTS

The aggregated 2024 results for Manufacturing, Marketing and the combined downstream industry are shown in Table 2.

Table 2 Aggregated 2024 results for all reporting companies

All reporting companies									
Sector	**Manufacturing**			**Marketing**			**Both Sectors**		
Workforce	**OS**	**CT**	**AW**	**OS**	**CT**	**AW**	**OS**	**CT**	**AW**
Hours worked Mh*	111	177	289	130	166	297	242	344	585
Fatalities	0	7	7	0	1	1	0	8	8
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OS: Own staff; CT: Contractors; AW: All workers
* Total hours recorded in millions, rounded to whole number (rates below use data before rounding for hours associated with those companies/sectors reporting incidents)
** LWIS is calculated for those LWI where number of lost days are reported
*** RAR is calculated only when both Road accidents and Distance travelled are reported

2.1. 2024 FATALITIES

There were eight fatalities reported for 2024, seven Manufacturing contractors and one Marketing contractor.

Five Manufacturing contractors were killed as a result of a single explosion during tanker loading operations and following fire impacting the tanker loading bays, tankers, depot control room, office building and gatehouse.

One Manufacturing contractor died due to entrapment under equipment. The IOGP Life Saving Rule involved in this event was "Bypassing safety controls".

One Manufacturing contractor died following unauthorised entry into a confined space. The IOGP Life Saving Rule involved in this event was "Confined space".

One Marketing contractor (truck driver) was fatally injured after becoming trapped between a truck and a trailer that the driver was connecting to the truck. The truck handbrake was not used and the truck rolled into the driver and trailer. The IOGP Life Saving Rule involved in this event was "Driving".

The number of fatalities in 2024 is higher than that recorded in 2023 (seven) and continued efforts are essential to achieve the target of zero fatalities in our industry, in particular a focus on the IOGP Life Saving Rules of Bypassing safety controls, Confined space and Driving.

2.2. 2024 LWI

In 2024, there were a total of 572 Lost Workday Injuries (LWI), with 58% of these in Manufacturing and 42% in Marketing. The proportion of Manufacturing LWI recorded for staff and contractors is 45 and 55% (151 and 181 LWI, respectively). In Marketing, the proportion of LWI recorded for staff and contractors is 51 and 49% (124 and 117 LWI, respectively).

There was a decrease in Lost Workday Injury Frequency (LWIF) compared with 2023. The LWIF went from 1.10 LWI/Mh in 2023 to 0.98 LWI/Mh in 2024 across all workers. Thirty-eight companies reported LWI in both 2023 and 2024. Of these, 22 companies (58%) reported a lower overall LWIF in 2024 than in 2023, one company had the same LWIF in 2023 and 2024 and 15 companies (39%) had a higher LWIF in 2024. Of the 40 companies with All Injury Frequency (AIF) data recorded in both 2023 and 2024, 28 companies (70%) reported a lower overall AIF in 2024 than in 2023, and eleven companies (28%) had a higher AIF in 2024. One company reported the same AIF in 2023 and 2024.

As in recent years, Manufacturing staff in 2024 is the sector with the highest LWIF (1.35 in 2024 and 1.90 in 2023) and Marketing contractors have the lowest recorded LWIF of all sectors in 2024 at 0.70 (0.72 in 2023).

For comparison purposes, the LTIF (frequency of LWI + Fatalities) has been calculated for each category of workers, compared with the LWIF and presented in Table 3 below.

The small difference between the two reported measures is related to the relatively small number of fatalities (eight) compared with the number of LWI (572). The effective investigation of all incidents (near miss, minor and major) to obtain a full understanding of their root causes is therefore essential for the creation of a supportive safety culture and the fostering of the right organisational behaviours necessary to achieve zero incidents or accidents in operations.

Table 3 Comparison of LWIF and LTIF in 2024

	LWIF	LTIF
All Workers	0.98	0.99
Manufacturing Staff	1.35	1.35
Manufacturing Contractors	1.02	1.06
Manufacturing All	1.15	1.17
Marketing Staff	0.95	0.95
Marketing Contractors	0.70	0.71
Marketing All	0.81	0.82

Table 4 indicates a relatively small number of categories contribute to most LWI reported. In order of overall frequency across all sectors (highest first):

- slips & trips (same height) 29.9% of LWI reported
- struck by 10.7%
- cut, puncture and scrape 10.0%
- falls from height 9.4%
- caught in under or between 8.6%

Together these incident categories account for over 68% of all LWI reported in 2024 across Manufacturing and Marketing.

Other frequently reported incident categories in Manufacturing include:

- Explosion or burns 7.5%
- Overexertion, strain 5.7%

Concentrating on the most frequently reported incident categories offers the opportunity to address prevention of LWI across both sectors.

The largest differences between Manufacturing and Marketing in the proportions of LWI reported by incident category are in slips and trips (32.8% of Marketing LWI, compared with 28% of Manufacturing LWI), assault or violent act (4.6% of Marketing and 0% of Manufacturing LWI) and falls from height (7.1% of Marketing and 11.1% of Manufacturing LWI).

As a proportion of LWI reported, Manufacturing contractors reported more struck by type LWI than own staff (14.9% of all Manufacturing contractor LWI compared with 7.9% of LWI for Manufacturing own staff), while slips and trips were more prevalent as LWI in Manufacturing staff (31.8% of all Manufacturing own staff LWI compared with 24.9% of all Manufacturing contractor LWI). Falls from height type LWI were reported more for Manufacturing contractors (13.8% of LWI) than for Manufacturing staff (7.9% of LWI).

In Marketing, the largest differences in the proportions of LWI reported between staff and contractors were in the incident categories of slips and trips (37.1% of staff LWI and 28.2% of contractor LWI), falls from height (4.0% of staff LWI and 10.3% of contractor LWI) and struck by (6.5% of staff LWI and 12.0% of contractor LWI).

Table 4 LWI by Incident Category in 2024

Category		MF & MK Combined		Manufacturing (MF)						Marketing (MF)					
		All	%	OS	%	CT	%	AW	%	OS	%	CT	%	AW	%
Road Accident	Road Accident	23	4.0	10	6.7	2	1.1	12	3.6	7	5.6	4	3.4	11	4.6
Height/Falls	Falls from height	54	9.4	12	8.0	25	13.8	37	11.2	5	4.0	12	10.3	17	7.1
	Staff hit by falling objects	11	1.9	1	0.7	5	2.8	6	1.8	1	0.8	4	3.4	5	2.1
	Slips & trips (same height)	171	29.9	47	31.3	45	24.9	92	27.8	46	37.1	33	28.2	79	32.8
Burn/ Electrical	Explosion or burns	38	6.6	14	9.3	11	6.1	25	7.6	8	6.5	5	4.3	13	5.4
	Exposure electrical	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Confined Space	Confined Space	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Other Causes	Assault or violent act	11	1.9	0	0.0	0	0.0	0	0.0	5	4.0	6	5.1	11	4.6
	Water related, drowning	3	0.5	1	0.7	2	1.1	3	0.9	0	0.0	0	0.0	0	0.0
	Cut, puncture, scrape	57	10.0	10	6.7	18	9.9	28	8.5	14	11.3	15	12.8	29	12.0
	Struck by	61	10.7	12	8.0	27	14.9	39	11.8	8	6.5	14	12.0	22	9.1
	Exposure, noise, chemical, biological, vibration	24	4.2	8	5.3	10	5.5	18	5.4	6	4.8	0	0.0	6	2.5
	Caught in, under or between	49	8.6	12	8.0	19	10.5	31	9.4	8	6.5	10	8.5	18	7.5
	Overexertion, strain	38	6.6	11	7.3	8	4.4	19	5.7	8	6.5	11	9.4	19	7.9
	Pressure release	4	0.7	1	0.7	1	0.6	2	0.6	1	0.8	1	0.9	2	0.8

OS: Own staff; CT: Contractors; AW: All workers MF: Manufacturing; MK: Marketing

Since 2021, Concawe collected information to link the event leading to the LWI to the type of Permit to Work (PTW) required to execute the task, if any. The assignment of type of PTW (Specific work permit required; Clearance/procedure/work instruction required and No PTW and no clearance / work procedure required) for each of the sectors is set out in Figure 1A, below.

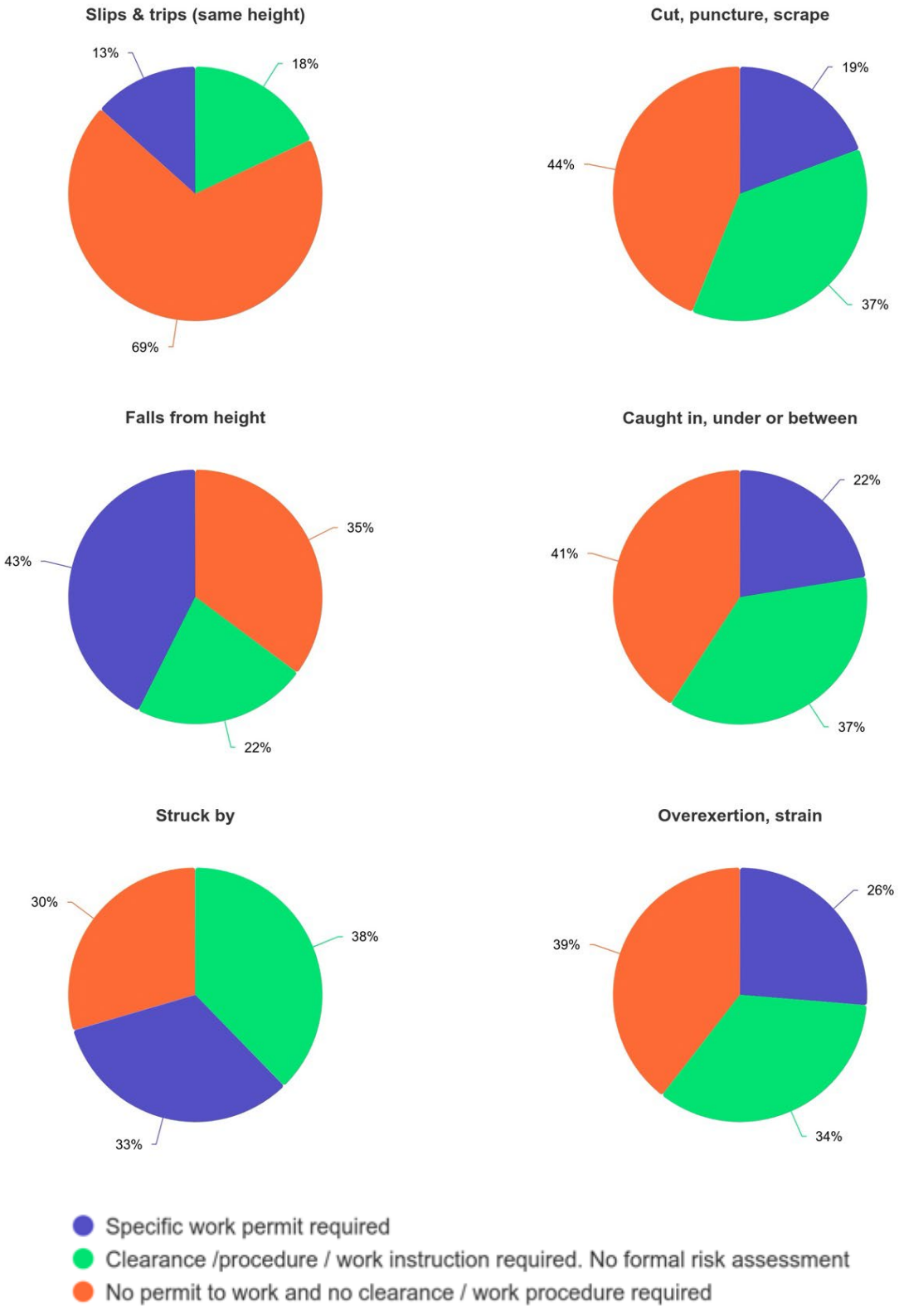
Figure 1A *Type of Permit to work for LWI recorded by sector*

In all sectors, most LWI occur during work that does not require a specific work permit. For Manufacturing staff, 88% of LWI occur in work that does not require a specific permit or clearance/procedure/work instruction. For Manufacturing contractors, 52% of LWI are associated with work that does not require a specific permit. In Marketing, 65% of staff LWI and 53% of contractor LWI are associated with work that does not require a specific work permit or clearance/procedure/work instruction.

The specification of a work permit required at the time of a LWI varies across the sectors between the highest of 48% for Manufacturing contractors and lowest of 7% for Marketing staff. The proportion of LWI associated with work that requires a specific work permit has increased in Manufacturing contractors year on year from 27% of sector LWI in 2022, 40% in 2023 and 48% in 2024. The proportion of Marketing own staff LWI associated with work not requiring a specific permit increased from 38% in 2023 to 93% in 2024.

For the most frequently reported LWI, the type of PTW in place at the time of the event is presented in Figure 1B. The proportion of the types of PTW specified varies between the LWI categories. A specific PTW was more likely to be in place at the time of events leading to LWI associated with falls from height (43% of incident category LWI) and struck by (33% of incident category LWI) type incidents than for LWI associated with slips and trips (13% of incident category LWI). The proportion of all LWI from falls from height in 2024 while working under a specific PTW is considerably higher than in 2023 (26%) and 2022 (7%). As in 2023, slips & trips reported the largest proportion of no PTW/ no clearance / work procedure required. Of the most frequently reported LWI in 2024, struck by incidents had the smallest proportion of no PTW/ no clearance / work procedure required (30%).

Figure 1B Type of PTW at LWI event for most frequently reported Incident Categories



The number of days absent from work per LWI was reported in 2024 for 87% of LWI (499 LWI) compared with 85% of LWI in 2023. The total number of days absence recorded for individual LWI in 2024 was 17,602 (the total number of days absence for all LWI reported, 20,356). The mean absence per LWI is 35 days. Manufacturing contractors are above this mean at 41 days lost per LWI and Marketing staff and contractors below the mean at 29 and 33 days per LWI, respectively, see Figure 1C.

Figure 1C Mean number of days absent from work per LWI by sector (MF = Manufacturing; MK = Marketing; OS = Own Staff: CT = Contractors)

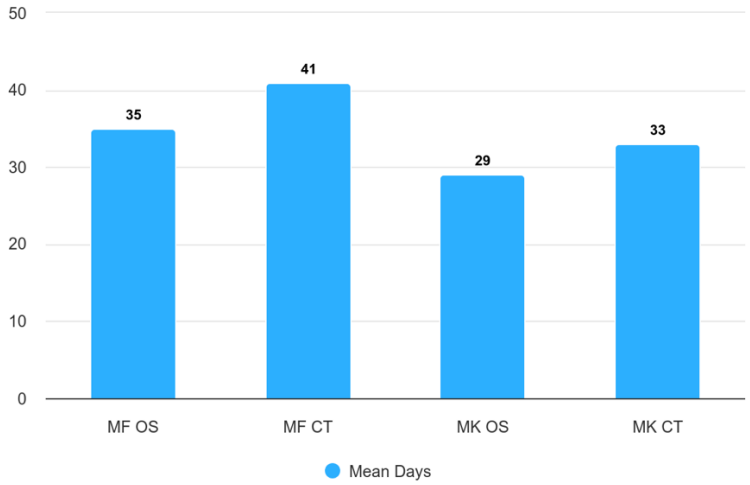
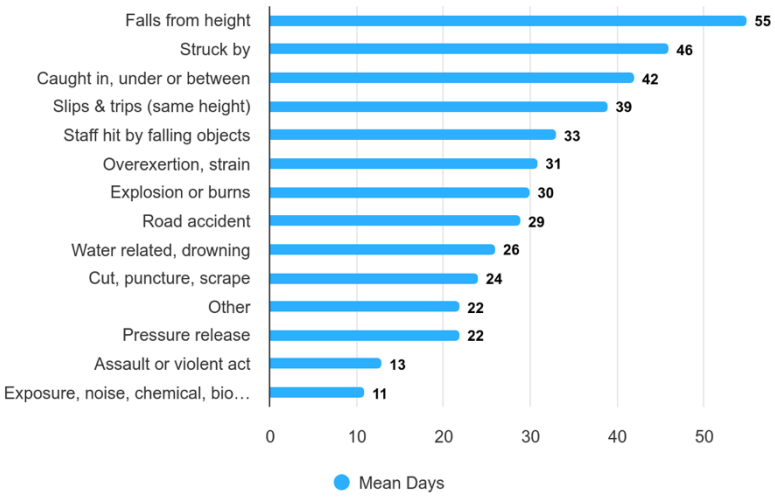


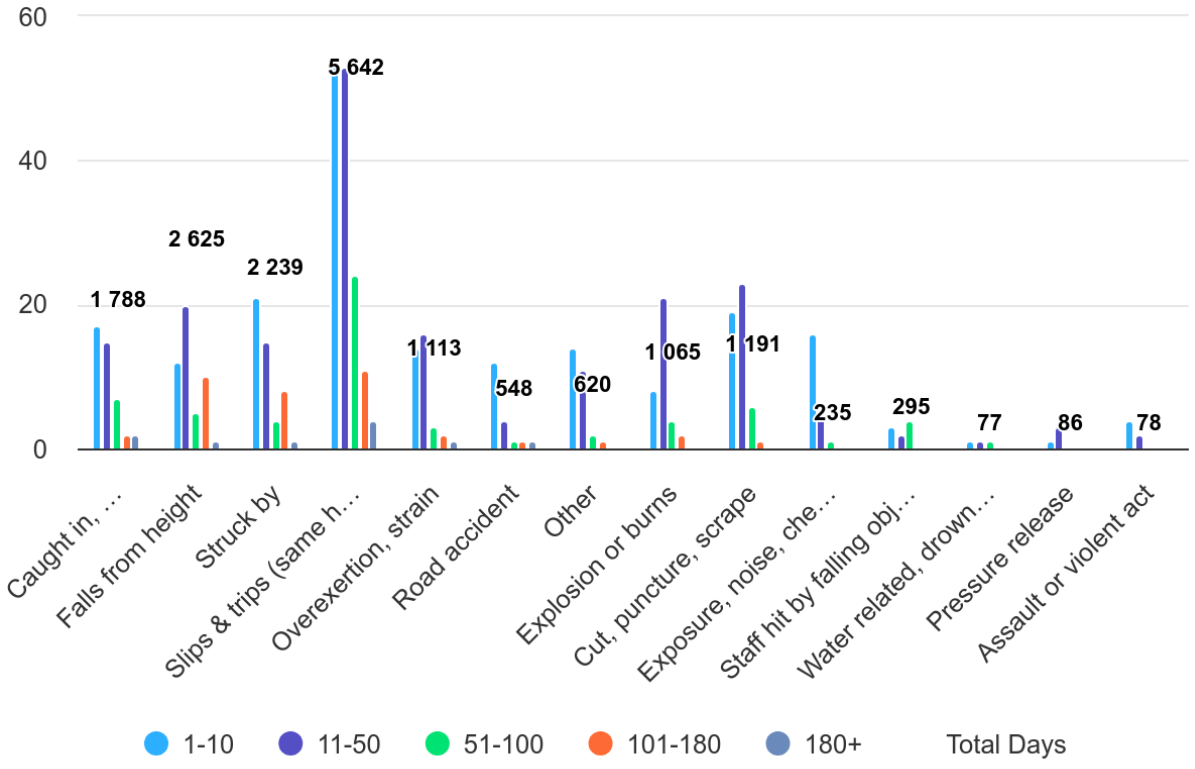
Figure 1D Mean number of days absent from work per LWI by incident category



The mean number of days absence per LWI by incident category is set out in Figure 1D. Falls from height categorised LWI have the highest mean number of days absence per LWI (55 days), followed by struck by (46 days), caught in, under or between (42 days) and slips and trips (39 days). These incident categories with above mean number of days absence per LWI are also the most frequently reported incident categories, see Table 4.

A view of the number of LWI and the period of absence per LWI by incident category is provided in Figure 1E. Slips and trips LWI contribute the most days absence of all incident categories with a total reported absence of 5,642 days (28% of total LWI days absence). The next largest contributors to days absence are falls from height and struck by LWI with 13% and 11% of LWI days absence, respectively. Slips and trips, falls from height and struck by LWI also most frequently lead to extended absence from work, with a total of 35 LWI with absence >101 days.

Figure 1E Distribution of number of days absent from work per LWI by Incident Category (days absence grouped 1-10 days, 11-50 day, 51-100 days and 101-180 days per LWI). Values above bars indicate total number of days absence reported for all incidents in each incident category



Concawe collected causal factors where available for each LWI, see Figure 1F and Appendix 3.

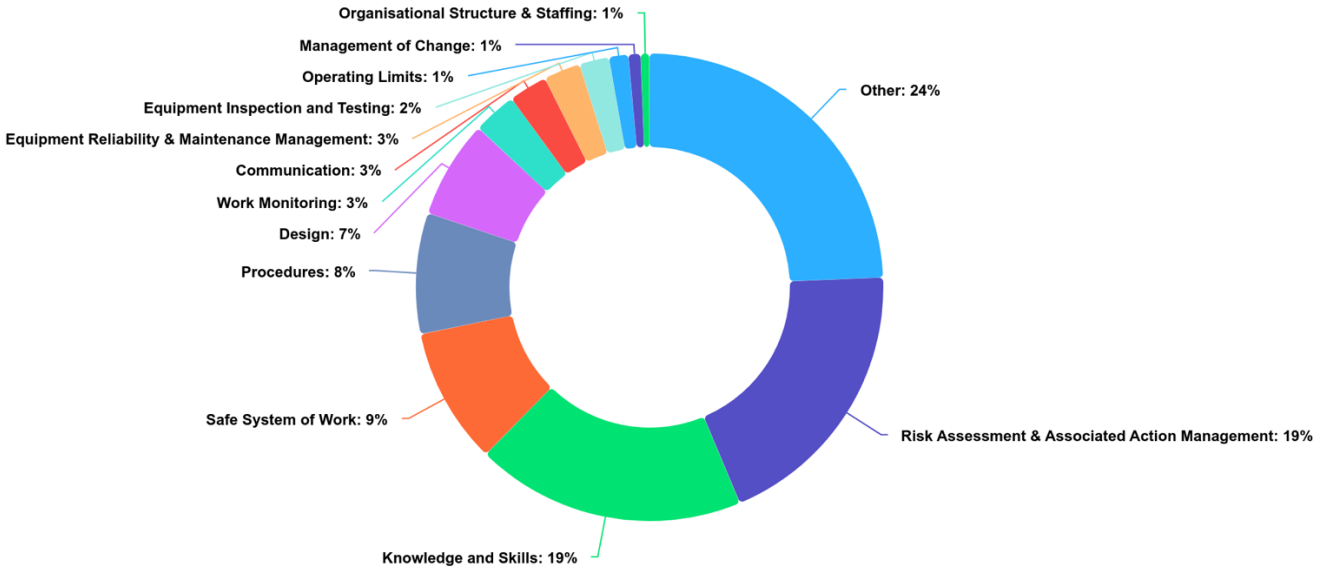
Causal factors were not available for 14% of LWI (83 LWI) in 2024. This is higher than in 2023 when 11% of incidents had no causal factor available. In many cases, the absence of causal factors reflects ongoing investigations.

The most commonly reported causal factors across all LWI are "risk assessment and associated action management" (19% of causal factors reported), knowledge and skills (19%), safe system of work (9%), procedures (8%) and design (7%). Twenty-four percent of LWI causal factors were reported as other (used to specify where an incident cannot be logically classed under any other category).

While Manufacturing LWI followed the above order for most commonly reported causal factors, the most frequently reported causal factor for Marketing LWI was knowledge and skills (77 incidents), followed by risk assessment and associated action management (37 incidents), then safe system of work (30 incidents) and procedures (27 incidents).

Manufacturing LWI were more often described with the causal factor risk assessment and associated action management than Marketing LWI. For Caught in under or between type LWI, 58% of Manufacturing incidents were described with this causal factor compared with only 16% of Marketing LWI of the same incident category. For explosion or burn LWI, this figure was 40% and 8% for Manufacturing and Marketing respectively and for Overexertion and strain the figure was 37% and 5% for Manufacturing and Marketing respectively.

Figure 1F Causal factors recorded for all LWI in 2024



Tables 5A and B show the LWI frequency statistics broken down into quartiles. This demonstrates a wide range of variability in performance between the top performing members (Quartile 1 – Q1) and the bottom performing members (Quartile 4 – Q4).

Table 5A 2024 LWIF quartile distribution ranges and average values for each quartile range

	Quartiles														
LWIF	**Manufacturing**			**Marketing**			**Total Own Staff**			**Total Contractors**			**Total Downstream**		
	Low	**High**	**Average**	**Low**	**High**	**Average**	**Low**	**High**	**Average**	**Low**	**High**	**Average**	**Low**	**High**	**Average**
Q1	0.00	0.58	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.59	0.23	0.00	0.62	0.25
Q2	0.76	1.21	1.01	0.00	0.52	0.30	0.00	1.02	0.59	0.63	1.11	0.87	0.67	1.16	0.93
Q3	1.44	2.60	1.92	0.77	1.49	0.95	1.10	3.37	1.78	1.16	2.82	1.74	1.20	2.60	1.76
Q4	2.76	5.66	4.40	1.52	1.81	1.70	3.77	7.42	5.82	3.23	10.73	5.26	2.76	5.66	4.37

Table 5B 2024 LWIF quartile distribution by staff type: ranges and average values for each quartile range

	Quartiles											
LWIF	**Manufacturing Staff**			**Manufacturing Contractors**			**Marketing Staff**			**Marketing Contractors**		
	Low	**High**	**Average**	**Low**	**High**	**Average**	**Low**	**High**	**Average**	**Low**	**High**	**Average**
Q1	0.00	0.00	0.00	0.00	0.59	0.14	0.00	0.00	0.00	0.00	0.00	0.00
Q2	0.00	1.05	0.51	0.63	1.24	0.94	0.00	0.22	0.04	0.32	0.81	0.52
Q3	1.11	3.37	1.93	1.24	2.82	1.81	0.27	1.30	0.63	0.85	1.99	1.25
Q4	3.45	7.42	5.82	3.23	10.73	5.26	1.62	4.84	2.74	2.24	3.78	2.79

The quartile distribution ranges and average values for each quartile for the 2024 All Injury Frequency (AIF) are shown in Tables 6A and 6B. The average performance indicator figures for the industry conceal a wide range of individual values between reporting companies.

Table 6A 2024 AIF quartile distribution by sector: ranges and average values for each quartile range

	Quartiles														
AIF	**Manufacturing**			**Marketing**			**Total Own Staff**			**Total Contractors**			**Total Downstream**		
	Low	**High**	**Average**	**Low**	**High**	**Average**	**Low**	**High**	**Average**	**Low**	**High**	**Average**	**Low**	**High**	**Average**
Q1	0.00	1.08	0.60	0.00	0.27	0.08	0.00	0.62	0.18	0.00	1.06	0.64	0.00	1.02	0.60
Q2	1.19	2.30	1.72	0.33	0.79	0.57	0.66	1.63	1.25	1.26	2.23	1.62	1.12	2.21	1.61
Q3	2.45	4.86	3.51	1.05	2.03	1.53	1.84	4.40	3.08	2.77	7.87	4.17	2.37	4.86	3.32
Q4	5.69	16.20	8.95	3.09	11.51	7.33	4.70	30.17	11.20	8.32	14.92	10.29	5.69	16.20	8.95

Table 6B 2024 AIF quartile distribution by staff type: ranges and average values for each quartile range

	Quartiles											
AIF	Manufacturing Staff			Manufacturing Contractors			Marketing Staff			Marketing Contractors		
	Low	High	Average	Low	High	Average	Low	High	Average	Low	High	Average
Q1	0.00	0.53	0.14	0.00	1.07	0.61	0.00	0.00	0.00	0.00	0.35	0.07
Q2	0.74	2.13	1.29	1.26	2.82	1.80	0.00	0.33	0.14	0.36	1.00	0.75
Q3	2.23	4.10	3.11	2.88	5.90	4.23	0.60	1.88	1.35	1.13	2.24	1.68
Q4	4.40	30.17	10.97	8.32	14.92	10.29	7.41	17.36	11.02	2.34	3.78	3.06

2.3. PERFORMANCE TRENDS IN THE LAST TEN YEARS - 2015 TO 2024

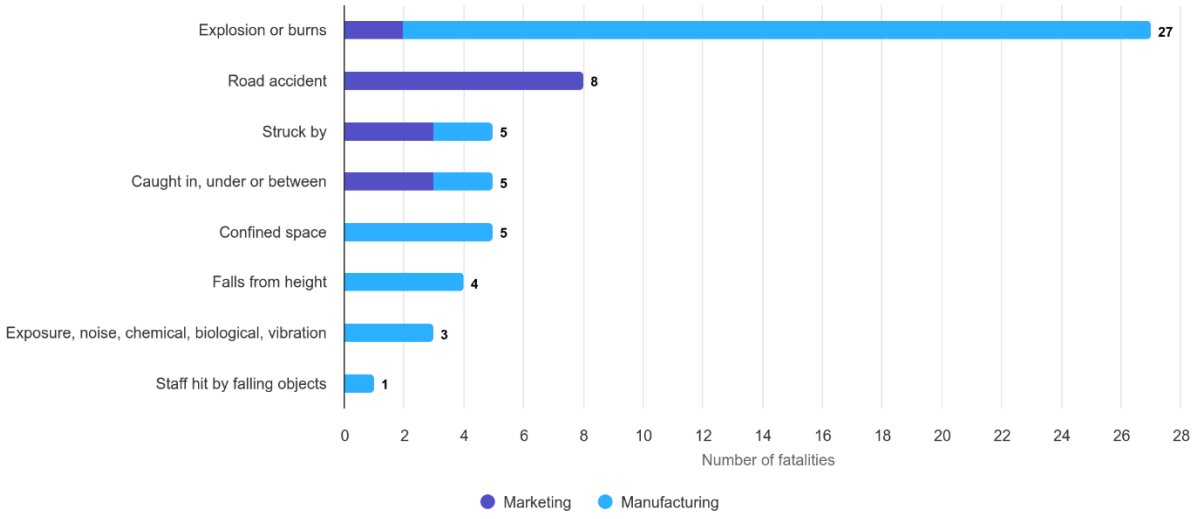
Performance indicators are particularly useful for identifying trends and patterns when considered over time. The historical trends for the European downstream oil industry over the past ten years are summarised in this section. Ten years has been chosen as a period reasonably representative of actual operating conditions and practices in place within the industry. For a full historical perspective, back to 1993, additional data tables are provided in Appendix 2.

Table 7 Fatalities by sector 2015-2024

Fatalities over ten years by sector			
Year	**Manufacturing**	**Marketing**	**Total**
2015	4	3	7
2016	2	0	2
2017	1	1	2
2018	7	3	10
2019	3	0	3
2020	1	1	2
2021	5	1	6
2022	6	5	11
2023	6	1	7
2024	7	1	8
Total	**42**	**16**	**58**

The total number of fatalities in 2024 (eight) is the third highest number of annual fatalities recorded in the last ten years. Continuous focus on understanding causal factors and putting in place clearly defined preventative actions and mitigative are required to achieve and sustain our objective of zero fatalities in both Manufacturing and Marketing.

Figure 2 Number of fatalities by category 2015-2024



In the last ten years there have been 58 fatalities, of which 27 explosions or burns type fatalities, eight road accident fatalities, five fatalities for each of the incident categories struck by, caught in

under or between and confined space and four falls from height. Together, these six incident categories account for 93% of the fatalities experienced in the industry since 2015.

Until 2013, Concawe compiled fatality data against broad categories that could change year to year. Expanding this to 16 distinct categories provided for greater transparency of cause and better benchmarking, but risked losing information on longer-term trends. However, by revisiting pre-2013 data, a reasonably consistent pattern can be seen.

Explosion or burns and road accidents are the most prevalent fatal incident categories recorded in the period 2009-2018. Road accidents have declined as an overall percentage of all fatalities compared to 1998-2008 when they represented almost half of all fatalities. This could be because of an increase in focus on Road Safety and the introduction of in-vehicle technology to help drivers.

The 2015-2024 reported fatalities in each of the sectors (Appendix Tables A2-2 to A2-5), indicate the higher prevalence of Contractor fatalities (31 fatalities in Manufacturing and 15 in Marketing) than own Staff (13 fatalities in Manufacturing and one in Marketing).

LWI category data has been available since 2013; a summary is shown in Table A2-6 (Appendix 2) and in Figure 3.

Figure 3: Percentage of LWI by incident category in Manufacturing and Marketing in 2024 compared with period 2015-2023

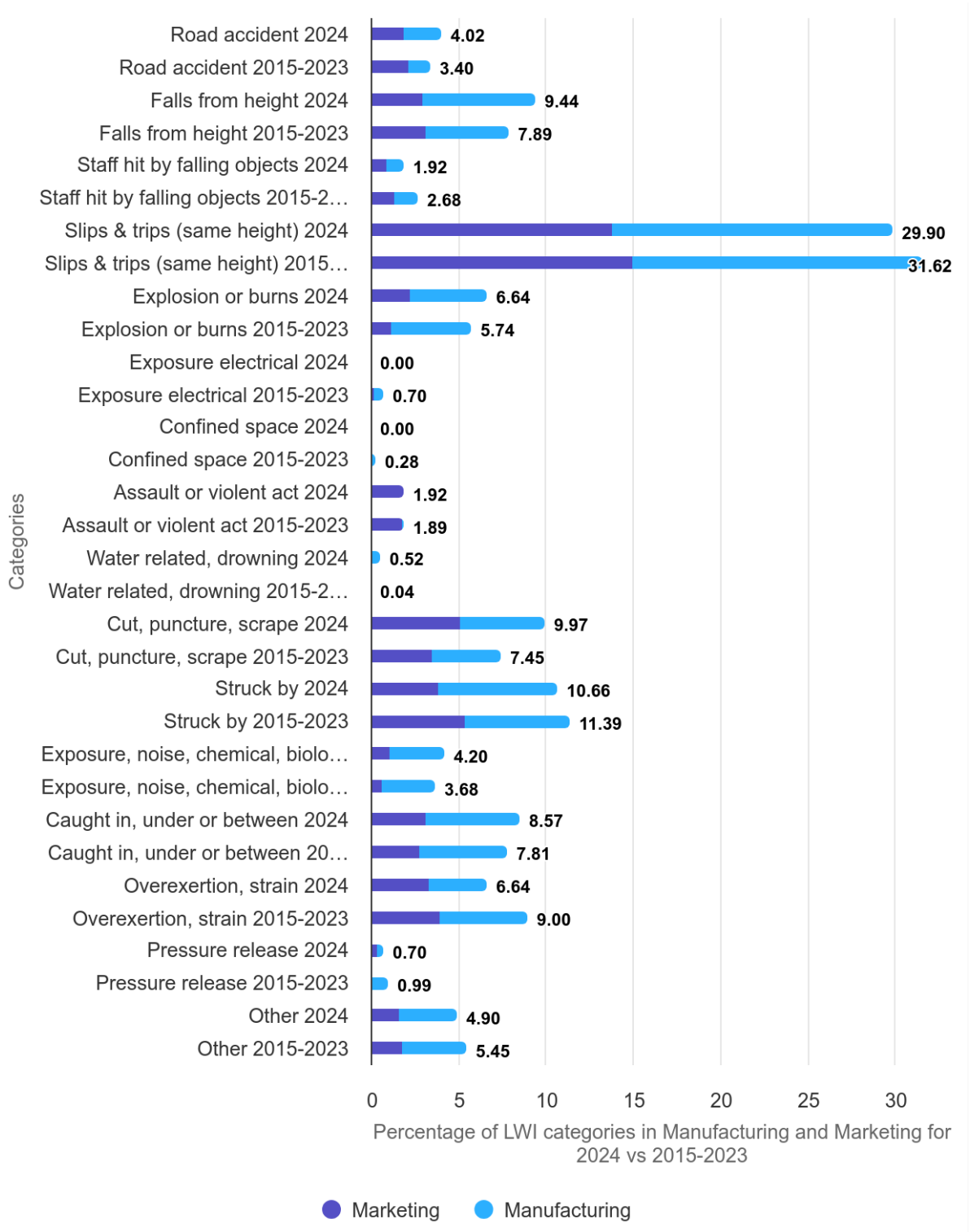


Figure 4a LWI and Fatalities 2015-2024 by Incident Category

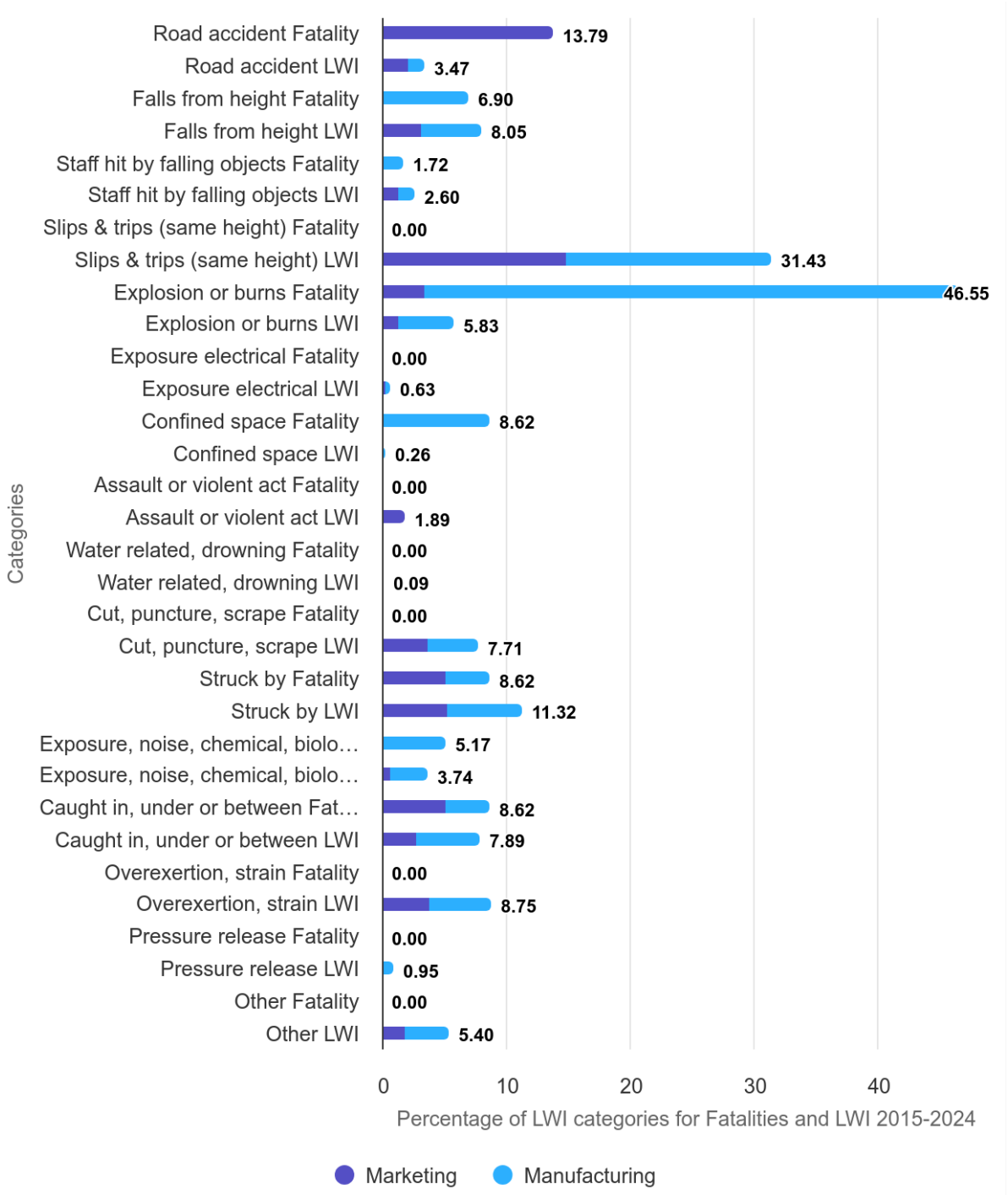


Figure 4b LWI and Fatalities 2015-2024 by Common Incident Category

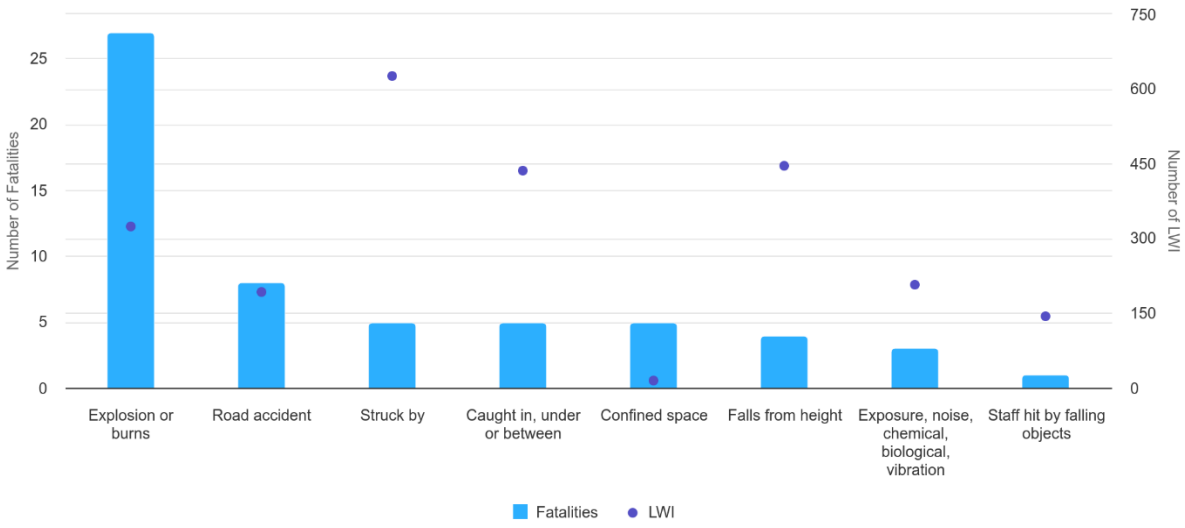


Figure 5A shows the historical evolution of the main personal safety performance indicators over the past ten years across all workers. With four fatal incidents (with eight casualties) in 2024, the Fatal Accident Rate (FAR) across all sectors is 1.37 in 2024 compared with 1.17 in 2023 and 2.02 recorded in 2022. The LWIF of 0.98 and the AIF of 1.66 in 2024 are both the lowest recorded since 2021. The Road Accident Rate (RAR) in 2024 is 0.25 showing a slight year on year increase since 2022 when RAR was at the lowest recorded (0.17). The total recorded distance driven in 2024 is 697 million km, a 17% reduction in the reported distance of 2023 (840 million km) (see Table A2-1). Figures 5B and 5C show the same data split for Manufacturing and Marketing, respectively.

Figure 5A Performance indicators over the last ten years for the European downstream oil industry

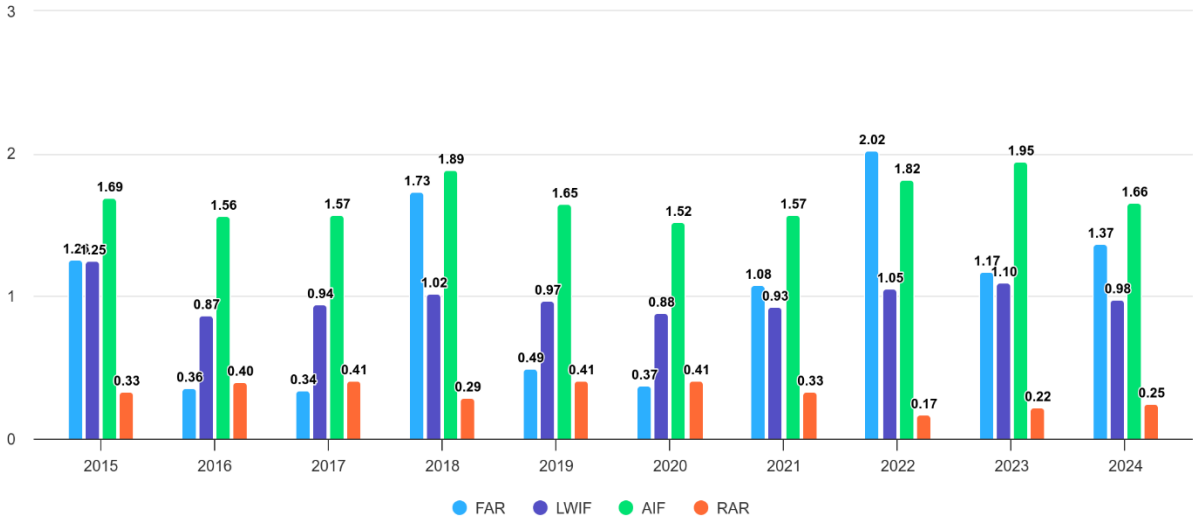


Figure 5B Performance indicators over the last ten years for Manufacturing

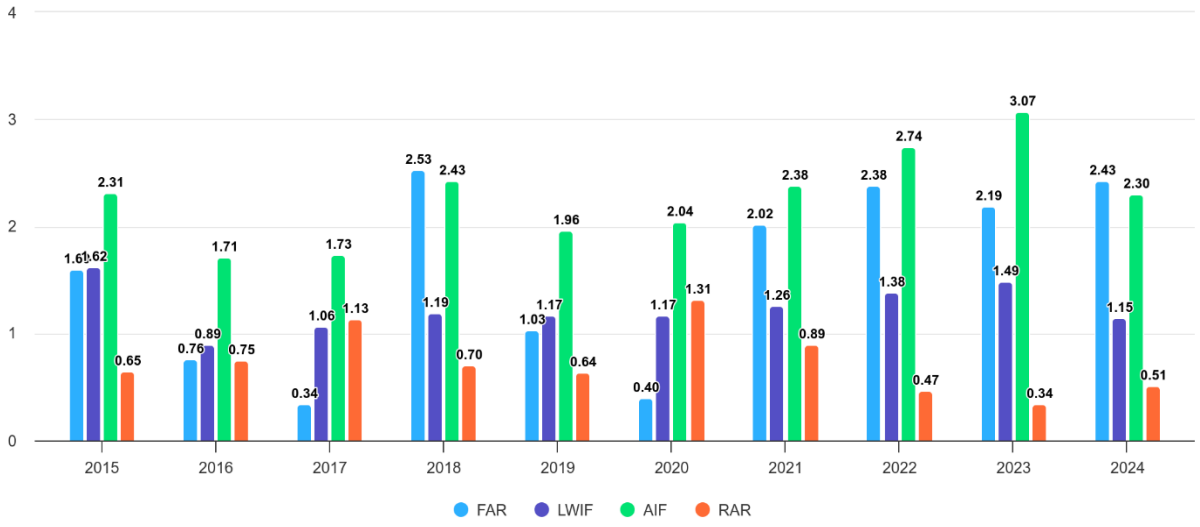
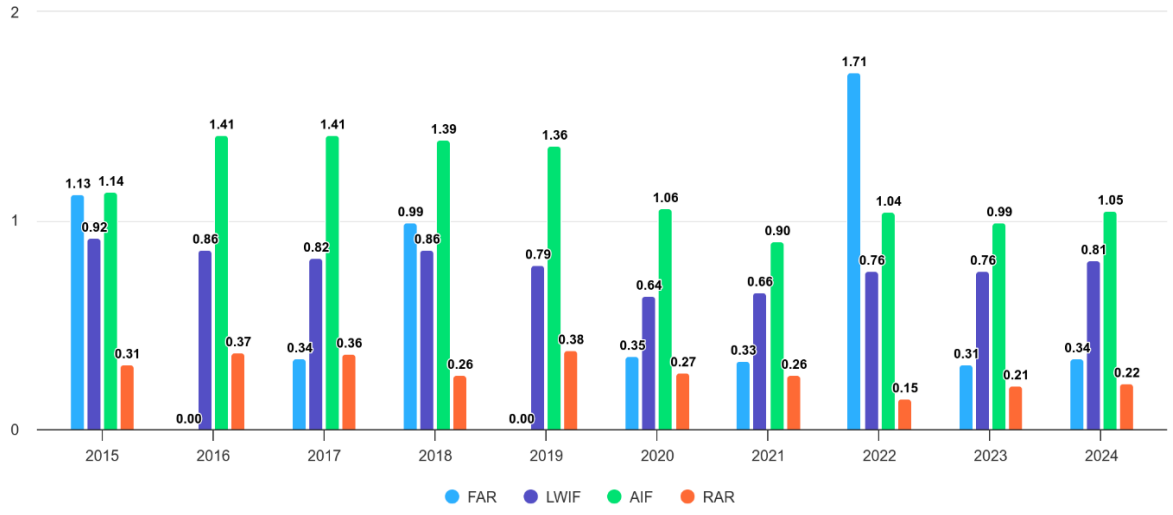


Figure 5C Performance indicators over the last ten years for Marketing



Figures 6A and 6B show the Fatal Accident Rate FAR for own staff versus contractors for Manufacturing (6A) and Marketing (6B). While FAR are in general higher in Manufacturing than in the Marketing, both sectors display a high degree of variability over the last ten years. In particular, Manufacturing contractor FAR in 2024 (3.95) associated with seven fatalities (five explosion or burns categorised incidents, seven a caught in, under or between and a confined space incident category) was the highest Manufacturing FAR recorded in this period. Further effort is required to reduce staff and contractor fatalities to zero.

Figure 6A Manufacturing Fatal Accident Rate (number of fatalities per 100 million hours worked) in the last ten years

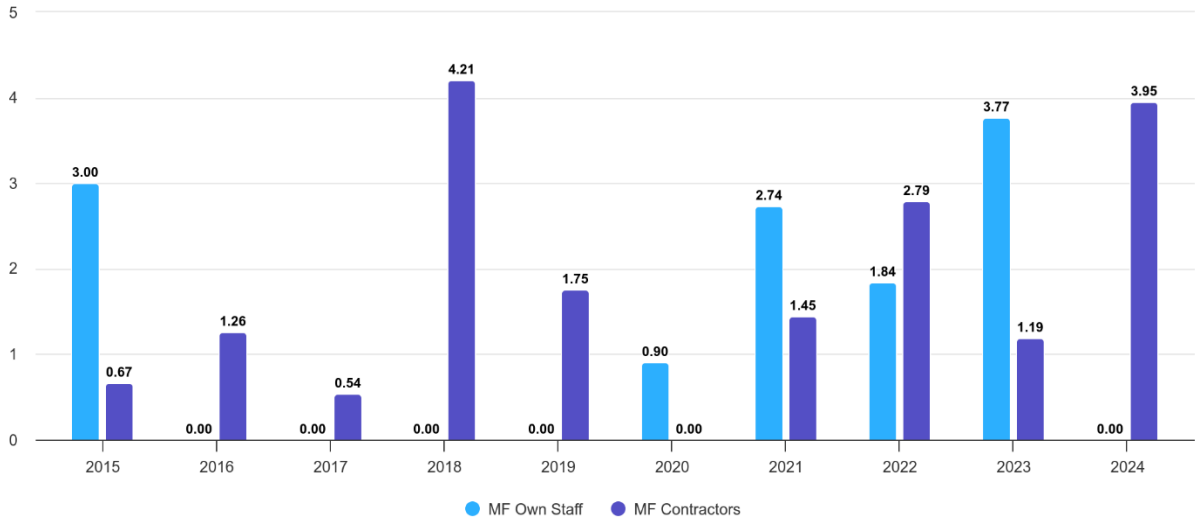


Figure 6B Marketing Fatal Accident Rate (number of fatalities per 100 million hours worked) in the last ten years

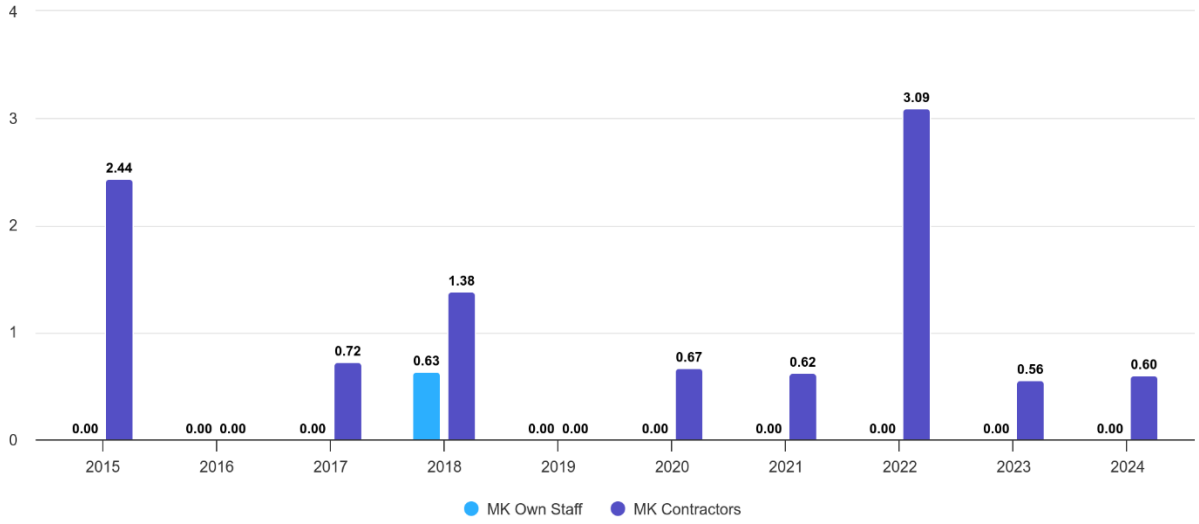
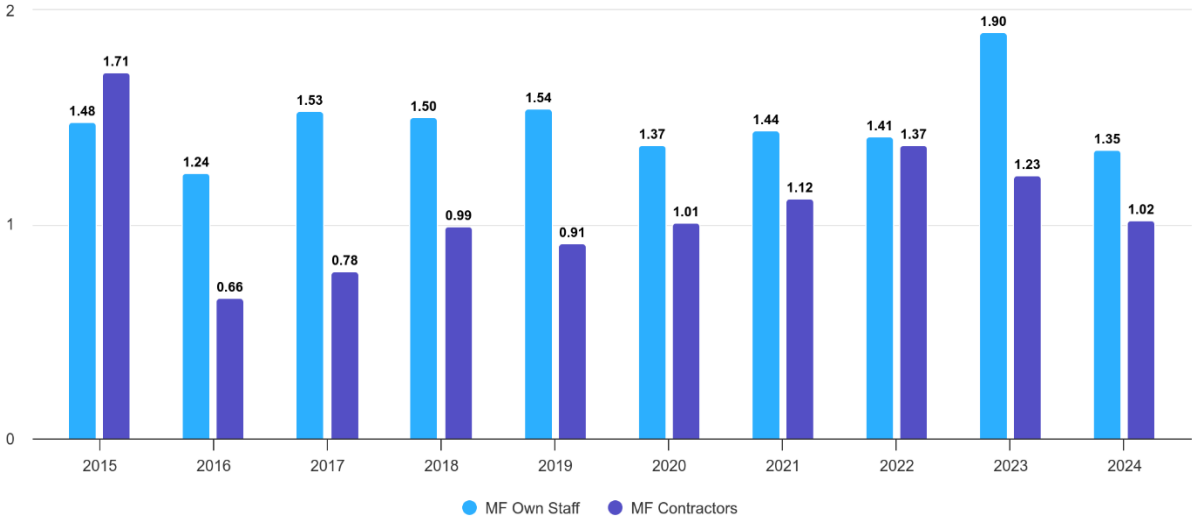


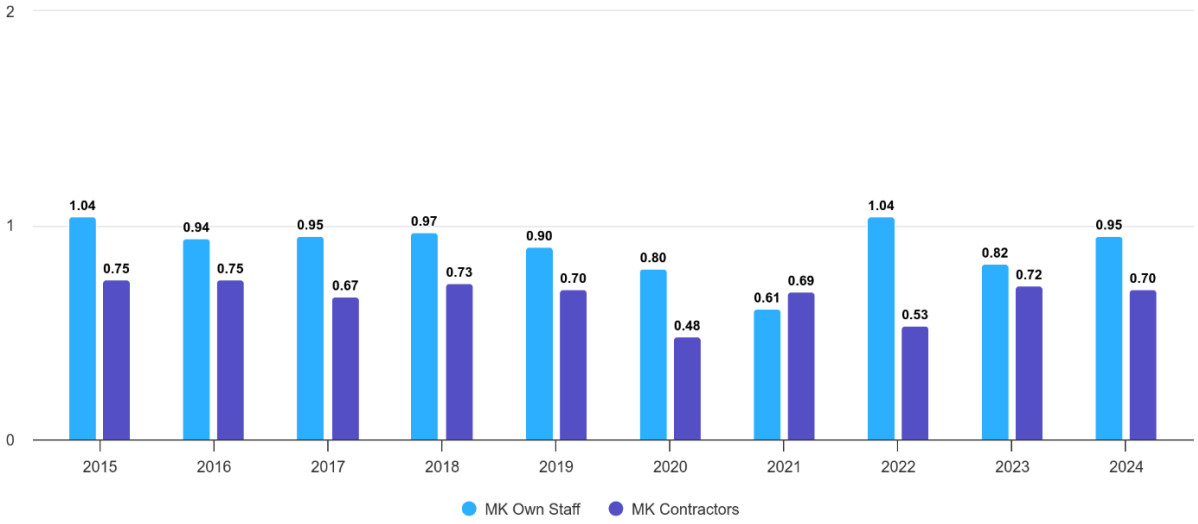
Figure 7A shows Manufacturing LWIF in 2024 to be lower than in 2023 for both own staff and contractors (1.35 and 1.02). However, the 2024 performance is still not as good as in 2016 when these figures were 1.24 and 0.66 respectively.

Figure 7A Manufacturing LWIF in the last ten years



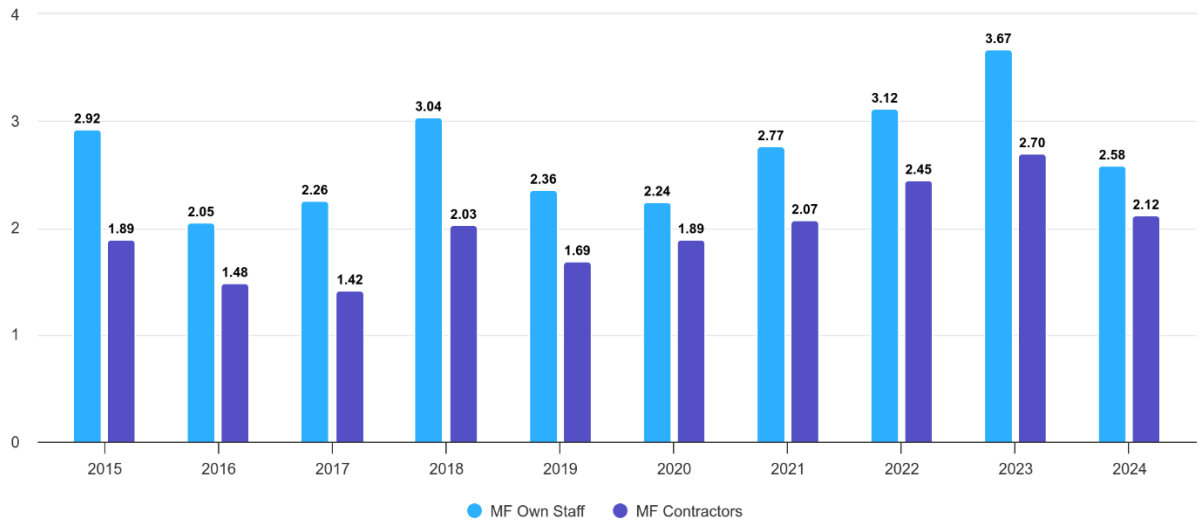
In 2024, Marketing own staff had an LWIF of 0.95 an increase since 2023 (0.82), but within the range recorded in the last ten years (LWIF range 0.61 to 1.04). Marketing contractors LWIF decreased slightly from 0.72 in 2023 to 0.70 in 2024, again the most recent performance within the range recorded in the past ten years (range 0.48 to 0.75; see Figure 7B and Appendix 2 Table A2-4).

Figure 7B Marketing LWIF in the last ten years



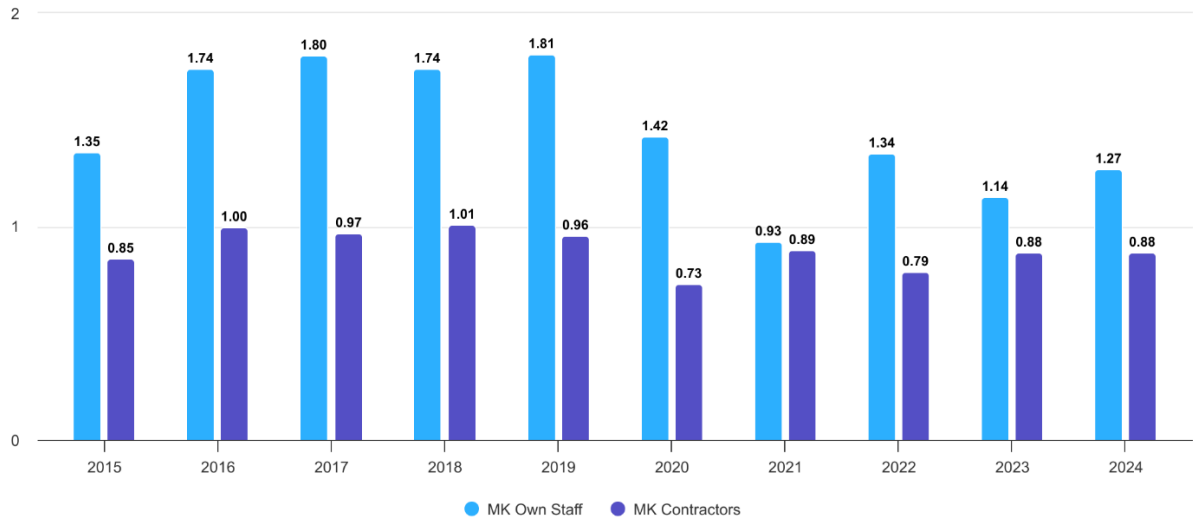
Historical figures (see Appendix 2) suggest that AIF peaked around 1995-97 but this was considered at the time likely the result of improved reporting standards. The downward trend in recorded Manufacturing AIF since 2010 ended in 2016 for staff and in 2017 for contractors. Since then, own staff and contractor AIF in Manufacturing have steadily increased in recent years to 3.67 (the highest in the last ten years) and 2.70 (the highest in the last ten years), respectively in 2023 (Figure 8A). 2024 saw a welcome end to this upward trend with Manufacturing AIF recorded at 2.58 for own staff and 2.12 for contractors.

Figure 8A Manufacturing All Injury Frequency (sum of fatalities, LWI, RWI, MTC per million hours worked) in the last ten years



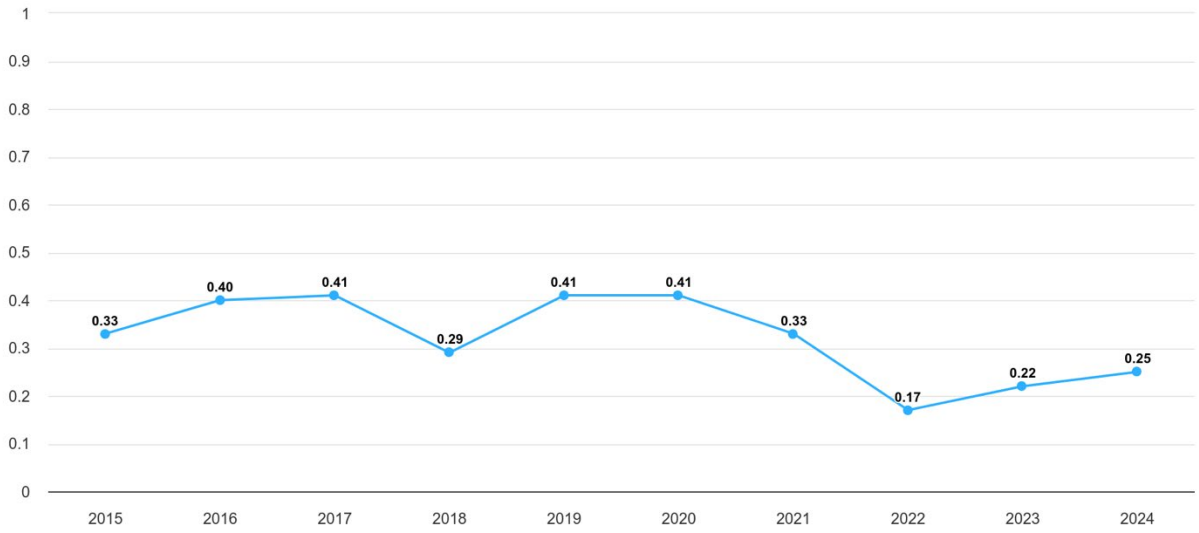
Marketing own staff AIF in 2024 rose to 1.27 from 1.14 in 2023. Marketing contractor AIF remained stable at 0.88 over 2023 and 2024, see Figure 8B and Appendix 2 Tables A2-4 and A2-5.

Figure 8B Marketing All Injury Frequency (sum of fatalities, LWI, RWI, MTC per million hours worked) in the last ten years



There was a slight decrease in the number of road accidents (182 in 2024 compared with 197 in 2023) and a 17% reduction in kilometres driven in 2024 (697 million km in 2024 compared with 840 million km in 2023). The Road Accident Rate continues to increase in 2024 (0.25), since a record low of 0.17 in 2022. Road safety has been a major focus for the industry and a sustained effort is required in order to improve performance. Road accidents mainly occur in the Marketing activity where the bulk of the driving takes place (Marketing 90.4% of total driving distance reported in 2024).

Figure 9 Road Accident Rate in the last ten years - European downstream oil industry



3. PROCESS SAFETY

The American Petroleum Institute (API) has recommended the adoption of Process Safety Performance Indicators (PSPI) in addition to personal safety performance indicators such as those contained in this report. This is intended to better address the potential causes of major process safety incidents, which can have catastrophic effects in the petroleum industry. As from the 2009 Concawe report, the Safety Management Group of Concawe expanded the scope of industry wide safety performance indicators to address process safety, following the reporting guidelines that were developed by the API [31, 32]. The expectation is that expanding the focus to include process safety in conjunction with the personal safety will contribute to a further reduction in serious injury rates in the industry.

The Concawe membership was requested to report their PSPI as defined by the API 754 in 2008 [34] and as further refined in the ANSI/API recommended practice that was published in 2010 [35] and the third edition released in 2021 [32]. The PSPI data that were requested are the number of Tier 1 and 2 Process Safety Events (PSE). Concawe does not explicitly instruct Member Companies as to which material hazard classification option should be used when determining PSE Tier 1 and 2. The Concawe definitions slightly differ from those in the ANSI/API guideline to allow for the use of SI-metric units (kg/m/sec) and for the inclusion of the European Classification and Labelling definitions [36] as an alternative for classifying the PSE.

More detailed consequence related Tier 1 data was collected for the first time in 2023 based on the API 754 consequence classifications. In 2024, this was extended to cover the consequences on Tier 2 events.

As in 2023, 41 companies and joint ventures representing 98% of reporting companies submitted PSE data in 2024 for their Manufacturing operations. Twenty-one companies submitted Marketing PSE data, representing 88% of reporting companies. This is two less companies than last year.

The aggregated 2024 results per sector and for the whole of the European downstream oil industry are shown in Table 8.

Table 8 Aggregated 2024 Process Safety (PS) results for all reporting companies

Sector	Manufacturing	Marketing	Both Sectors
Companies - Total	42	24	24
- PS Reporting	41	21	21
- %	98	88	88
Hours worked Mh	288.7	296.7	585.4
- PS Reporting	288.4 (288.4)	254.9 (254.9)	543.3 (543.3)
- %	100	86	93
T-1 PSE	56	9	65
T-2 PSE	128	11	139
T-1 PSER PSI/Mh reported	0.19	0.04	0.12
T-2 PSER PSI/Mh reported	0.44	0.04	0.26
Total PSER PSI/Mh reported	0.64	0.08	0.38

Of the 24 companies that reported Process Safety Events across both Manufacturing and Marketing in 2024, five companies reported zero Tier 1 events, one company reported zero Tier 2 events and three companies reported zero Tier 1 and Tier 2 events.

Tables 9, 10, 11 and 12 show the quartile ranges for PSE and PSER.

Table 9 Total PSE quartile distribution ranges and average values for each quartile range

Total PSE			
PSE	**Low**	**High**	**Average**
Q1	0	1	0.2
Q2	1	3	1.9
Q3	3	8	5.0
Q4	8	30	15.8

Table 10 Manufacturing PSE quartile distribution ranges and average values for each quartile range

Manufacturing PSE			
PSE	**Low**	**High**	**Average**
Q1	0	1	0.1
Q2	1	3	1.9
Q3	3	7	4.6
Q4	7	25	13.9

Table 11 Total PSER quartile distribution ranges and average values for each quartile range

Total PSER			
PSER	**Low**	**High**	**Average**
Q1	0.00	0.05	0.01
Q2	0.10	0.49	0.30
Q3	0.51	1.04	0.74
Q4	1.04	2.64	1.64

Table 12A Manufacturing PSER quartile distribution ranges and average values for each quartile

Manufacturing PSER			
PSER	**Low**	**High**	**Average**
Q1	0.00	0.12	0.01
Q2	0.18	0.68	0.43
Q3	0.71	1.20	0.93
Q4	1.20	2.64	1.70

Table 12B Marketing PSER quartile distribution ranges and average values for each quartile range

Marketing PSER			
PSER	**Low**	**High**	**Average**
Q1	0.00	0.00	0.00
Q2	0.00	0.00	0.00
Q3	0.00	0.14	0.05
Q4	0.19	0.77	0.43

The total number of Tier 1 and Tier 2 process safety events reported in 2024 at Manufacturing sites where the higher process safety risks exist is 184. This is a decrease of 8% since 2023 (200 events). Figure 10 shows counts of the total reported Manufacturing PSE for the period 2015 to 2024.

Figure 10 Manufacturing Process Safety Events in the last ten years

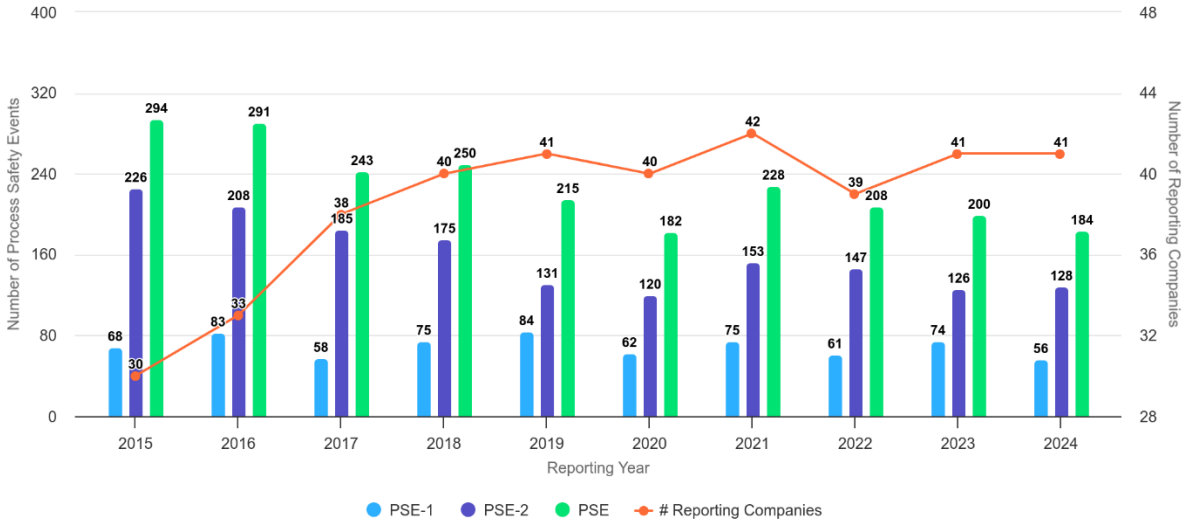
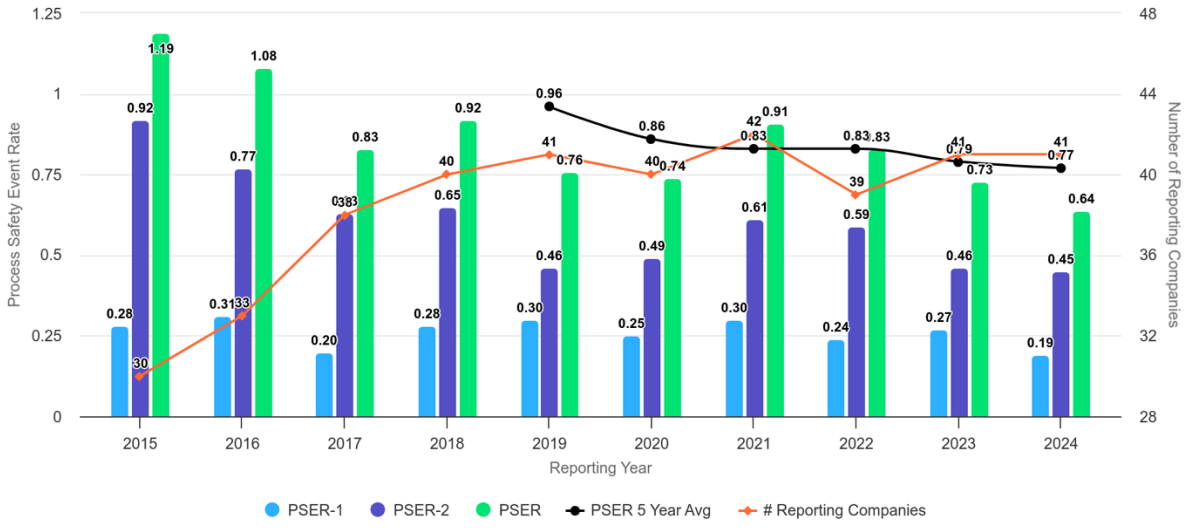


Figure 11 shows the same data as Figure 10 expressed as rates, together with the five-year rolling average PSER.

Figure 11 Manufacturing Process Safety Event Rate in the last ten years



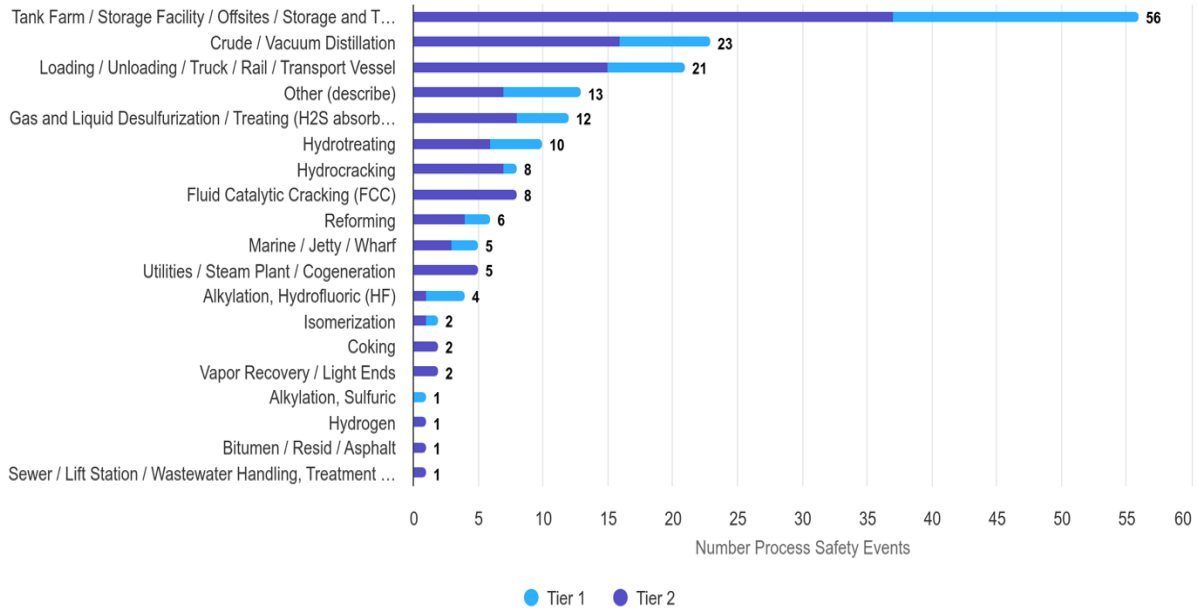
The Manufacturing PSER rate (the total number of Tier 1 and Tier 2 process safety events per million hours reported) in 2024 is 0.64, the lowest recorded values in the past ten years, see Figure 17. Both the 2024 Manufacturing Tier 1 PSE rate (PSER1) of 0.19 and the 2024 Manufacturing Tier 2 PSE rate (PSER2) of 0.45, were also the lowest recorded in the past decade. 2024 therefore saw a slight reduction in the five-year rolling average of Manufacturing PSER and it now stands at the lowest value of 0.77.

The ratio of Tier 1 to Tier 2 Manufacturing process safety events in 2024 is 0.43 (56 Tier 1 and 128 Tier 2). This is a reduction in Tier 1 to Tier 2 ratio since 2023 when it was 0.59 (74 Tier 1 and 126 Tier 2), similar to the ratio of 0.41 in 2022 (61 Tier 1 and 147 Tier 2) and remaining in the range of ratios recorded since 2017 (0.29-0.64).

Information about the circumstances of each Tier 1 and Tier 2 PSE across Manufacturing and Marketing in 2024 are provided in table form in Appendix 4 and in Figures 12 to 16. The following comments relate to the notable responses with regard to refining process, mode of operation, point of release, material released and causal factors.

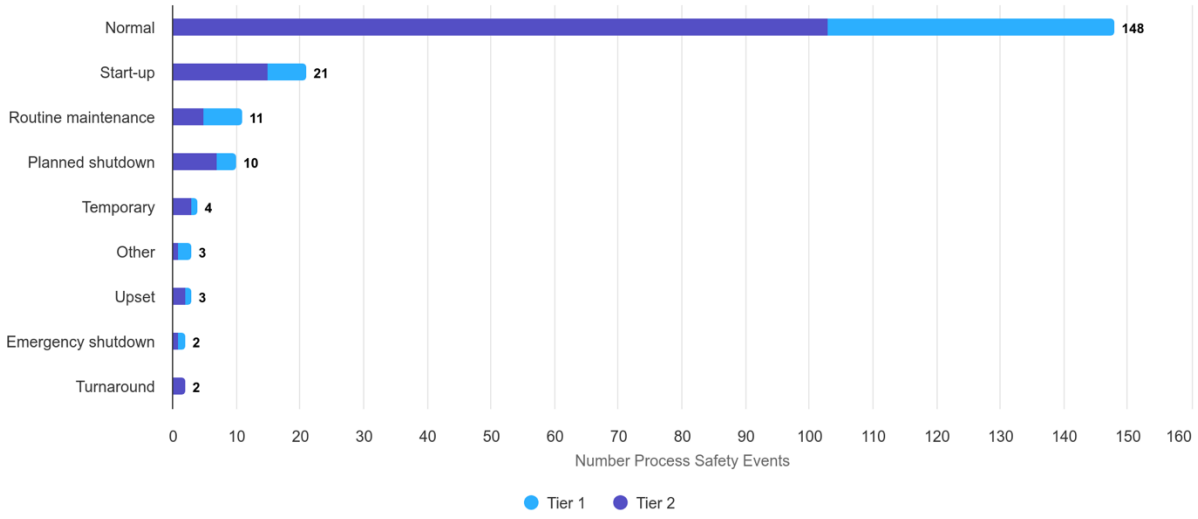
Type of Process: Process Safety Events in 2024 most frequently occurred in Tank Farm / Storage Facility / Offsites / Storage and Transfer Piping (31% of all Process Safety Events, 61% of Tier 1 PSE and 24% of Tier 2 PSE), see Figure 12 and Table A4-1. This finding is in alignment with recorded PSE since 2017. Note that nine PSE Tier 1 and 14 Tier 2 PSE attributed to petrochemical processes are not included in Figure 12 as this refers to refining processes only.

Figure 12 Number of Tier 1 and 2 Process Safety Events (Manufacturing and Marketing) reported in 2024 by Refining Process



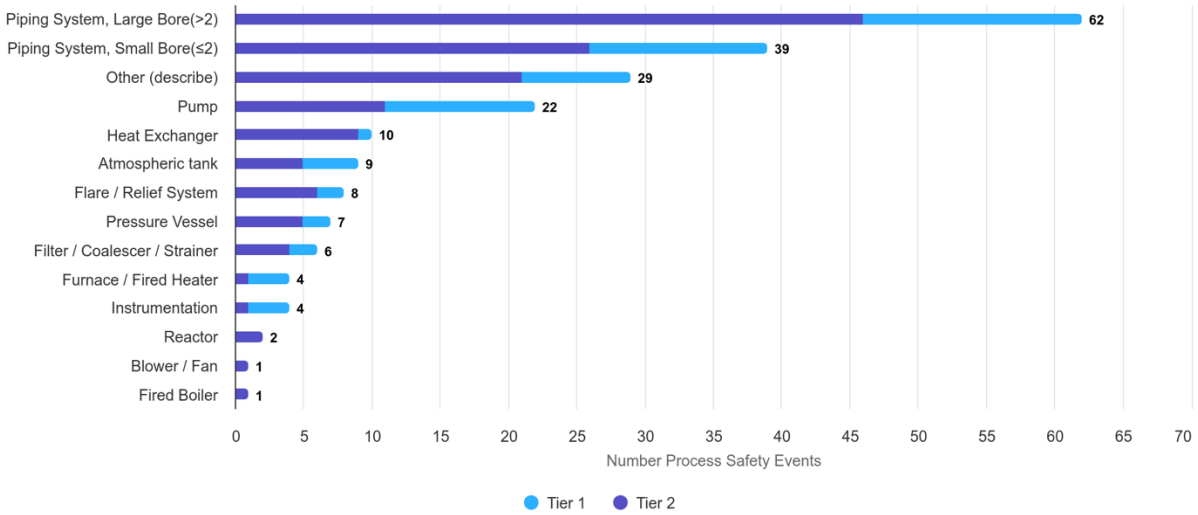
Mode of Operation: Seventy-three percent of Process Safety Events occurred during normal operation, see Figure 13 and Table A4-3. For Tier 1 events, 69% occurred during normal operation and 74% of Tier 2 events occurred during normal operation. The overall percentage is within the range recorded since 2017 (66-78%).

Figure 13 Number of Tier 1 and Tier 2 Process Safety Events (Manufacturing and Marketing) reported in 2024 by mode of operation



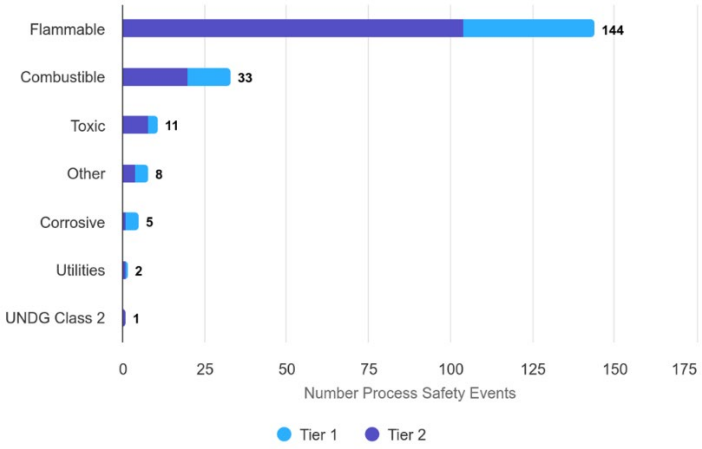
Point of Release: As in previous years, large bore piping remained the main point of release for Process Safety Events (30% of all PSE in 2024, 25% of Tier 1 and 33% of Tier 2 events), see Figure 14 and Table A4-4.

Figure 14 Number of Tier 1 and Tier 2 Process Safety Events (Manufacturing and Marketing) reported in 2024 by point of release



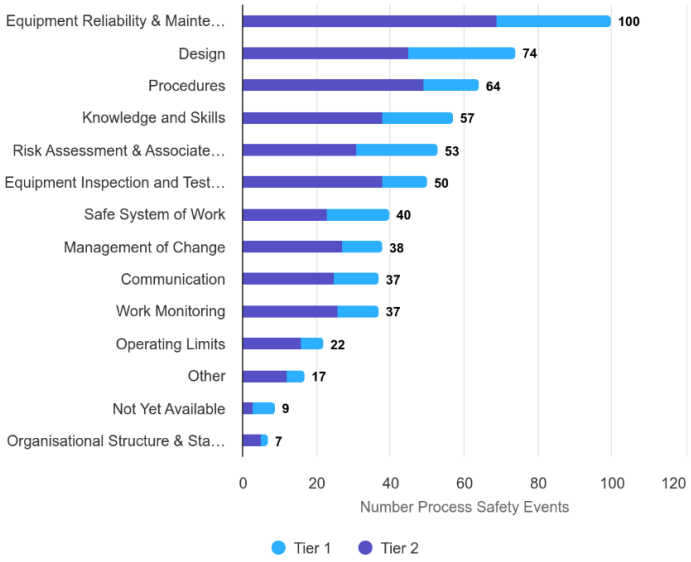
Type of material: Figure 15 and Table A4-5 indicate that flammable material was most frequently released in Process Safety Events in 2024 (71% of all PSE, 62% of Tier 1 and 75% of Tier 2 events). The proportion of total PSE that are reported as flammable material released is slightly higher than in previous years (64% each year since 2020).

Figure 15 Number of Tier 1 and Tier 2 Process Safety Events (Manufacturing and Marketing) reported in 2024 by type of material released



Causal Factors: Equipment Reliability & Maintenance Management (allocated to 56% of events), Design (42%) and Procedures (37%) are the most frequently cited causal factors across all Process Safety Events in 2024, see Figure 16 and Table A4-6. For Tier 1 PSE the most frequently cited causal factors are Equipment Reliability & Maintenance Management (58%), Design (55%) and Risk Assessment & Associated Action Management (46%). Equipment Reliability was cited most frequently as a causal factor of Tier 2 PSE (allocated to 55% of Tier 2 PSE), Procedures (39%) and Design (36%) were also cited.

Figure 16 Number of Tier 1 and Tier 2 Process Safety Events (Manufacturing and Marketing) reported in 2024 by Causal Factor (note that more than one causal factor may be assigned to an event)



Over time, the collection of this information across the industry is expected to result in an evaluation of the main factors contributing to process safety incidents, which will facilitate the development of approaches to address incident prevention.

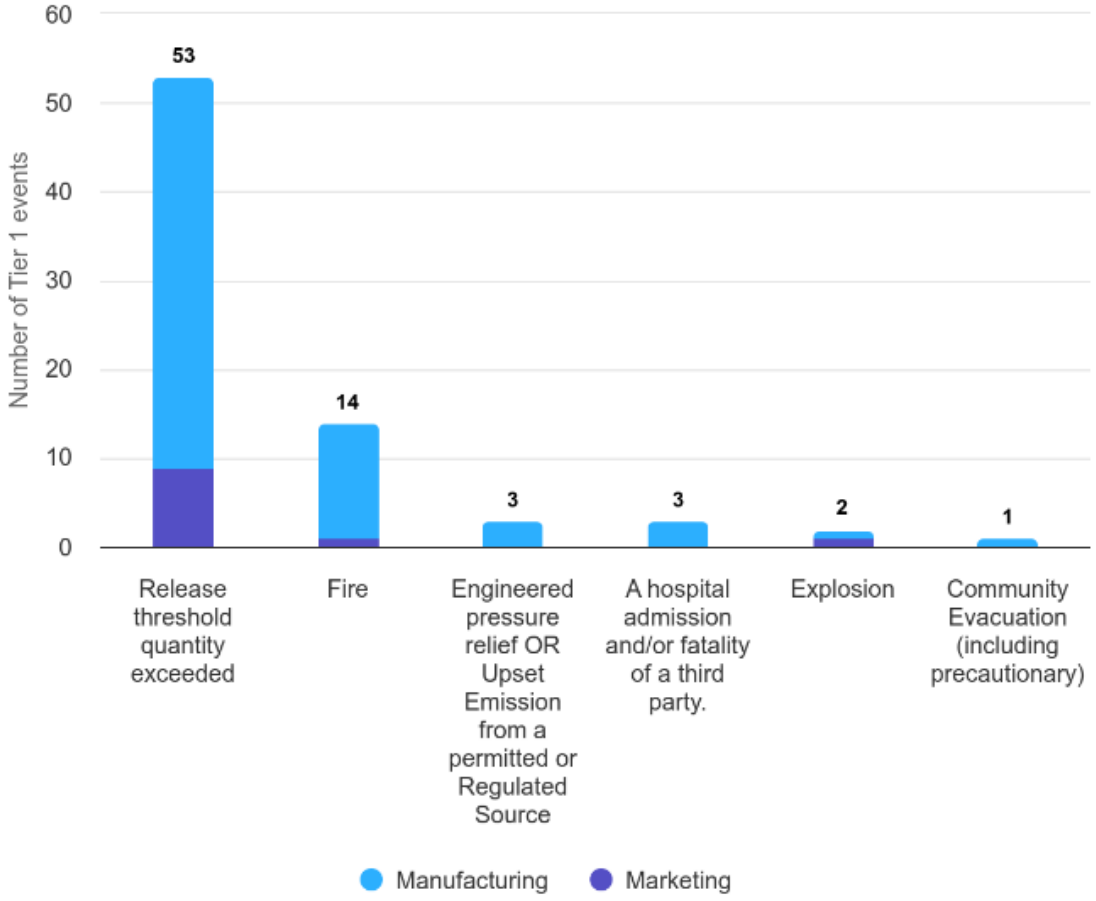
Tier 1 and 2 process safety events are investigated in detail within Member Companies and considerable effort is expended in identifying root causes and responding accordingly. As with fatalities and LWI cases in personal safety, such events are now relatively infrequent occurrences at each site so establishing trends on a site-by-site basis and across the industry is a challenge. To overcome this, many Member Companies now look to Tier 3 process safety events for their site-based improvement activity. The definition of a Tier 3 event is often asset specific and therefore trending such events across the industry is not practicable at this time.

The number of Tier 1 PSEs resulting in LWI or fatality was reported for the first time in 2019. In 2024, eleven Tier 1 PSE (ten Manufacturing Tier 1 events and one Marketing Tier 1 event) were associated with five fatalities (all explosion or burn type incident in one Manufacturing Tier 1 event) and 18 LWI (ten explosion or burn, five exposure, noise, chemical, biological, vibration, one fall from height, one pressure release and one struck by type incidents). Thirteen Manufacturing contractors (five fatalities and eight LWI) and ten staff (all LWI) were involved in these Tier 1 events which represent 17% of all reported Tier 1 events in 2024. This is an increase in number of Tier 1 PSE related-injuries compared with 2023 when 16 Tier 1 events were associated with three Manufacturing fatalities and 14 LWI and in 2022 when twelve Manufacturing Tier 1 events were associated with twelve LWI and two fatalities. “Safe system of work” was the most commonly assigned causal factor (six assignments) for these Tier 1 events leading to LWI. “Knowledge and skills” (assigned to five Tier 1 events), “design” (five events) and “risk assessment and associated action management” (four events) were the next most frequently assigned causal factors. As in previous years, no Tier 2 PSE were reported to be associated with RWI or MTC in 2024.

In 2024 Concawe collected information about the consequences of both Tier 1 and Tier 2 events. For Tier 1 events, the most commonly reported consequence is release threshold quantity exceeded (44 events in Manufacturing and nine events in Marketing). Fire was reported as a consequence in 14 Tier 1 events (13 in Manufacturing), see Figure 17.

Three Tier 1 process safety events were recorded as “upset emission from a permitted or regulated source”. The further consequences recorded for the first event were: "rainout" and “on-site shelter-in-place or on-site non-precautionary evacuation” and “public measures (including precautionary)”. For the second event, only "rainout" was recorded as a further consequence. For the third event, the further consequence was "discharge to a potentially unsafe location".

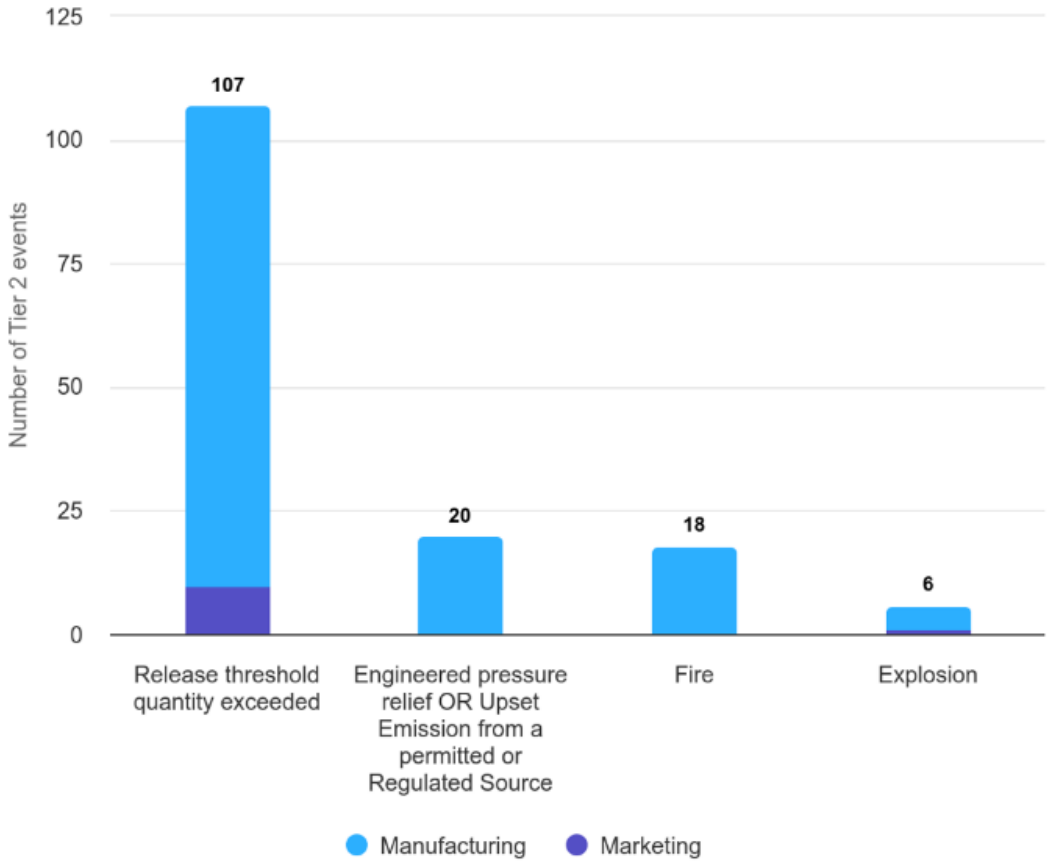
Figure 17. Consequences of Tier 1 process safety events



As with Tier 1 events, the most commonly reported consequence of Tier 2 events was release threshold quantity exceeded (97 events in Manufacturing and ten events in Marketing). Fire was reported as a consequence in 18 Tier 2 events, all in Manufacturing, and explosion was the consequence of five Manufacturing and one Marketing Tier 2 event, see Figure 18.

Twenty Tier 2 process safety events all in Manufacturing were recorded as “upset emission from a permitted or regulated source” or “engineered pressure relief”. The further consequences recorded for these events were: "rainout" (18 events), "discharge to a potentially unsafe location" (seven events), “on-site shelter-in-place or on-site non-precautionary evacuation” (one event) and “public measures (including precautionary)” (one event).

Figure 18. Consequences of Tier 2 process safety events



4. COMPARISON WITH OTHER SECTORS

Most of the safety performance indicators used in the oil industry have also been adopted in many other sectors so that meaningful comparisons are possible, see Table 13. The IOGP statistics cover the oil and gas exploration and production activities of participating IOGP Member Companies [37]. In comparison with IOGP statistics for European onshore, Concawe recorded a 1.37 fatality rate, a 0.99 LWIF and 1.66 AIF. These Concawe rates include Marketing activities, which are typically not represented in the IOGP data.

Table 13 Comparison of oil industry safety performance (own staff and contractors)

	Concawe 2024	International Association of Oil & Gas Producers IOGP 2024	
		Europe Onshore	Europe Onshore & Offshore
FAR	1.37	0.00	0.43
LTIF	0.99	0.56	0.91
AIF*	1.66	1.05	2.06

FAR is per 100 million work hours
LTIF and AIF per million work hours
*AIF reported as Total Recordable Injury Rate (TRIR) by IOGP (number of recordable injuries (fatalities + LWI + RWI + MTC) per million hours worked

In 2023, the rate of job-related nonfatal injuries and illnesses for U.S. Oil and Natural Gas petroleum refinery workers was 0.5 per 100 full-time workers [38]. Note this figure does not refer to lost workdays. Note also that this figure is based upon 200,000 work hours as a denominator compared with 1,000,000 work hours used by Concawe. The Concawe 2023 AIF expressed per 200,000 work hours is 0.39.

The US Refining Tier 1 and 2 PSE rates recorded by API for 2024 are 0.0654 and 0.1699, respectively [39]. The Concawe rates are 0.024 and 0.052 when expressed per 200,000 work hours.

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APPENDIX 1 EUROPEAN OIL INDUSTRY STATISTICS DEFINITIONS AND GUIDING NOTES

Several safety performance indicators have become "standard" in the oil industry and in many other industry sectors. They are mostly expressed in terms of frequency of the incident with the number of hours worked being the common denominator. This taken to be representative of the overall level of activity. Such parameters have the advantage of relying on a small number of straightforward inputs allowing meaningful statistical analysis even when the data sets are incomplete. The "standard" performance indicators considered in this report are FAR, LWIF, LWIS, RAR, AIF, and PSE(R) [31, 32]. There are subtle differences in the way these parameters are used, collected, and reported by different companies. The features, relevance and reliability of each indicator are therefore discussed below in the guidance section.

Abbreviations and Definitions

1.	AIF (TRCF)	All Injury Frequency (Total Recordable Case Frequency) which is calculated from the sum of fatalities, LWIs, RWIs and MTCs divided by number of hours worked expressed in millions of hours.
2.	COCO	Company owned and operated sites.
3.	CODO	Company owned; Dealer operated sites.
4.	Contractor	A company or an individual engaged to carry out specified work under a contract on company premises (incl. retail stations and office buildings). Off-site contractor activities are considered only for transportation and loading/unloading of hydrocarbons and other products performed on behalf of the company.
5.	Distance travelled	This is the distance, expressed in millions of kilometres, covered by company owned delivery vehicles, contractor delivery vehicles and company cars whether leased or owned. It should also include kilometres travelled in employee's cars when on company business.
6.	DOCO	Dealer owned; Company operated sites.
7.	DODO	Dealer owned and operated sites.
8.	FAR	Fatal Accident rate is calculated from the number of fatalities divided by the number of hours worked expressed in hundred million.
9.	Fatality	This is a death resulting from a work-related injury where the injured person dies within twelve months of the injury.
10.	Hours worked	Hours worked by employees and contractors. Estimates should be used where contractor data is not available.

11. LOPC	Loss of Primary Containment (LOPC) is an unplanned or uncontrolled release of any material from primary containment, including non-toxic and non-flammable materials (e.g., steam, hot condensate, nitrogen, compressed CO_2, or compressed air).
12. LTIF	Lost Time Injury Frequency is calculated from the sum of fatalities and LWI divided by the number of hours worked expressed in millions
13. 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.
14. LWIF	LWI Frequency is calculated from the number of LWIs divided by the number of hours worked expressed in millions.
15. LWIS	LWI Severity is the total number of days lost as a result of LWIs divided by the number of LWIs.
16. Marketing	Marketing covers all non-Manufacturing activities including distribution and / or transport, Retail Operation which comprises the selling of products to the public at Company owned and operated sites (COCO), Company owned, Dealer operated sites (CODO), Dealer owned, Company operated sites (DOCO) and Dealer owned and operated sites (DODO) as well as "Head Office" personnel and other Marketing activities. COCO and DOCO retail operations are likely to be operated by staff and/or contractors while CODO are likely to be operated by contractors. DODO retail operations are not usually operated by Company staff or contractors and hence their hours are not usually included.
17. MTC	Medical Treatment Case is a work-related personal injury which requires treatment by a medical professional and does not result in time away from work or restriction in duties. It excludes all cases involving first aid treatments as specified in OSHA 1904.7(b) (5) even if these treatments are performed by a medical professional.
18. RAR	Road Accident Rate is calculated from the number of accidents divided by the kilometres travelled expressed in millions.
19. PSE	A Process Safety Event is an unplanned or uncontrolled LOPC. The severity of the PSE is defined by the consequences of the LOPC.
20. PSER	Process Safety Event Rate (PSER) is calculated as the number of PSE (Tier 1, Tier 2 or Total) divided by the total number of hours worked (including contractor hours) expressed in millions.
21. RA Road Accidents	Any incident involving any of the vehicles described above that occurs on or off-road resulting in a recordable injury (fatality, LTI, MTI, RWI), asset damage greater than EUR 2.500 or loss of containment greater than a Tier 2 Process Safety incident. It excludes all accidents where the vehicle was legally parked, the journey to or from the driver's home and normal place of work, minor wear and tear, vandalism, or theft. On-site incidents involving cars or trucks should be covered in the site statistics.

22. 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.
23. Tier 1 PSE	A Tier 1 Process Safety Event (T-1 PSE) is a loss of primary containment (LOPC) with the greatest consequence. Refer to the definitions in API (2010) ANSI/API Recommended practice 754 for further details. Note Concawe has modified the unit and costs in API RP754 to reflect SI units and € costs. See previous Concawe safety reports [18-28] for further details
24. Tier 2 PSE	A Tier 2 Process Safety Event (T-2 PSE) is a LOPC with lesser consequence. Refer to the definitions in API (2010) ANSI/API Recommended practice 754 for further details. Note Concawe has modified the unit and costs in API RP 754 to reflect SI units and € costs. See previous Concawe safety reports [18-30] for further details
25. Total days lost	The number of calendar days lost through LWIs counting from the day after the injury occurred.

Concawe Categorization of causes for Fatalities and LWIs

Previous Category	Current Concawe Incident Category	Description
Road accident	Road accident	Incidents involving motorised vehicles designed for transporting people and goods over land e.g., cars, buses, and trucks. Pedestrians struck by a vehicle are classes as road accidents. Fatal incidents from a mobile crane would only be road accidents if the crane were being moved between locations.
Height/Falls	Falls from height	A person falls from one level to another.
	Staff hit by falling objects	Incidents where injury results from being hit by flying or falling objects.
	Slips & trips (same height)	Slips, trips, and falls caused by falling over or onto something at the same height.
Burn/electrical	Explosion or burns	Burns or other effects of fires, explosions, and extremes of temperature. "Explosion" means a rapid combustion not an overpressure.
	Exposure electrical	Exposure to electrical shock or electrical burns etc.
Confined space entry	Confined Space	Incidents which occur within a confined space. Spaces are considered "confined" because their configurations hinder the activities of employees who must enter, work in, and exit them. Confined spaces include, but are not limited to underground vaults, tanks, storage bins, manholes, pits, silos, process vessels and pipelines.
Construction / Maintenance & Other	Assault or violent act	Intentional attempt, threat, or act of bodily injury by a person or persons or by violent harmful actions of unknown intent, includes intentional acts of damage to property.
	Water related, drowning	Incidents/events in which water played a significant role including drowning.
	Cut, puncture, scrape	Abrasions, scratches, and wounds that penetrate the skin.
	Struck by	Incidents/events where injury results from being hit by moving equipment or machinery, or by moving objects. Also includes vehicle incidents where the vehicle is struck by or struck against another object.
	Exposure, noise, chemical, biological, vibration	Exposure to noise, chemical substances (including asphyxiation due to lack of oxygen not associated with a confined space), hazardous biological material, vibration, or radiation.
	Caught in, under or between	Injury where injured person is crushed or similarly injured between machinery moving parts or other objects, caught between rolling tubulars or objects being moved, crushed between a ship and a dock, or similar incidents. Also includes vehicle incidents involving a rollover.
	Overexertion, strain	Physical overexertion, e.g., muscle strain.
	Pressure release	Failure of or release of gas, liquid or object from a pressurised system.
	Other	Used to specify where an incident cannot be logically classed under any other category.

Causal Factors

Multiple causal factors can be assigned to a single incident/event.

Management of Change: Issues related to the management of change (MOC) process including: identification of a change; identification and risk assessment of hazards associated with the change; timely execution; action item follow-up; stakeholder engagement and review team composition. Includes changes to plant, equipment and processes as well as organisational changes. Includes management of temporary MOCs and their extensions.

Communication: Issues related to verbal, written or other forms of communication between different parties for example shift handover, maintenance handback, or critical communications related to key controls. Not included in this category are documents such as policies, permanent procedures, standards, or specifications.

Design: Incorrect or lack of application of codes and standards. Specification, purchase, fabrication, materials, construction or installation not consistent with design. Includes design deficiencies that make operations, maintenance, inspection or emergency response tasks more difficult to complete e.g., poor ergonomic design, poor accessibility, Human-Machine Interface (HMI) Less Than Adequate (LTA), poor layout, signage and labelling LTA.

Equipment Reliability & Maintenance Management: Maintenance, repair and testing issues including program requirements, program execution and standards applied. This could include: Maintenance Less Than Adequate (LTA), Repair LTA, Testing LTA, Premature Failure due to Defective Parts or Vibration, etc. Includes cases where equipment condition or unavailability influenced the performance of critical tasks.

Equipment Inspection and Testing: Issues related to equipment inspection and maintenance programs to detect or monitor failure mechanisms, including Safety Critical Equipment (SCE). Includes cases where inspections are not performed in a timely manner (or at all), incorrect technique or location, inadequate frequency, poor record keeping. If no inspection or testing was in place, chose Equipment Reliability.

Organisational Structure & Staffing: Issues related to the way a facility is staffed in terms of numbers of personnel, team organisation, reporting lines, shift system, roles and responsibilities. Includes issues related to workload, pressure, duty rotas, worker fatigue and impairment due to illness. Note that pressure can be caused by the individual themselves, by a peer or group of peers, a leader, or the organisation.

Knowledge and Skills: Issues related to personnel not having sufficient understanding of a process, equipment or hazard to manage the risk. Some of the programs included in this category include: worker recruitment/selection, worker training, worker qualification, testing and skill verification. Includes knowledge, skills and experience. This factor also includes extensive knowledge, skills and experience resulting in risk blindness (missing hazards), a lack of focus, autopilot behaviour or disrespect of risk.

Operating Limits: Issues related to the process for establishing, monitoring and deviating from operating limits established to adhere to design requirements, control metallurgical degradation and ensure safe operation. Includes limits not being specified or applied correctly, and lack of process alarms.

Procedures: Issues related to appropriate procedures/documents not being utilized, available, complete, accurate or correctly executed. Procedures included in this category may include operating procedures, maintenance procedures, emergency procedures, security procedures and procedures related to shutdowns, commissioning, start-ups, etc. Includes contractor procedures

where appropriate. Not included in this category are safe work procedures such as hot work permitting, confined space entry, hazardous energy isolation, etc. which should be classified under Safe System of Work.

Risk Assessment & Associated Action Management: Issues related to a failure to adequately choose a risk assessment methodology, perform a risk assessment, identify hazards, investigate incidents, apply risk criteria or close action items. Some of the risk assessment processes in this category include: process hazards analysis, reliability-centered maintenance assessments, risk-based inspection analysis, incident investigation, quantitative risk analysis, critical task analysis and safety inspections.

Safe System of Work: Issues related to safe work practices or procedures such as permit to work, hot work permitting, confined space entry, hazardous energy isolation, breaking containment, job safety analysis, blinding practices, lock out/tag out (LOTO) protocols, override management, etc.

Work Monitoring: Issues related to supervision of personnel such as oversight of work and auditing to ensure quality, effective scheduling, establishing priorities or correcting behaviours/enforcing rules. Includes housekeeping.

Other: Causal factor known but not described by any of the above.

Not Yet Available: Investigation not yet complete therefore no known causal factors.

Permit to work (PTW) reporting

Operational incidents are reported according to one of the following types:

Specific work permit required, e.g., hot work, confined space

Clearance /procedure / work instruction required, no formal risk assessment
e.g., driving in hazardous area, sampling, loading / unloading tank truck

No permit to work and no clearance / work procedure required, e.g., walking, cycling

Guidance

Fatalities and Fatal Accident Rate (FAR)	Because of their very low numbers, fatalities and, therefore, FAR are not necessarily reliable indicators of the safety performance of a Company or Industry. A single accident can produce several fatalities and cause an abnormally high result in the indicator for a certain year. Conversely, the lack of fatalities is certainly no guarantee of a safe operation. The safety pyramid of H.W. Heinrich [40] implies that for every fatality there have been many other incidents with less serious injury outcomes. These less severe incidents provide the opportunities to address equipment, standards, training, attitudes, and practices that may prevent both the less, and the more serious incidents.
LWI Frequency (LWIF) and LWI Severity (LWIS)	The LWIF is the most common indicator in the oil and other industries and has been in use for many years. It is now common practice to include not only a company's own staff but also contractors in the statistics and this is done almost universally in the oil industry. All companies without exception collect employee LWIF data for at least their own staff and this is, therefore, the most frequently used and reliable indicator. Not all companies keep track of the number of lost days and, in some cases, the numbers are skewed by local interpretation. The overall LWIS reported is calculated taking account only of those companies that report the data. It should also be noted that the difference in interpretation of days lost results in a wide variation in the results and hence trends are difficult to identify.
All Injury Frequency (AIF)	As LWIF figures become progressively lower they appear to reach a plateau. Companies that have achieved very low LWIF levels may need a more meaningful indicator to monitor trends and detect improvements or deterioration of performance. AIF would provide such an indicator, since it records fatalities, RWI and MTC in addition to LWIs. Although it is still less widely used than LWIF, reporting improves year by year with more companies including this indicator into their performance reporting. 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 available are taken into account in the calculation of the overall AIF figure.

Road Accident Rate (RAR)

It is no surprise that, since road accidents remain a cause of both fatalities and LWI in the oil industry, a number of companies have chosen to calculate and monitor these separately outside of their impact on the overall statistics. This allows some extra focus on this key area of concern. The separate road accident data is still incomplete and the overall figures should therefore be considered as indicative only. For this reason, Concawe only reports RAR data for the whole downstream industry and all personnel involved (own staff and contractors), since the level of reporting is insufficient for the segmented data to be analysed. It must be noted, however, that the vast majority of road accidents occur in distribution and retail activities where both sales employees and truck drivers travel longer distances.

APPENDIX 2 HISTORICAL DATA 1993 TO 2024

Table A2-1 Performance indicators - All sectors

Year	Fatalities	FAR	AIF	LWIF	LWIS	RAR	Million Hours Reported	Distance Travelled Million km
1993	18	5.04	7.88	4.66	27	3.8	357	252
1994	19	5.36	7.42	3.96	25	3.1	354.8	227
1995	13	3.55	11.15	4.64	24	2.6	366.4	627
1996	14	3.33	10.72	4.71	19	2.0	420.6	705
1997	15	3.39	11.4	4.57	23	1.9	442	720
1998	12	2.55	9.91	4.48	22	1.5	469.7	369
1999	8	1.78	9.45	4.27	21	0.9	448.5	474
2000	13	2.74	8.78	4.25	25	0.9	475.1	1084
2001	14	2.83	9.53	4.28	24	0.8	495.5	1112
2002	16	3.33	6.92	3.91	23	1.1	480	1123
2003	22	4.14	6.34	3.22	30	1.0	531.6	1459
2004	12	2.34	6.28	3.17	33	1.0	513.3	1016
2005	11	1.89	4.47	2.57	35	0.9	581.7	1364
2006	7	1.47	4.62	2.48	30	1.6	477.5	557
2007	15	2.79	4.00	1.88	35	0.9	538.2	1069
2008	11	1.98	3.69	1.71	28	0.9	555.5	1004
2009	11	2.02	4.00	1.83	30	0.8	545.3	1036
2010	14	2.68	5.00	1.87	30	0.6	522.2	1011
2011	11	1.91	3.48	1.48	42	0.5	577.2	1084
2012	13	2.41	2.92	1.33	29	0.4	538.9	1164
2013	6	1.11	2.68	1.20	34	0.5	540.5	1178
2014	7	1.30	2.03	1.08	43	0.3	539.3	1271
2015	7	1.26	1.69	1.25	29	0.3	554.7	1111
2016	2	0.36	1.56	0.87	34	0.4	559.6	833
2017	2	0.34	1.57	0.94	34	0.4	594.3	953
2018	10	1.73	1.89	1.02	35	0.3	579.1	978
2019	3	0.49	1.65	0.97	35	0.4	617.6	818
2020	2	0.37	1.52	0.88	35	0.4	542.5	576
2021	6	1.08	1.57	0.93	36	0.3	556.4	593
2022	11	2.02	1.82	1.05	31	0.2	544.9	1164
2023	7	1.17*	1.95*	1.10	40	0.2	595.7*	840
2024	**8**	**1.37**	**1.66**	**0.98**	**39**	**0.3**	**585.2**	**697**

*2023 data provided in this table have been revised since publication of the Concawe 2023 report [29]. This includes an increase in the originally reported work hours for 2023 from 592.9 million to 595.7 million in this report which impacts certain calculated rates.

Table A2-2 Performance indicators – Manufacturing Staff

Year	Fatalities	FAR	AIF	LWIF	LWIS
1993	2	2.67	12.71	3.84	50
1994	3	3.98	10.24	2.93	29
1995	1	1.08	12.23	3.58	29
1996	0	0	14.83	3.94	28
1997	2	1.76	15.09	4.78	24
1998	1	0.92	10.76	4.7	20
1999	0	0	12.46	4.45	16
2000	0	0	13.89	3.14	30
2001	5	5.56	9.91	3.35	27
2002	4	5.44	9.67	2.95	28
2003	2	2.5	8.38	2.9	38
2004	3	3.3	6.63	1.87	51
2005	0	0	5.11	1.83	44
2006	0	0	5.06	1.98	28
2007	0	0	3.93	1.78	33
2008	1	0.83	3.69	1.51	32
2009	3	2.63	5.60	2.20	34
2010	1	1.02	8.00	2.27	28
2011	1	0.86	5.70	1.69	76
2012	0	0.00	4.51	1.41	32
2013	0	0.00	3.65	1.29	33
2014	1	0.92	2.96	1.38	44
2015	3	3.00	2.92	1.48	41
2016	0	0.00	2.05	1.24	34
2017	0	0.00	2.26	1.53	35
2018	0	0.00	3.04	1.50	42
2019	0	0.00	2.36	1.54	32
2020	1	0.90	2.24	1.37	39
2021	3	2.74	2.77	1.44	39
2022	2	1.84	3.12	1.41	36
2023	4	3.77	3.67	1.90	39
2024	**0**	**0.00**	**2.58**	**1.35**	**38**

Table A2-3 Performance indicators – Manufacturing Contractors

Year	Fatalities	FAR	AIF	LWIF	LWIS
1993	8	20.68	13.11	5.35	20
1994	1	2.63	12.73	4.57	36
1995	0	0	12.57	7.39	24
1996	3	5.03	18.66	8.26	19
1997	1	1.78	28.45	8.84	23
1998	0	0	25.08	9.32	24
1999	2	3.53	24.47	8.14	19
2000	2	3.07	20.96	8	23
2001	3	4.09	18.13	6.89	24
2002	6	9.89	14.34	6.31	23
2003	6	8.41	12.78	4.55	42
2004	5	6.16	10.23	3.54	30
2005	3	3.36	8.02	3.07	33
2006	2	2.07	6.82	2.88	31
2007	8	7.01	6.2	2.3	25
2008	4	3.09	5.28	1.81	26
2009	6	4.75	6.07	2.21	33
2010	10	7.61	8.84	2.13	32
2011	9	6.59	5.51	1.70	34
2012	7	5.17	4.30	1.48	26
2013	4	3.46	3.92	1.22	32
2014	5	3.91	2.97	1.13	46
2015	1	0.67	1.89	1.71	18
2016	2	1.26	1.48	0.66	42
2017	1	0.54	1.42	0.78	36
2018	7	4.21	2.03	0.99	37
2019	3	1.75	1.69	0.91	40
2020	0	0.00	1.89	1.01	34
2021	2	1.45	2.07	1.12	38
2022	4	2.79	2.45	1.37	29
2023	2	1.19	2.70	1.23	48
2024	**7**	**3.95**	**2.12**	**1.02**	**48**

Table A2-4 Performance indicators – Marketing Staff

Year	Fatalities	FAR	AIF	LWIF	LWIS
1993	2	1.20	6.07	5.68	23
1994	13	8.07	5.95	5.16	21
1995	1	0.62	12.0	4.93	22
1996	2	1.11	8.64	4.89	18
1997	4	2.40	8.62	4.61	23
1998	3	1.64	7.73	3.41	21
1999	2	1.12	6.50	3.67	23
2000	0	0.00	4.71	3.68	29
2001	3	1.42	6.68	3.63	27
2002	4	2.10	5.66	3.61	22
2003	2	0.98	5.73	3.33	19
2004	0	0.00	6.62	3.90	25
2005	3	1.40	4.17	2.98	36
2006	0	0.00	3.73	2.63	23
2007	2	1.18	3.98	2.12	31
2008	1	0.62	4.04	2.13	27
2009	1	0.62	3.28	1.75	22
2010	0	0.00	2.43	1.81	26
2011	1	0.48	2.17	1.43	32
2012	2	1.17	1.96	1.42	29
2013	0	0.00	2.18	1.33	34
2014	0	0.00	1.52	0.99	43
2015	0	0.00	1.35	1.04	40
2016	0	0.00	1.74	0.94	25
2017	0	0.00	1.80	0.95	36
2018	1	0.63	1.74	0.97	31
2019	0	0.00	1.81	0.90	42
2020	0	0.00	1.42	0.80	29
2021	0	0.00	0.93	0.61	41
2022	0	0.00	1.34	1.04	26
2023*	0	0.00	1.14*	0.82*	38
2024	**0**	**0.00**	**1.27**	**0.95**	**29**

*2023 data provided in this table have been revised since publication of the Concawe 2023 report [29]. This includes an increase in the originally reported work hours for Marketing staff which impacts the calculated rates.

Table A2-5 Performance indicators – Marketing Contractors

Year	Fatalities	FAR	AIF	LWIF	LWIS
1993	6	7.83	3.66	2.90	21
1994	2	2.49	4.34	2.21	25
1995	11	18.16	7.03	3.09	21
1996	9	11.85	3.54	2.57	11
1997	8	7.60	3.37	2.01	20
1998	8	6.79	5.87	3.5	19
1999	4	3.30	5.60	3.23	18
2000	11	9.66	2.86	4.06	17
2001	3	2.48	8.2	4.52	17
2002	2	1.29	4.41	3.79	20
2003	12	6.82	3.40	2.68	31
2004	4	2.77	3.33	2.79	43
2005	5	2.73	2.61	2.28	28
2006	5	4.58	3.79	2.32	19
2007	5	3.94	2.35	1.39	22
2008	5	3.46	1.88	1.31	20
2009	1	0.71	1.64	1.27	28
2010	3	2.53	1.67	1.33	36
2011	0	0.00	1.23	1.08	19
2012	4	3.63	1.23	0.95	29
2013	2	1.70	1.21	0.87	37
2014	1	0.76	1.00	0.89	37
2015	3	2.44	0.85	0.75	25
2016	0	0.00	1.00	0.75	37
2017	1	0.72	0.97	0.67	28
2018	2	1.38	1.01	0.73	28
2019	0	0.00	0.96	0.70	25
2020	1	0.67	0.73	0.48	35
2021	1	0.62	0.89	0.69	24
2022	5	3.09	0.79	0.53	33
2023	1	0.56	0.88	0.72	30
2024	**1**	**0.60**	**0.88**	**0.70**	**34**

Table A2-6 LWI causes 2018-2024 – Staff and Contractors in both Manufacturing and Marketing

		LWI 2024				2023	2022	2021	2020
Categories		**Manufacturing**	**Marketing**	**Combined**	**%**	**%**	**%**	**%**	**%**
Road Accident	Road Accident	12	11	23	4	3.5	2.6	3.1	3.4
Height/Falls	Falls from height	37	17	54	9.4	8.1	7.4	7.8	5.5
	Staff hit by falling objects	6	5	11	1.9	2.7	2.3	2.1	1.9
	Slips & trips (same height)	92	79	171	29.9	33.0	27.1	26.9	29.2
Burn/ Electrical	Explosion or burns	25	13	38	6.6	6.9	5.1	6.0	6.1
	Exposure electrical	0	0	0	0.0	1.2	0.5	1.0	0.4
Confined Space	Confined Space	0	0	0	0.0	0.2	0.2	0.8	0.4
Other Causes	Assault or violent act	0	11	11	1.9	1.5	0.9	1.6	1.1
	Water related, drowning	3	0	3	0.5	0.0	0.2	0.2	0.0
	Cut, puncture, scrape	28	29	57	10.0	6.6	10.4	9.4	9.2
	Struck by	39	22	61	10.7	10.8	9.7	10.5	13.0
	Exposure, noise, chemical, biological, vibration	18	6	24	4.2	1.7	4.4	4.9	4.8
	Caught in, under or between	31	18	49	8.6	10.2	10.2	7.8	7.1
	Overexertion, strain	19	19	38	6.6	6.7	8.5	9.6	8.2
	Pressure release	2	2	4	0.7	0.6	1.2	1.6	1.7
	Other	19	9	28	4.9	6.3	9.3	6.8	8.0
Total		332	241	572	100.0	100.0	100.0	100.0	100.0

APPENDIX 3 LWI 2024 - CAUSAL FACTORS

		Number of Causal Factors assigned to Lost Workday Injuries (more than 1 causal factor can be assigned to a single LWI)													
Sector	**Incident Category**	Management of Change	Communication	Design	Equipment Reliability & Maintenance Management	Equipment Inspection and Testing	Organisational Structure & Staffing	Knowledge and Skills	Operating Limits	Procedures	Risk Assessment & Associated Action Management	Safe System of Work	Work Monitoring	Other	Not Yet Available
Manufacturing	Assault or violent act	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Marketing	Assault or violent act	0	0	0	0	0	0	0	0	0	2	0	0	11	0
Manufacturing	Caught in, under or between	0	1	5	4	1	0	7	0	9	18	6	2	7	0
Marketing	Caught in, under or between	0	1	4	0	0	0	7	0	2	3	3	0	6	1
Manufacturing	Confined space	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Marketing	Confined space	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manufacturing	Cut, puncture, scrape	0	0	2	2	2	1	8	2	5	9	6	1	9	3
Marketing	Cut, puncture, scrape	0	1	4	1	1	0	10	0	6	3	5	2	12	3
Manufacturing	Explosion or burns	0	1	2	1	4	0	4	0	4	10	7	2	2	8
Marketing	Explosion or burns	0	0	0	0	0	1	3	0	1	1	3	0	5	2
Manufacturing	Exposure electrical	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Marketing	Exposure electrical	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manufacturing	Exposure, noise, chemical, biological, vibration	1	0	1	2	1	0	9	0	5	3	4	3	1	2
Marketing	Exposure, noise, chemical, biological, vibration	0	0	1	0	0	0	5	0	1	0	0	0	4	0
Manufacturing	Falls from height	2	1	4	0	0	0	9	1	9	16	7	3	12	4
Marketing	Falls from height	0	1	2	1	0	0	11	0	7	2	3	1	7	1
Manufacturing	Other	0	0	0	0	1	0	2	2	3	7	2	0	10	1
Marketing	Other	0	1	1	0	0	0	2	0	1	0	0	0	8	0
Manufacturing	Overexertion, strain	0	0	7	3	0	0	4	2	0	7	1	1	4	1
Marketing	Overexertion, strain	1	0	1	1	2	0	6	1	2	1	2	0	8	3
Manufacturing	Pressure release	0	0	0	0	0	0	1	0	0	1	0	1	1	0
Marketing	Pressure release	0	0	0	0	0	0	1	0	0	1	0	0	0	0
Manufacturing	Road accident	0	1	0	1	0	0	2	0	0	3	0	1	8	1
Marketing	Road accident	0	0	0	0	0	0	1	1	0	0	0	0	3	7
Manufacturing	Slips & trips (same height)	2	3	10	1	3	1	21	2	4	35	9	3	27	12
Marketing	Slips & trips (same height)	0	2	4	1	1	1	25	0	4	19	10	1	37	9
Manufacturing	Staff hit by falling objects	0	1	0	0	0	0	1	0	0	3	2	1	0	0
Marketing	Staff hit by falling objects	0	0	0	0	0	0	1	0	0	0	1	0	3	0
Manufacturing	Struck by	1	6	4	1	0	1	9	0	3	9	4	2	11	7
Marketing	Struck by	0	2	4	2	1	0	5	0	3	5	3	0	5	5
Manufacturing	Water related, drowning	0	0	0	0	0	0	0	0	0	2	0	1	0	0
Marketing	Water related, drowning	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	7	22	56	21	17	5	154	11	69	160	78	25	201	70

APPENDIX 4 PROCESS SAFETY EVENTS 2024

Table A4-1 Tier 1 and 2 Process Safety events by Type of Process (Refining)

Type of Process: Refining	Tier 1	Tier 2
1. Active Warehouse	0	0
2. Alkylation, Hydrofluoric (HF)	3	1
3. Alkylation, Sulfuric	1	0
4. Bitumen / Resid / Asphalt	0	1
5. Calcining	0	0
6. Coking	0	2
7. Crude / Vacuum Distillation	7	16
8. Flares / Flare Systems / Flare Gas Recovery	0	0
9. Fluid Catalytic Cracking (FCC)	0	8
10. Gas and Liquid Desulfurization / Treating (H2S absorbers, amine systems, Merox)	4	8
11. Hydrocracking	1	7
12. Hydrogen	0	1
13. Hydrotreating	4	6
14. Isomerization	1	1
15. Loading / Unloading / Truck / Rail / Transport Vessel	6	15
16. Marine / Jetty / Wharf	2	3
17. Other (describe)	6	7
18. Pilot Plant	0	0
19. Polymerization	0	0
20. Reforming	2	4
21. Sewer / Lift Station / Wastewater Handling, Treatment or Disposal	0	1
22. Sulfur Recovery	0	0
23. Tank Farm / Storage Facility / Offsites / Storage and Transfer Piping	19	37
24. Utilities / Steam Plant / Cogeneration	0	5
25. Vapor Recovery / Light Ends	0	2
Total	**56**	**125**

Table A4-2 Tier 1 and 2 Process Safety events by Type of Process (Petrochemical & other process)

Type of Process: Petrochemical & other process	Tier 1	Tier 2
1. Acetic Acid and Derivatives	0	0
2. Active Warehouse	0	0
3. Amines Derivatives	0	0
4. Aromatics Derivatives (cumene, dis-proportionation, aromatic isomerization, linear alkylbenzene)	0	0
5. Benzene	0	0
6. Butadiene	0	0
7. Butane	0	0
8. Cyclohexane	0	0
9. Dehydrogenation (propylene, butylenes)	0	0
10. Diisocyanates (TDA, MDA, IPDA, etc.)	0	0
11. ETBE	0	0
12. Ethane	0	0
13. Ethanol	0	0
14. Ethyl Benzene and Derivatives	0	0
15. Ethylene and Derivatives	0	1
16. Ethylene Dichloride and Derivatives	0	0

17. Ethylene Oxide	1	0
18. Flares / Flare Systems / Flare Gas Recovery	0	0
19. Formaldehyde and Derivatives	0	0
20. Glycols (ethylene, propylene)	0	0
21. Hexane	0	0
22. Hexanol	0	0
23. Isobutane	0	0
24. Isobutene	0	0
25. Isocyanates	0	0
26. Isopropanol	0	0
27. LNG	0	0
28. Loading / Unloading / Truck / Rail / Transport Vessel	3	3
29. Methane	0	0
30. Methanol	0	0
31. Methyl Mercaptan	0	0
32. MTBE	1	0
33. NGL Fractionation	0	0
34. Other (describe)	2	7
35. Paraxylene	0	0
36. Pentane	1	0
37. Phenol	0	0
38. Pilot Plant	0	0
39. Polyethylene	0	1
40. Polypropylene	0	0
41. Polystyrene	0	0
42. Propane	0	1
43. Propylene	0	0
44. Propylene Oxide and Derivatives	0	0
45. Sewer / Lift Station / Wastewater Handling, Treatment or Disposal	1	0
46. Specialty Chemicals	0	0
47. Styrene-Butadiene	0	0
48. Synthesis Gas (CO, H2)	0	0
49. Tank Farm / Storage Facility / Offsites / Storage and Transfer Piping	0	1
50. Toluene	0	0
51. Utilities / Steam Plant / Cogeneration	0	0
52. Xylene	0	0
Total	**9**	**14**

Table A4-3 Tier 1 and 2 Process Safety events by Mode of Operation

Mode of Operation	**Tier 1**	**Tier 2**
1. Emergency shutdown	1	1
2. Normal	45	103
3. Other	2	1
4. Planned shutdown	3	7
5. Routine maintenance	6	5
6. Start-up	6	15
7. Temporary	1	3
8. Turnaround	0	2
9. Upset	1	2
Total	**65**	**139**

Table A4-4 Tier 1 and 2 Process Safety events by Point of release

Point of release	Tier 1	Tier 2
1. Atmospheric tank	4	5
2. Blower / Fan	0	1
3. Compressor	0	0
4. Cooling Tower	0	0
5. Filter / Coalescer / Strainer	2	4
6. Fired Boiler	0	1
7. Flare / Relief System	2	6
8. Furnace / Fired Heater	3	1
9. Heat Exchanger	1	9
10. Instrumentation	3	1
11. Other (describe)	8	21
12. Piping System, Large Bore (>2)	16	46
13. Piping System, Small Bore (≤2)	13	26
14. Pressure Vessel	2	5
15. Pump	11	11
16. Reactor	0	2
Total	**65**	**139**

Table A4-5 Tier 1 and 2 Process Safety events by Type of Material released

Type of Material released	Tier 1	Tier 2
1. Combustible	13	20
2. Corrosive	4	1
3. Flammable	40	104
4. Other	4	4
5. Toxic	3	8
6. UNDG Class 2	0	1
7. Utilities	1	1
Total	**65**	**139**

Table A4-6 Tier 1 and 2 Process Safety events by Causal Factor

Causal Factors	Tier 1	Tier 2
1. Management of Change	11	27
2. Communication	12	25
3. Design	29	45
4. Equipment Reliability & Maintenance Management	31	69
5. Equipment Inspection and Testing	12	38
15. Organisational Structure & Staffing	2	5
7. Knowledge and Skills	19	38
8. Operating Limits	6	16
9. Procedures	15	49
10. Risk Assessment & Associated Action Management	22	31
11. Safe System of Work	17	23
12. Work Monitoring	11	26
13. Other	5	12
14. Not Yet Available	6	3
Total	**198**	**407**

*More than one causal factor may be assigned to a single Tier 1/2 event

APPENDIX 5 CONCAWE MEMBER COMPANIES THAT SUBMITTED DATA

The following member companies provided the data upon which this report is based. The report includes additional data from two Joint Ventures when these are not provided in the Member Company submissions.

ALMA Petroli	Gunvor	MOL Group	Rompetrol
Gruppo API	H&R	Motor Oil (Hellas)	Sara
BP	Helleniq Energy	Neste	Saras
Crossbridge	Ineos	Nynas	Shell
ENI	IPLOM	OMV	St1
Equinor	Irving	Orlen	Tamoil
ESSAR	ISAB	Phillips 66	TotalEnergies
ExxonMobil	Klesch	Preem	Valero
FN Trusteeship of Rosneft Germany Assets	LUKOIL	Q8	Varo
Galp	Moeve	Repsol	Vitol

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