REGIONAL ASSOCIATION OF
OIL, GAS AND BIOFUELS SECTOR COMPANIES
IN LATIN AMERICA AND THE CARIBBEAN

Safety benchmarking in the oil and gas industry in Latin America and the Caribbean

Statistics 2015

August 2016

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BENCHMARKING

ARPEL REPORT

Safety benchmarking in the oil and gas industry in Latin America and the Caribbean

2015 Statistics for ARPEL Member Companies

ARPEL, August 2016

Report on Safety Benchmarking in the Oil and Industry for Latin America and the Caribbean - 2014
Statistics for ARPEL Member Companies
Report BE01-2016
July 2016

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This report was prepared upon request of ARPEL and its Environment, Health and Safety Committee by Camila Morales, Project Coordinator at ARPEL.

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1. EXECUTIVE SUMMARY

This report is a compilation of safety statistics of ARPEL Member Companies. It analyzes four reactive indicators (total incidents, gravity, frequency of incidents with lost workdays and fatalities) and two proactive indicators (safety training intensity and task planned observations), broken down by business line (E&P, refining, pipelines, distribution and others) and by category (company and contractors), and also including historical data since 2002.

Scope:
For 2015, 22 companies detailed below shared their data, with a total coverage of 831 thousands employees and 1,929 million hours worked.

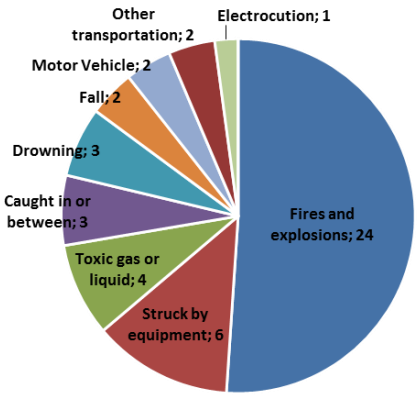
ANCAP – AXION – CENIT –CHEVRON –COGA – ECOPETROL – ENAP – EP PETROECUADOR – EQUIÓN – OCENSA – PCJ – PEMEX – PETROBRAS – PETROPERU – PETROTRIN – PLUSPETROL – RECOPE – REPSOL – STAATSOLIE – TECPETROL – YPF – YPFB

Reactive indicators:

Indicator	2014	2015	variation
Total incidentes rate	1.740	1.494	-14%
Gravity rate	89.356	61.160	-32%
Incidents w/LWD rate	0.839	0.804	-4%
Fatalities rate	0.015	0.024	64%

Total incident rate continues to decline, registering in 2015 the lowest level since ARPEL began compiling statistics. Gravity rate and incidents with lost work days rate decreased compared to the values registered in 2014, while the fatalities rate increased by 64%. 51% of the fatalities were related to multiple-fatality incidents what highlights the importance of incorporating process safety indicators to this report and working with process safety projects.

Fatalities:



During 2015, 47 fatalities were registered representing a rate of 0.024 fatalities per million man-hours worked.
"Fires and Explosions" continues being the main cause of mortality since ARPEL began to keep records in 2001, representing in 2015 the 51% of the total of the fatalities for this year.

ARPEL's incident Database
In order to prevent and reduce fatal and high potential incidents that happen every year in the industry, ARPEL has a space for the exchange of information, only for members in its web page (www.arpel.org), in which you can see in detail the conditions, causes, failures, and lessons learned from safety incidents that have been recorded in the industry from 2010 to date.

The tool also includes an "Interactive Reports" section where statistics of fatal incidents in recent years are available. Fatal incidents may be viewed per year, per function, cause and type of activity.

2. INDICATORS (methodological note)

This report collects four reactive indicators and two proactive indicators, which are detailed below:

1.1. Reactive

1. $$Total\ incidents'rate = \frac{Total\ recordable\ cases\ (injuries+illnesses+fatalities)}{Hours\ worked\ (in\ millions)}$$
2. $$Incidents\ gravity\ rate = \frac{Number\ of\ days\ away\ from\ work}{Hours\ worked\ (in\ millions)}$$
3. $$Incidents'frequency\ rate\ with\ lost\ workdays = \frac{cases\ with\ lost\ workdays}{Hours\ worked\ (in\ millions)}$$
4. $$Fatalities'rate = \frac{Number\ of\ fatalities}{Hours\ worked\ (in\ millions)}$$

1.2. Proactive

5. $$TPO\ Indicator = \frac{Number\ of\ Task\ Planned\ Observations\ (TPO)recorded}{Average\ number\ of\ workers}$$
6. $$Safety\ Training\ Intensity = \frac{Total\ number\ of\ safety\ trining\ hours}{Hours\ worked\ (in\ millions)} * 100$$

For further information on the indicators or definitions, please refer to the User Manual (6th edition 2012) or the glossary provided at the end of this Report.

Not all companies report data for the calculation of all the rates, either because they do not have the information in the required breakdown, or simply because the requested information does not apply to the company in question. The indicators are calculated with the data reported for each particular indicator, so the basis of calculation vary depending on the number of companies that have reported their data correctly for each particular indicator.

Overall data of the companies is shown, broken down by category (company/contractors), for all the controlled operations of the companies in Latin America and the Caribbean. Proactive indicators are calculated only for company employees.

In all cases, an analysis by business line and comparisons between companies is done.

3. SCOPE OF THE INFORMATION

As shown in the following table, 22 ARPEL member companies shared their 2015 safety data for this report.

Companies							
ANCAP	AXION	CENIT	CHEVRON	COGA	ECOPETROL	ENAP	EP PETROECUADOR
EQUIÓN	OCENSA	PCJ	PEMEX	PETROBRAS	PETROPERÚ	PETROTRIN	PLUSPETROL
RECOPE	REPSOL	STAATSOLIE	TECPETROL	YPF	YPFB		

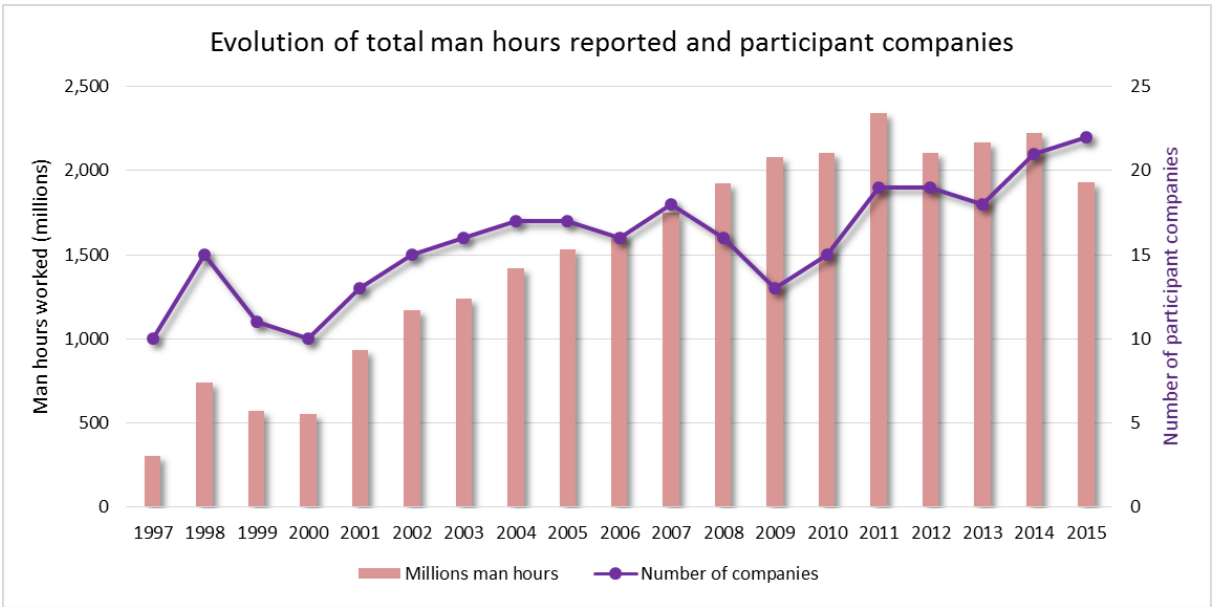
The following table shows the total number of employees and man-hours reported this year for this report.

A total of 831 thousands employees and 1,929 million hours were considered in this report, achieving a high representativeness of the oil and gas industry in Latin America and the Caribbean.

		Company		Contractors		Total	
Function	# Companies	Employees	MH	Employees	MH	Employees	MH
E&P	13	99.461	222.128	261.018	656.298	360.479	878.426
Refining	14	69.166	172.425	49.387	117.803	118.553	290.228
Pipelines	12	25.760	57.712	42.150	94.487	67.910	152.198
"Transport - maritime"	3	11.917	18.044	1.754	966	13.671	19.010
Distribution	9	25.990	61.999	15.529	31.197	41.519	93.196
Other	12	85.785	185.806	142.636	309.951	228.421	495.757
Total	**22**	**318.079**	**718.114**	**512.474**	**1.210.702**	**830.553**	**1.928.815**

MH: Man Hours worked

The data on maritime transportation are considered only in the total as there are not enough companies for an exclusive benchmarking of this business line. The data on the business line “others” is considered in the global data but a particular analysis is not made due to the heterogeneity of the activities included in that line.



4. RESULTS

4.1. Overall results

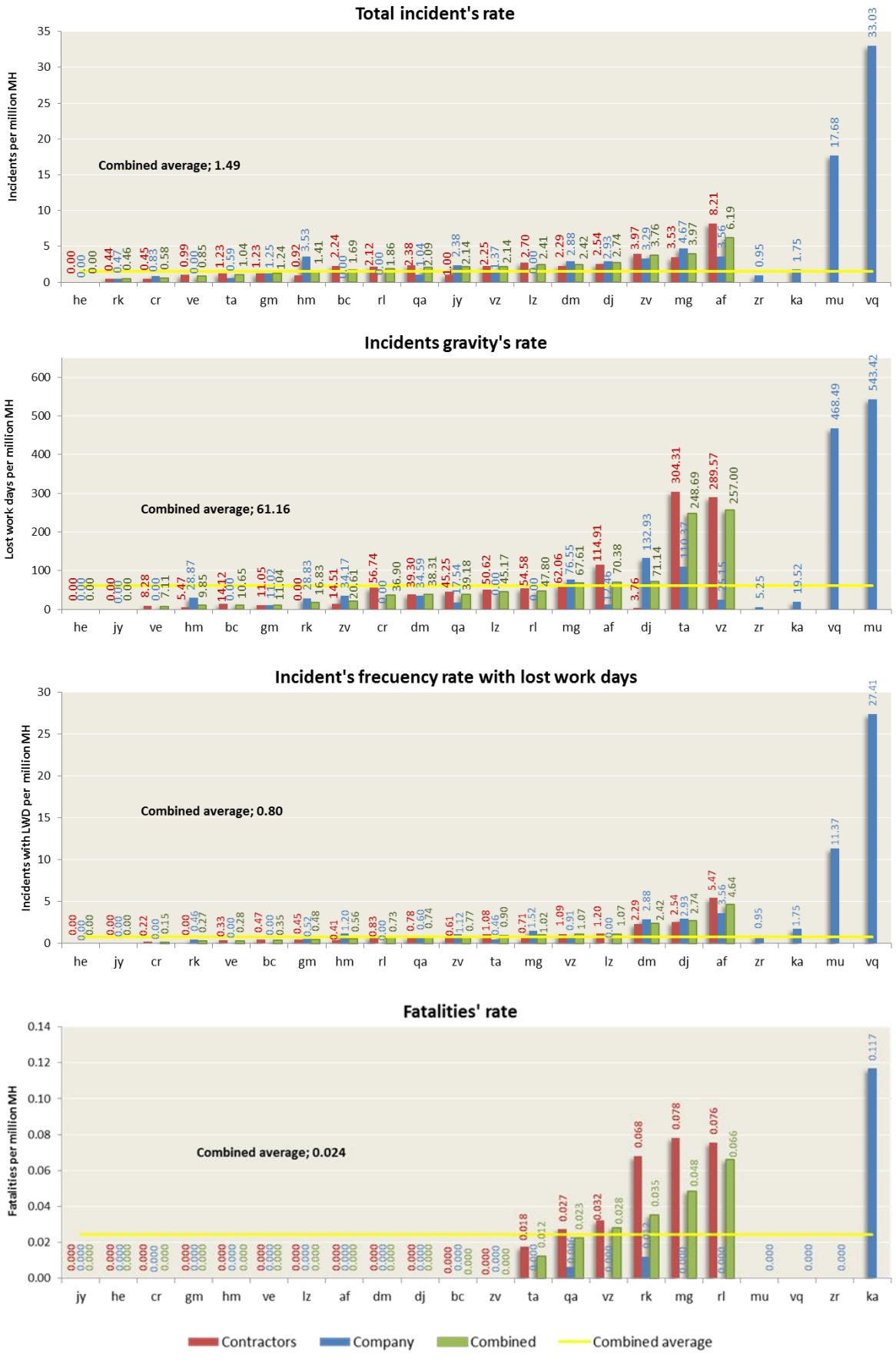
Below are the 2015 overall results for the four reactive indicators by business line and then by company.

Distribution was the business line with more incidents per million hours worked (2.12), the biggest fatalities rate (0.054) and the biggest incident's frequency rate with lost workdays (1.06), while E&P was the function the highest number of lost workdays -gravity- (97.94).

Following there is a breakdown by business line of the reactive indicators, sorted by descending order according to the combined average of each company (company + contractors).

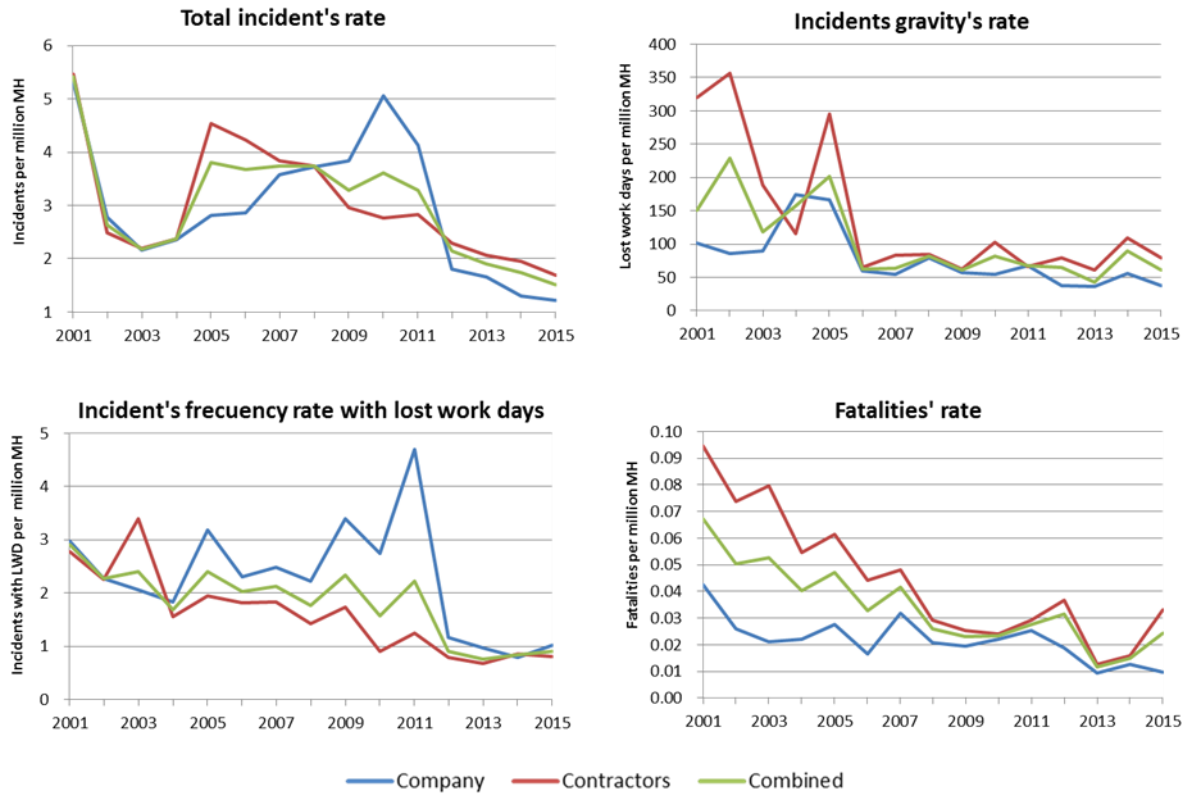
Notes:

- The combined indicator is only possible to be calculated for those companies that report their data for their employees and contractors, so for those companies that shared only the information for company employees, only the company indicator is plotted and it will not be ordered along with the combined indicators.
- Since the total number of incidents is calculated as the sum of injuries, diseases and fatalities; and some companies do not report the number of registered occupational diseases, the comparability of the total incident rate is partially affected.


Total incident's rate
Incidents per million MH
Combined average; 1.49
he rk cr ve ta gm hm bc rl qa jy vz lz dm dj zv mg af zr ka mu vq
Incidents gravity's rate
Lost work days per million MH
Combined average; 61.16
he jy ve hm bc gm rk zv cr dm qa lz rl mg af dj ta vz zr ka vq mu
Incident's frecuency rate with lost work days
Incidents with LWD per million MH
Combined average; 0.80
he jy cr rk ve bc gm hm rl qa zv ta mg vz lz dm dj af zr ka mu vq
Fatalities' rate
Fatalities per million MH
Combined average; 0.024
jy he cr gm hm ve lz af dm dj bc zv ta qa vz rk mg rl mu vq zr ka
Contractors
Company
Combined
Combined average

4.1.1. Evolution of reactive indicators

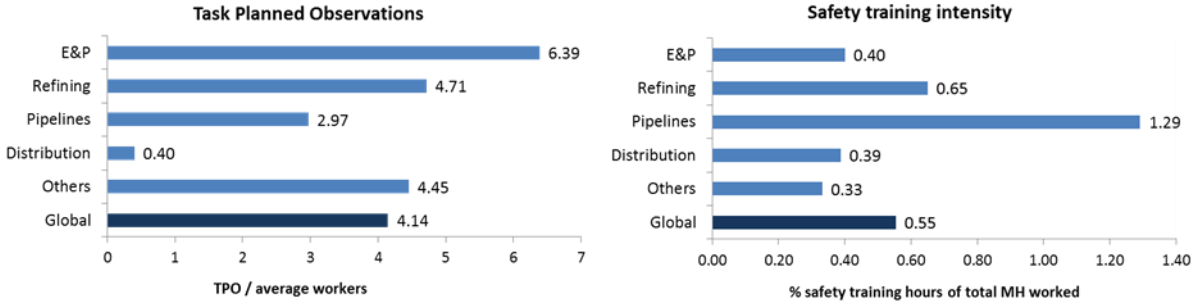
The following four graphs show the evolution of reactive indicators since 2001.



4.1.2. Proactive indicators

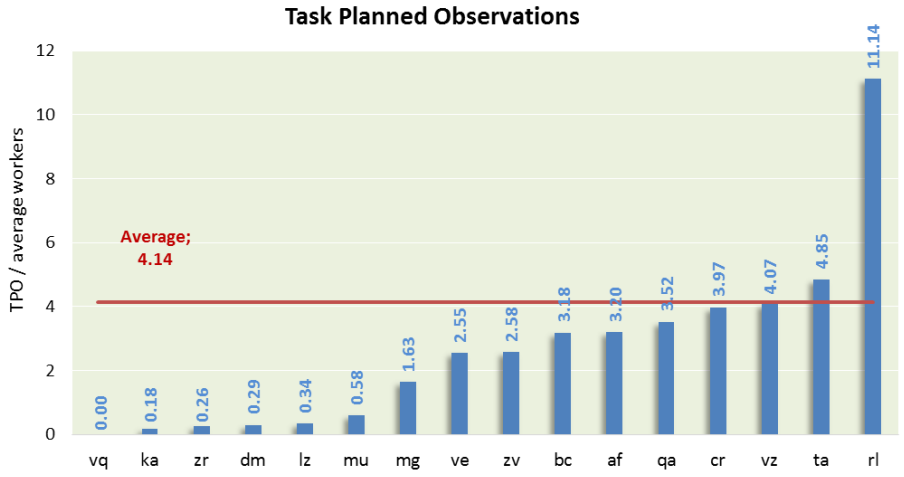
Finally, the proactive indicators are shown by business line (4.1.2), their global evolution since 2005 (4.1.2.1) and a comparison between companies for 2014 (4.1.2.2).

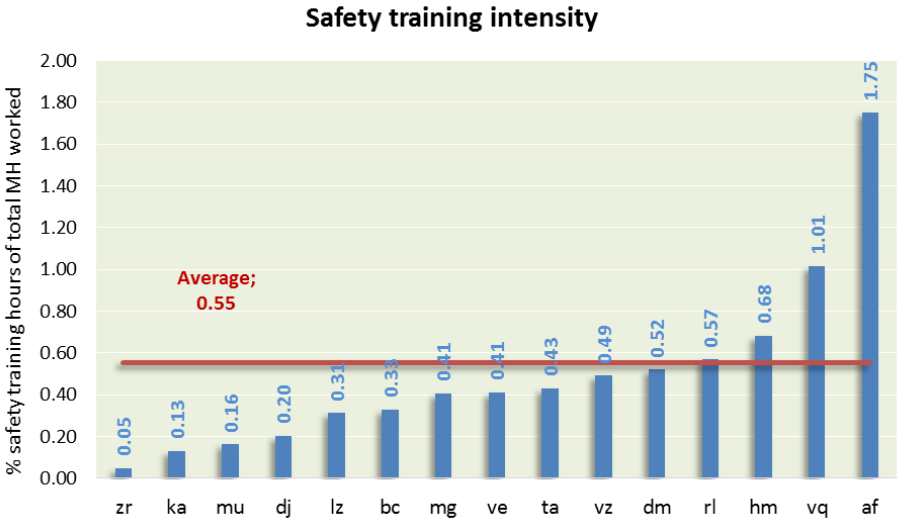
Both indicators recorded an increasing trend, which is desirable since it shows a growth in preventive measures such as training and task observation actions.



4.1.3. Evolution of proactive indicators

4.1.4. Proactive indicators by company



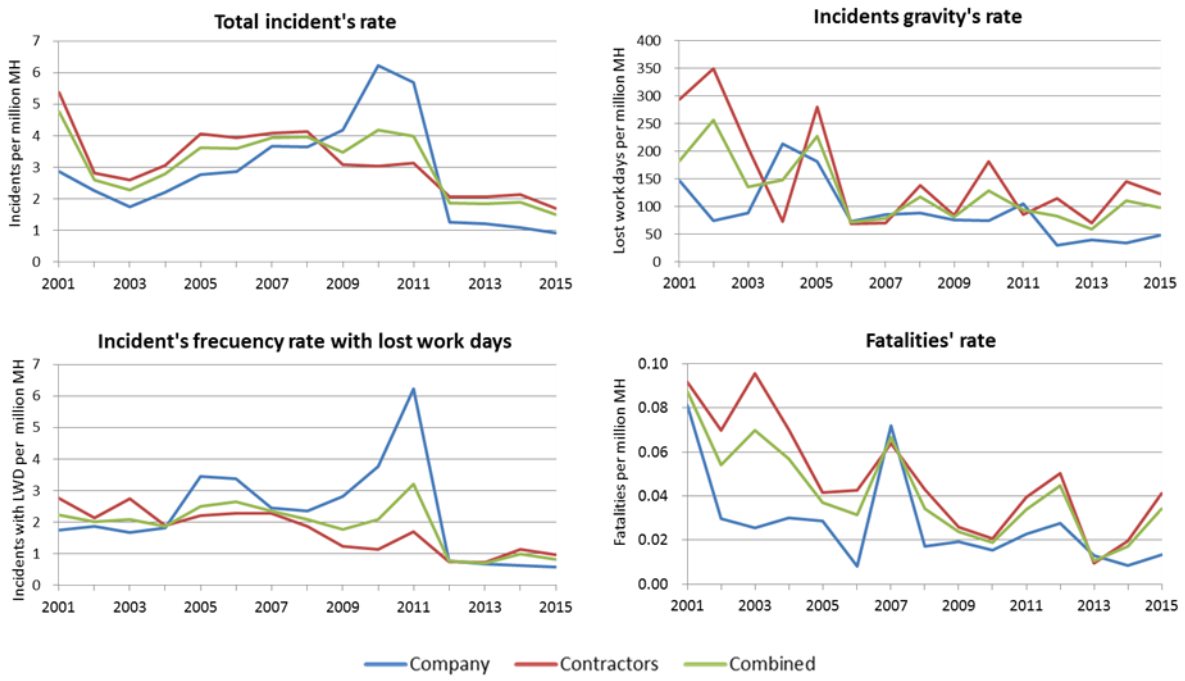


4.2. Exploration and Production

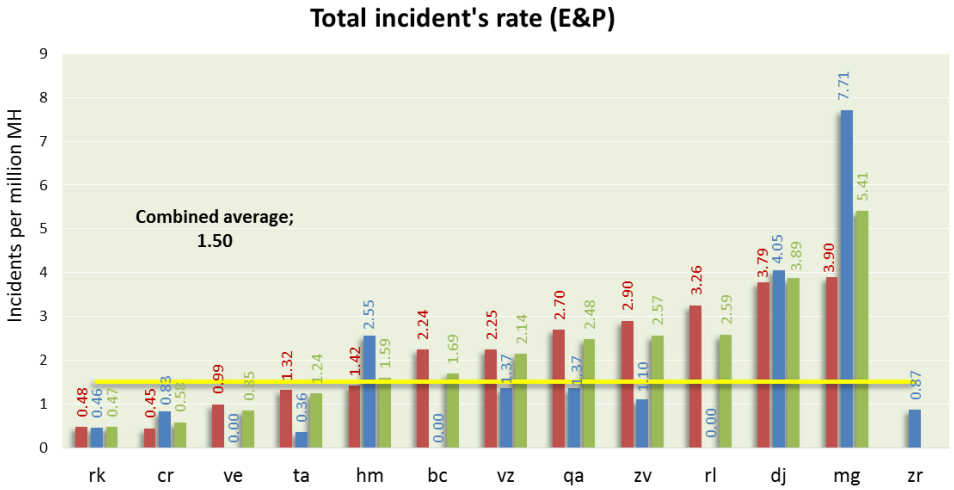
Below is the evolution of the reactive indicators (4.2.1), a comparison between companies for the year 2014 (4.2.2), as well as the causes of fatalities of ARPEL for the function E&P (4.2.3). Finally, in section 4.2.4, a historical evolution of proactive indicators for the mentioned business line is presented.

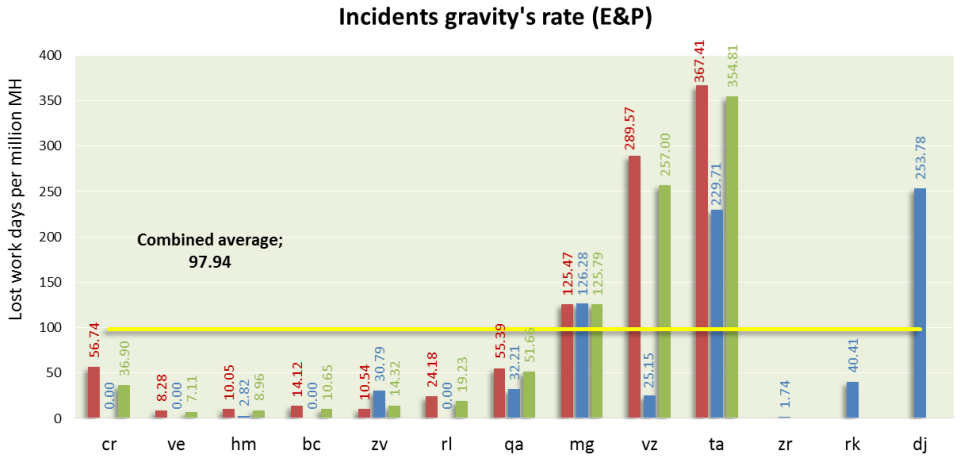
E&P total data includes offshore operations, in sections 4.2.4 and 4.2.5 there is an analysis of the historical evolution and comparisons between companies of the reactive indicators only for E&P offshore.

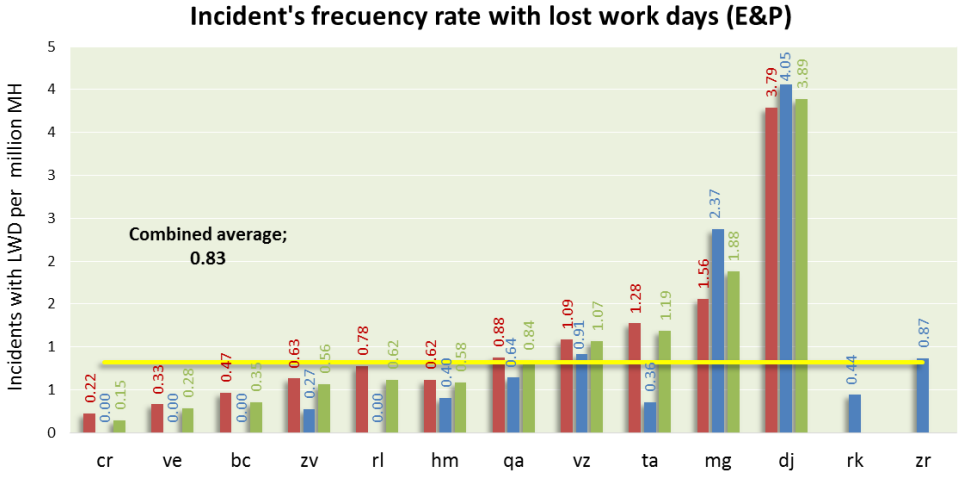
4.2.1. Evolution of proactive indicators (E&P total)

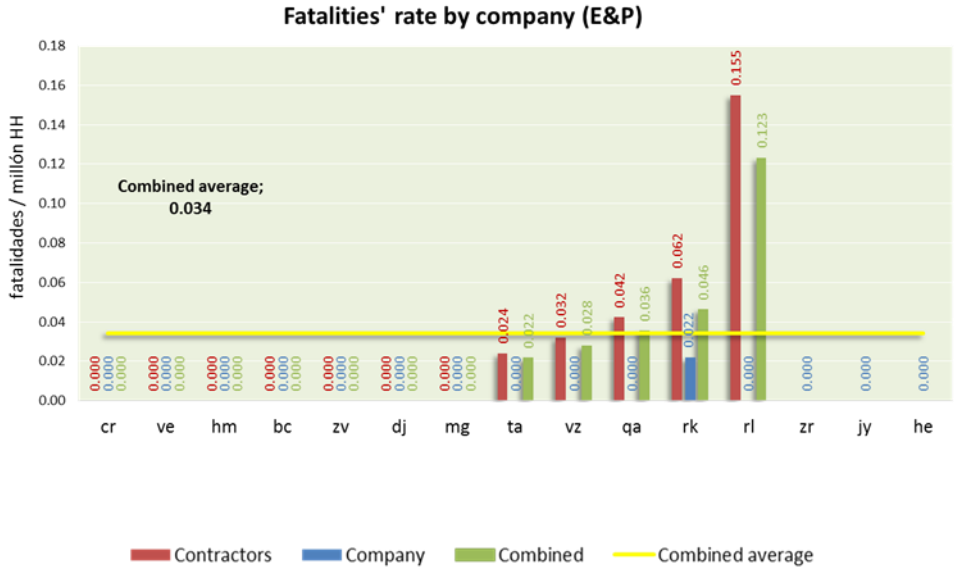


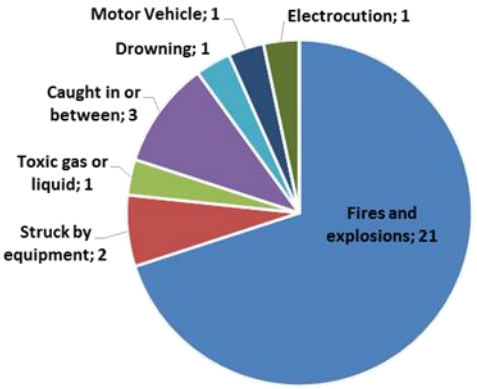
4.2.2. Reactive indicators by company (E&P total)




Incidents gravity's rate (E&P)
Lost work days per million MH
Combined average; 97.94
cr ve hm bc zv rl qa mg vz ta zr rk dj


Incident's frecuency rate with lost work days (E&P)
Incidents with LWD per million MH
Combined average; 0.83
cr ve bc zv rl hm qa vz ta mg dj rk zr

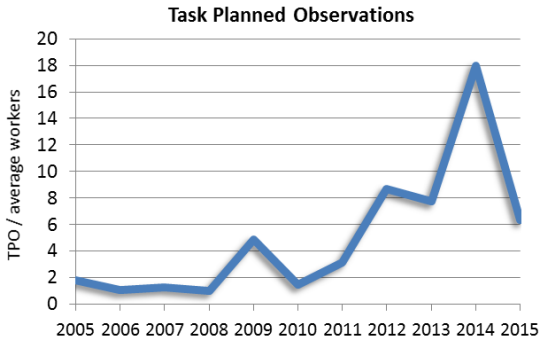

Fatalities' rate by company (E&P)
fatalidades / millón HH
Combined average; 0.034
cr ve hm bc zv dj mg ta vz qa rk rl zr jy he
Contractors
Company
Combined
Combined average



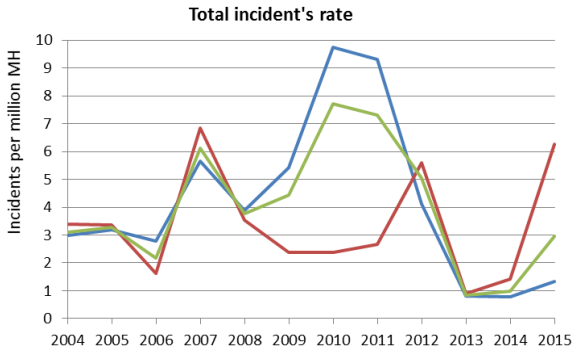
Approximately 64% of the fatalities reported in 2015 by ARPEL member companies occurred in E&P. A graph that shows the causes of fatalities is presented.

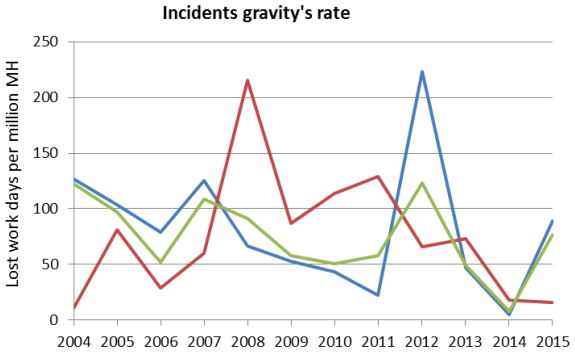
The main cause of the fatalities presented by ARPEL member companies in the function E&P was "Fires and Explosions" with 70% of total cases.

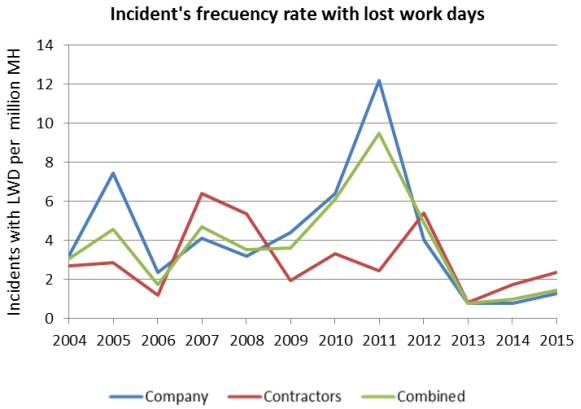
4.2.3. Proactive indicators (E&P total)



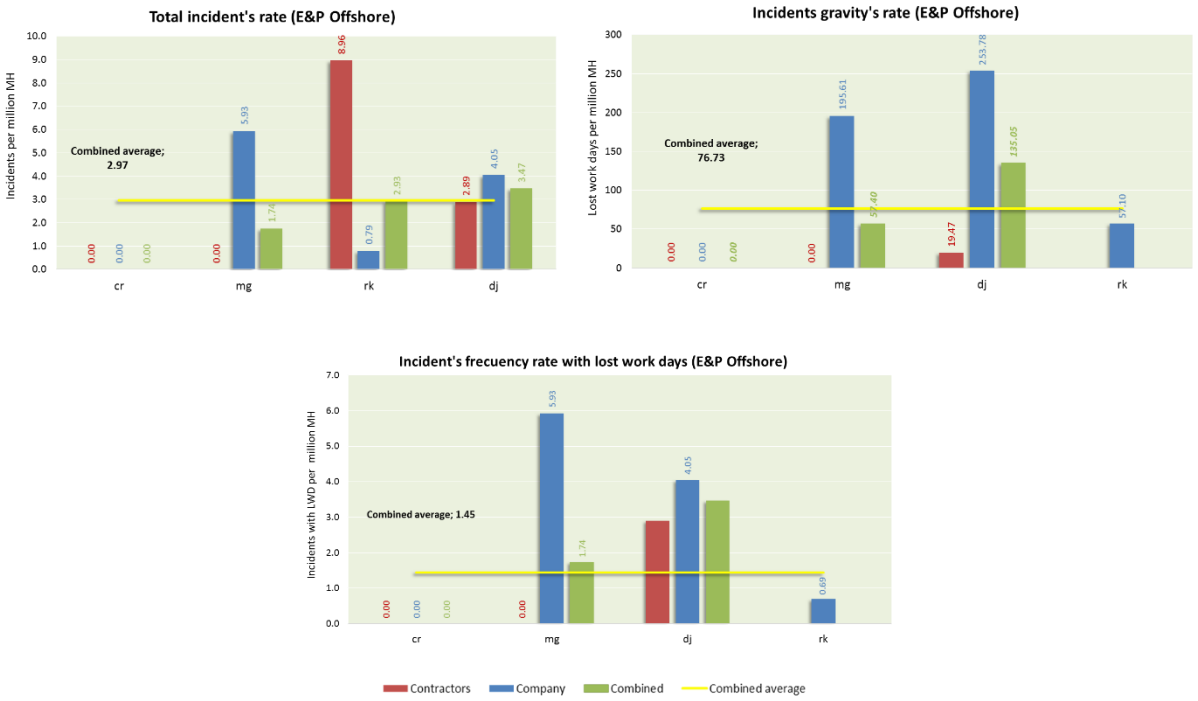
4.2.4. Reactive indicators E&P (offshore)







4.2.5. Reactive indicators by company E&P (offshore)[1]



4.3. Comparisons with international references

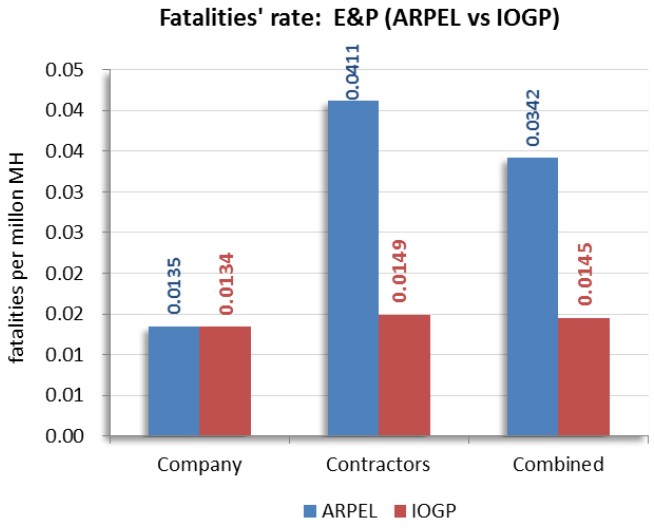
Following is a comparison between the data of fatalities in E&P for ARPEL and IOGP (International Oil and Gas Producers Association) member companies.

The overall rate of fatalities in E&P for ARPEL companies in 2015 was 0.0342 fatalities per million hours worked, which represents more than double of the fatalities per million hours worked registered by IOGP companies for the same period (0.0145).

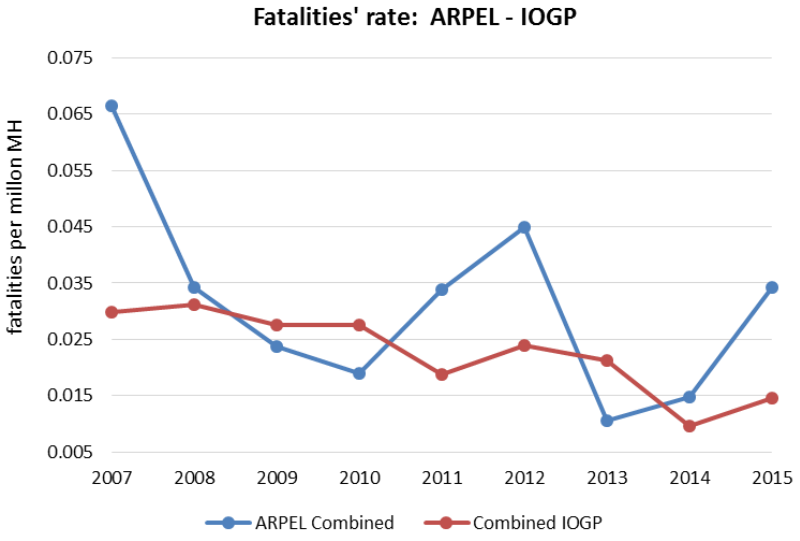
[1] Although fatalities in E&P offshore were registered, the necessary information to calculate the average fatalities rate for this business line was not provided.

Breaking down the data in company and contractors shows that this rate has very similar values to compare company data (0.0135 vs 0.0134 IOGP ARPEL), while for the contractors of IOGP companies a better performance is shown (0.0411 vs 0.0149 IOGP ARPEL).

The two main causes of fatality presented by IOGP were "Fires and explosions" and "Caught in or between" matching with those recorded by ARPEL companies for E&P.



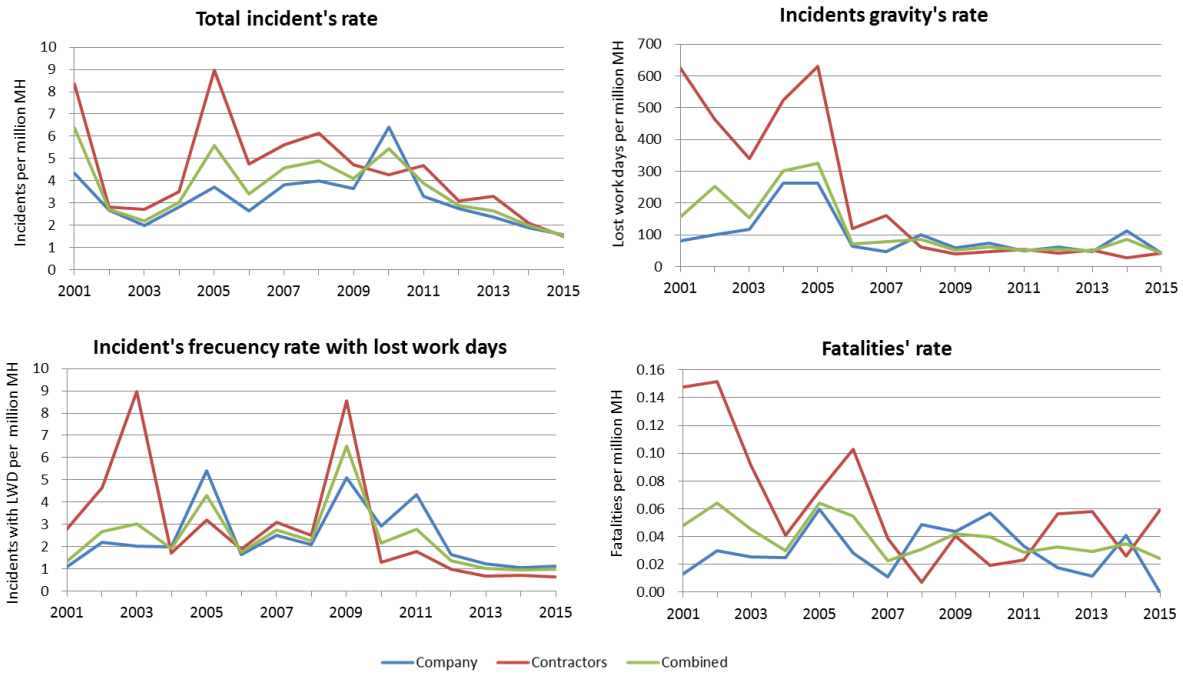
The following graph shows the evolution of fatalities' rate since 2007 for ARPEL and IOGP.



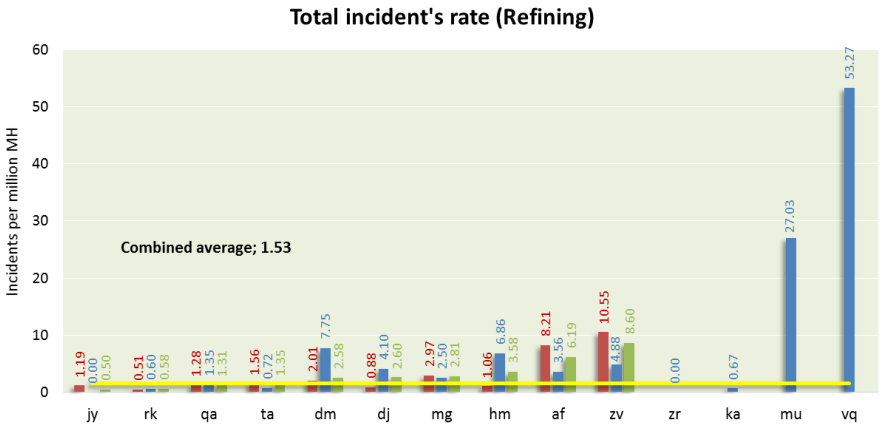
4.4. Refining

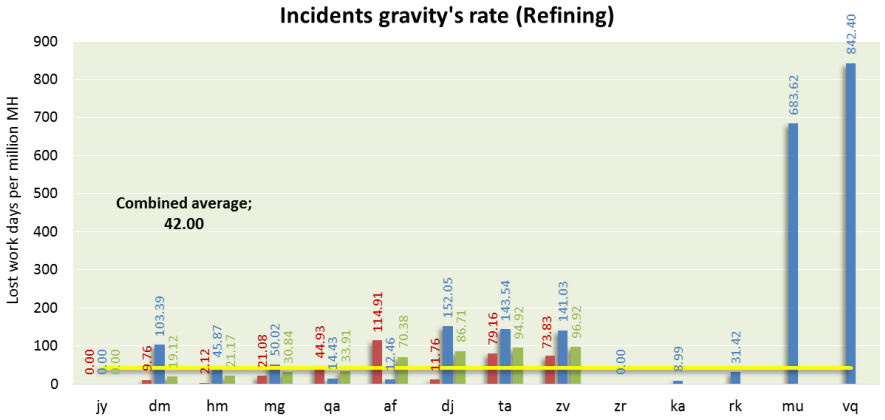
Below is the historical evolution of the reactive indicators (4.3.1), a comparison between companies for the year 2015 (4.3.2) and a historical evolution of proactive indicators (4.3.3) for the business line Refining.

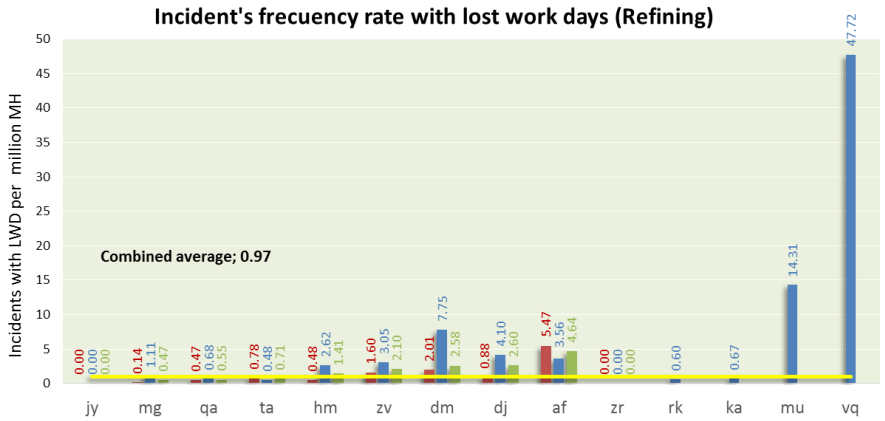
4.4.1. Evolution of reactive indicators

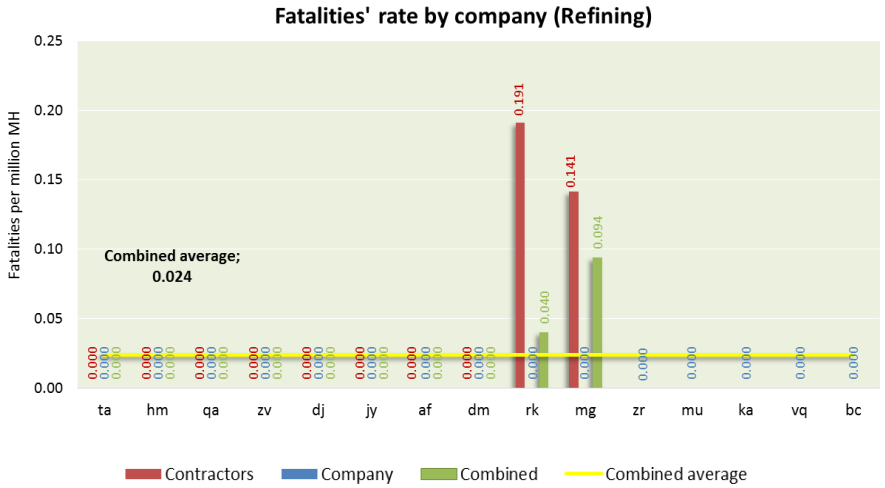


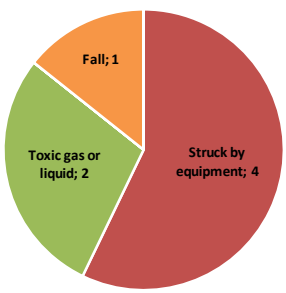
4.4.2. Reactive indicators by company







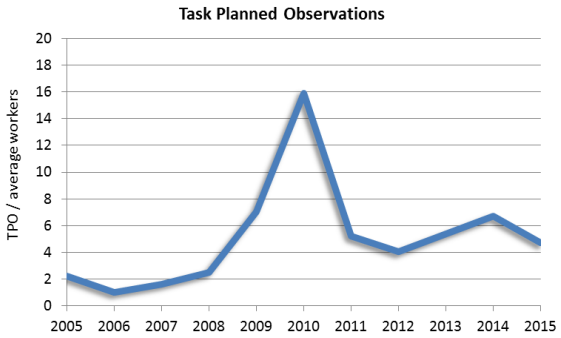




15% of the fatalities reported in 2015 by ARPEL member companies occurred in Refining.

The main cause of fatality with almost 60% of the total was “Struck by equipment”. The remaining fatalities causes were “Toxic gas or liquid” and “Fall”.

4.4.3. Proactive indicators

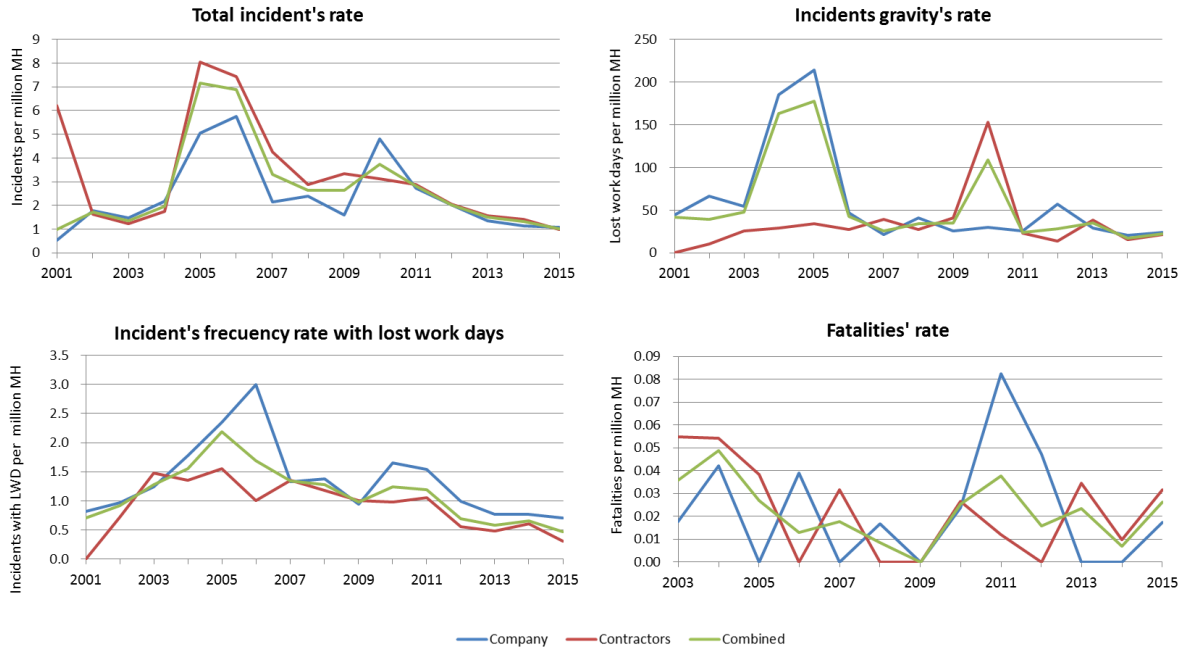


4.5. Pipelines

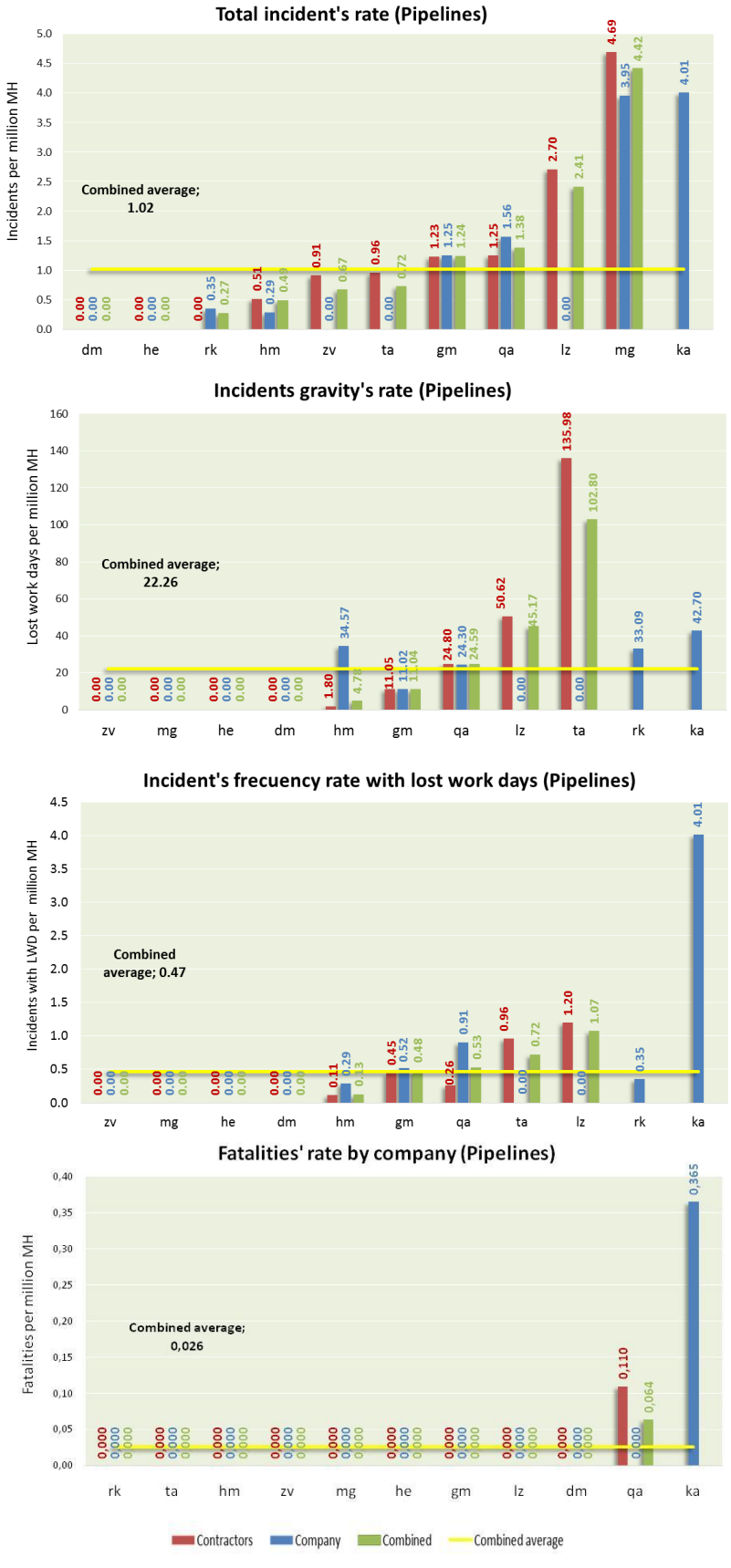
Below is the historical evolution of the reactive indicators (4.4.1), a comparison between companies for the year 2015 (4.4.2) and the historical evolution of proactive indicators (4.4.3) for the business line Pipelines.

The data includes the information reported in "transport – pipelines for liquids", "transport – pipelines for gases" and "transport – pipelines not separated". The data prior to 2009 correspond only to "transport - pipelines for liquids".

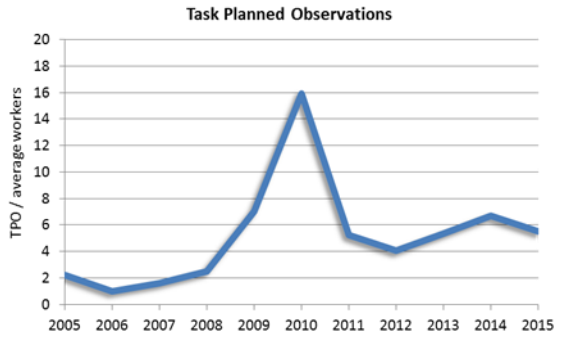
4.5.1. Evolution of reactive indicators



4.5.2. Reactive indicators by company



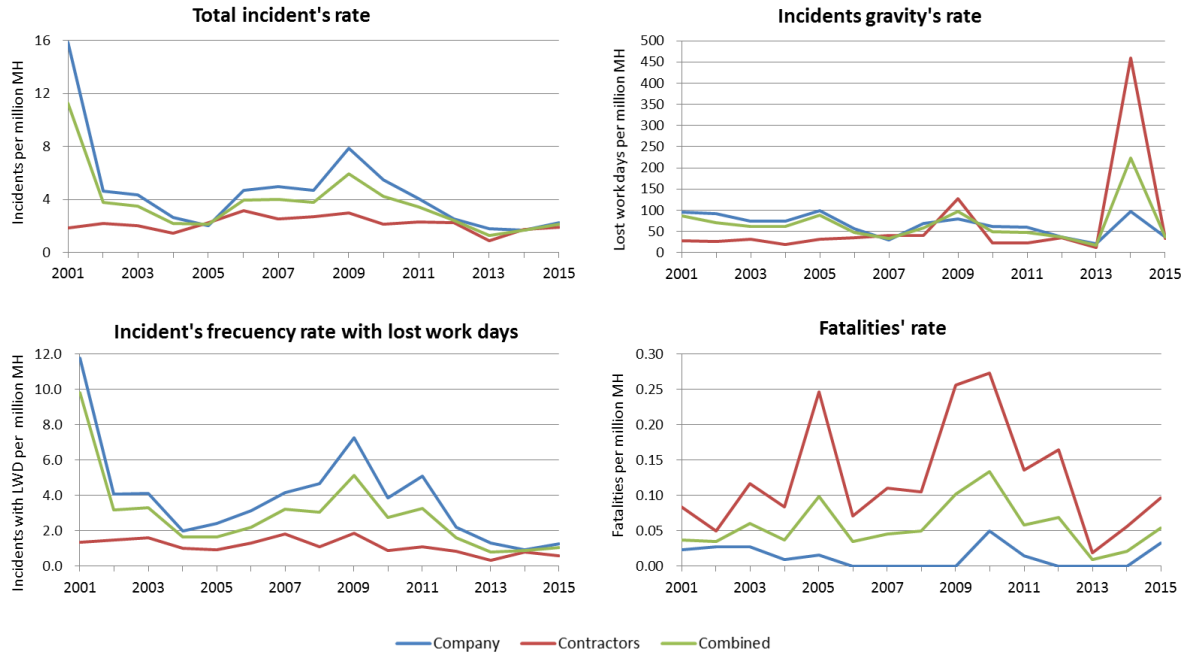
4.5.3. Proactive indicators



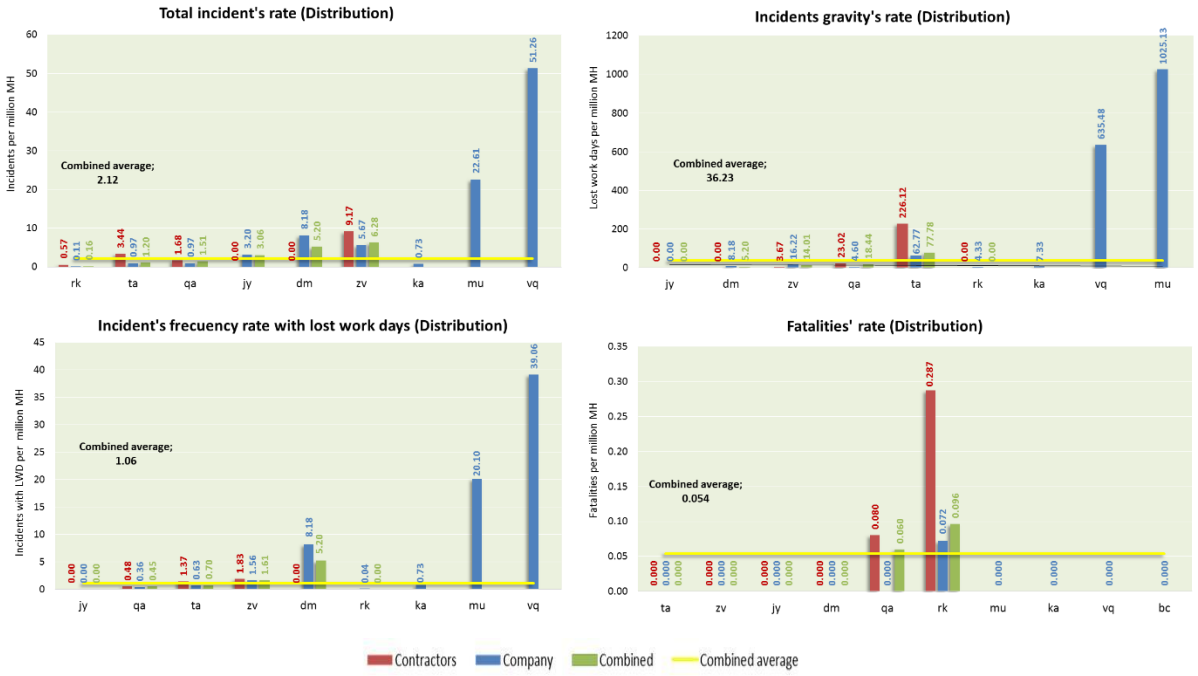
4.6. Distribution

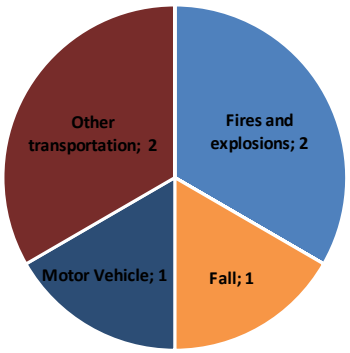
Below is the historical evolution of the reactive indicators (4.5.1), a comparison between companies for the year 2015 (4.5.2) and a historical evolution of proactive indicators (4.5.3) for the business line Distribution.

4.6.1. Evolution of reactive indicators



4.6.2. Reactive indicators by company

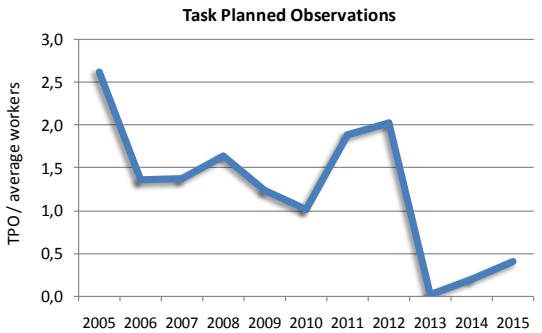




6 fatalities were registered in Distribution business line, these represents 13% of the fatalities reported in 2015 by ARPEL member companies.

The main causes of fatality for this business line were “Other transportation” and “Fires and explosions”, both with a third of total.

4.6.3. Proactive indicators

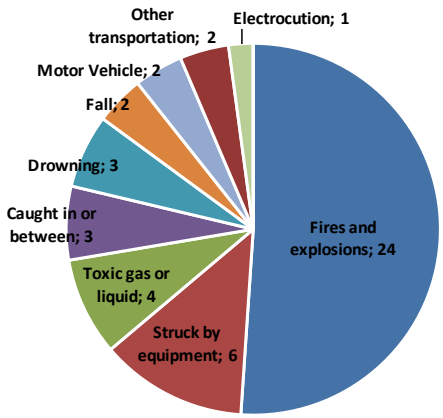


5. CAUSES OF FATALITIES

This chapter presents an analysis of the fatalities reported in 2015 by companies and contractors, providing a breakdown by cause, type of activity and function. In turn, it presents a historical comparative analysis of the causes of fatalities reported from 2001 to date.

In 2015, a total of 47 fatalities were reported, corresponding to 0.024 fatalities per million hours worked, representing an increase of 64% compared to the last year. The main cause of fatalities in 2015 was Fires and Explosions, which is also the main historical cause of fatalities since data has been collected (2001).

5.1. Fatalities by cause



The pie chart shows the causes of fatalities reported for 2015.

As it can be seen the main cause of fatalities was "fires and explosions" with 24 cases, which represents 51% of the fatal incidents in 2015. The second cause was "struck by equipment" with 6 incidents and 13% of the total.

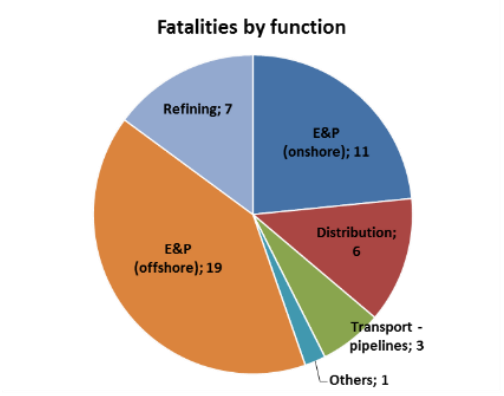
The table below in the right shows the causes of fatalities registered from 2001 to 2015.

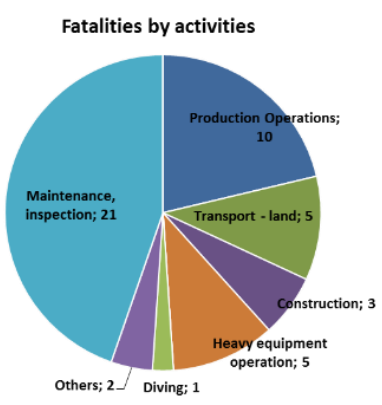
Cause	# fat	%
Fires and explosions	**178**	**23%**
Struck by equipment	**117**	**15%**
Motor vehicle	**113**	**14%**
Fall	79	10%
Caught in or between	64	8%
Drowning	61	8%
Electrocution	53	7%
Toxic gas or liquid	43	5%
Other transportation	38	5%
Other	37	5%
ndd	1	0%
Total	**784**	**100%**

As it can be appreciated, 784 fatalities have been registered during this period of 15 years. The 23% of them corresponds to fires and explosions, followed by struck by equipment with 15% and then, motor vehicles accidents with 14% of the total fatal incidents.

5.2. Fatalities by type of activity and business line

In 2015, Inspection and Maintenance was the activity that recorded more fatalities (21 cases), while E&P was the most affected business line with 30 fatalities, 19 of them onshore and 11 offshore.





6. GLOSSARY OF TERMS

Case involving lost workdays
All non-fatal cases that result in the worker being away from work at least one business day after the day of the injury or disease. The day on which the worker goes home before the end of his workday is not considered in this item. Fatalities, as well as restricted labor activity days are excluded, since they are recorded separately.

Case involving restricted workdays
All non-fatal cases implying days of restricted activity of the usual tasks after the day of the injury or disease. Fatalities must be excluded.

Case involving medical treatment
All treatment cases of injuries / diseases administered by doctors, registered professionals or non-medical personnel. The medical treatment does not include first aids (one single treatment and the following observation of scratches, cuts, burns, splinters, and other episodes without gravity that generally do not require medical attention) even if a doctor or a registered professional provides them.

Company worker
Any person employed by the reporting company or included in its payroll.

Contractor
Any person directly involved in the execution of an assigned work for the reporting company, according to a contract.

Number of days away from work
The total number of days (consecutive or not) after the day when the injury or disease occurred, on which the workers involved (according to the definition of case involving lost workdays) should have worked but did not, as a result of the occupational injury or disease, until the day they get back to work. The day the person starts to work is excluded. Weekends and holidays are included, even if the employee was not scheduled to work.

This definition has to be distinguished from 'cases with lost work days' which include those incidents that generated lost work days –the number of incidents, not the number of days- and which is used to calculate the 'frequency of incidents with lost work days'

Recordable case - disease
Any occupational incident resulting from a disease (according to the provided classification by the legislation/regulation [if applicable] of the country where the company reports its activities). Occupational diseases resulting in fatalities are included.

Recordable case - fatality
A fatality resulting from an occupational injury or disease. The fatality should be loaded to the year in which the injury occurred or the occupational disease was recorded.

Recordable case - injury
Any occupational incident resulting in an injury (according to the provided classification by the legislation/regulation [if applicable] of the country where the company reports its activities). Occupational injuries resulting in fatalities are included.

Recordable cases - total
The sum of Recordable cases – Injury, Recordable cases – Disease and Recordable cases – Fatalities.

Tasks planned observations (TPO)
"Tasks planned observations" (TPO) are safety observations performed according to a systematic method. They constitute a recorded visual analysis in which the sequence of tasks, maneuvers and operations required to obtain a certain result of the service which is pre-established within the company, is studied by well trained and qualified personnel. The referred study includes hazard identification and risk management during normal task performance and comprises observations of immediate and basic aspects as well as systematic ones. Observations are recorded in a pre-established form according to a given procedure to determine all deviations that result in an increased probability of any human resources or material loss.

Worked hours
Hours worked by both the company workers and contractors' workers (separately recorded).

Work relatedness

An injury or disease is to be considered to be work-related if an event or exposure in the work environment caused or contributed to the resulting condition or significantly aggravated a pre-existing injury or disease. Work-relatedness is defined for injuries and diseases resulting from events or exposures occurred in the work environment, defining the work environment as the physical place where one or more employees work or are present due to work reasons. The work environment includes not only physical locations, but also the equipment or materials used by the employee during the course of his/her work.

7. ANNEXES

7.1. 2015 Data

Company Data

Function	average # employees	Hours worked (thousands)	Injuries	Illnesses	Fatalities	Total	Cases of Lost Workdays	Number of days away from work	Reactive indicators: Total	Reactive indicators: Incidents gravity's rate**	Reactive indicators: Incident's frecuency rate with lost work days***	Reactive indicators: Fatalities' rate
E&P offshore*	8,329	23,016	29	0	2	31	29	2,050	1.347	89.068	1.260	0.087
E&P Total	99,461	222,128	175	23	3	201	124	10,497	0.905	47.257	0.558	0.014
Refining	69,166	172,425	230	39	0	269	196	7,296	1.560	42.314	1.137	0.000
Pipelines	25,760	57,712	60	1	1	62	41	1,391	1.074	24.103	0.710	0.017
Transport-Maritime	11,917	18,044	9	0	0	9	6	452	0.499	25.050	0.333	0.000
Distribution	25,990	61,999	137	0	2	139	79	2,343	2.242	37.791	1.274	0.032
Others	85,785	185,806	146	9	1	156	132	5,158	0.840	27.760	0.710	0.005
Total	**318,079**	**718,114**	**757**	**72**	**7**	**836**	**578**	**27,137**	**1.164**	**37.789**	**0.805**	**0.010**

*Since the total men hours for E&P offshore was not provided, the indicators for this business line are calculated based on the data of the companies that shared their statistics.

Contractors Data

Function	average # employees	Hours worked (thousands)	Injuries	Illnesses	Fatalities	Total	Cases of Lost Workdays	Number of days away from work	Reactive indicators: Total	Reactive indicators: Incidents gravity's rate**	Reactive indicators: Incident's frecuency rate with lost work days***	Reactive indicators: Fatalities' rate
E&P offshore*	4,260	11,360	63	0	8	71	11	74	6.250	15.861	2.358	0.704
E&P Total	261,018	656,298	1,093	0	27	1,120	429	54,479	1.707	123.458	0.958	0.041
Refining	49,387	117,803	168	0	7	175	56	3,576	1.486	41.386	0.648	0.059
Pipelines	42,150	94,487	90	0	3	93	28	1,885	0.984	21.074	0.313	0.032
Transport-Maritime	1,754	966	0	0	0	0	0	0	0.000	nda	nda	0.000
Distribution	15,529	31,197	56	0	3	59	16	907	1.891	32.731	0.577	0.096
Others	142,636	309,951	599	0	0	599	208	11,651	1.933	43.779	0.782	0.000
Total	**512,474**	**1,210,702**	**2,006**	**0**	**40**	**2,046**	**737**	**72,498**	**1.690**	**79.583**	**0.803**	**0.033**

*Since the total men hours for E&P offshore was not provided, the indicators for this business line are calculated based on the data of the companies that shared their statistics.

** Gravity indicators are calculated with the following values of man hours worked (in thousands): E&P offshore - 4,666 / E&P total - 441,275 / Refining - 86,406 / Pipelines - 89,446 / Distribution - 27,711 / Others - 266,132 // Total - 910,970

*** Cases of Lost Workdays are calculated with the following values of man hours worked (in thousands): E&P offshore - 4,666 / E&P total - 447,611 / Refining - 86,406 / Pipelines - 89,446 / Distribution - 27,711 / Others - 266,132 // Total - 910,970

Combined data

Function	average # employees	Hours worked (thousands)	Injuries	Illnesses	Fatalities	Total	Cases of Lost Workdays	Number of days away from work	Reactive indicators: Total	Reactive indicators: Incidents gravity's rate**	Reactive indicators: Incident's frecuency rate with lost work days***	Reactive indicators: Fatalities' rate
E&P offshore*	12,589	34,376	92	0	10	102	40	2,124	2.967	76.730	1.445	0.291
E&P Total	360,479	878,426	1,268	23	30	1,321	553	64,976	1.504	97.943	0.826	0.034
Refining	118,553	290,228	398	39	7	444	252	10,872	1.530	42.004	0.974	0.024
Pipelines	67,910	152,198	150	1	4	155	69	3,276	1.018	22.262	0.469	0.026
Transport-Maritime	13,671	19,010	9	0	0	9	6	452	0.473	25.050	0.333	0.000
Distribution	41,519	93,196	193	0	5	198	95	3,250	2.125	36.228	1.059	0.054
Others	228,421	495,757	745	9	1	755	340	16,809	1.523	37.193	0.752	0.002
Total	**830,553**	**1,928,815**	**2,763**	**72**	**47**	**2,882**	**1,315**	**99,635**	**1.494**	**61.160**	**0.804**	**0.024**

*Since the total men hours for E&P offshore was not provided, the indicators for this business line are calculated based on the data of the companies that shared their statistics.

** Gravity indicators are calculated with the following values of man hours worked (in thousands): E&P offshore - 27,682 / E&P total - 663,403 / Refining - 258,831 / Pipelines - 147,157 / Transport-Maritime - 18,044 / Distribution - 89,710 / Others - 451,938 // Total - 1,628,083

*** Cases of Lost Workdays are calculated with the following values of man hours worked (in thousands): E&P offshore - 27,682 / E&P total - 669,739 / Refining - 258,831 / Pipelines - 147,157 / Transport-Maritime - 18,044 / Distribution - 89,710 / Others - 451,938 // Total - 1,628,083

7.2. Proactive indicators

Function	average # employees	Hours worked (thousands)	Task Planned Observations	Safety Training HoursI	Proactive indicators: Task Planned Observations	Proactive indicators: Safety Training Intensity
E&P Total	37,294	34,551	238,126	138,435	**6.39**	**0.40**
Refining	22,549	27,789	106,232	180,668	**4.71**	**0.65**
Pipelines	18,210	18,833	54,153	243,253	**2.97**	**1.29**
Transport-Maritime	35	75	14	74	**0.40**	**0.10**
Distribution	12,922	20,927	57,559	81,286	**4.45**	**0.39**
Others	39,815	34,880	86,174	115,793	**2.16**	**0.33**
Total	**130,825**	**137,056**	**542,258**	**759,509**	**4.14**	**0.55**

7.3. Historical data

7.3.1. Reactive indicators

Function		Indicator	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
E&P																		
E&P	Company	Total	1.167	2.875	2.266	1.742	2.202	2.779	2.865	3.663	3.648	4.184	6.234	5.680	1.254	1.220	1.086	**0.905**
E&P	Contractors	Total	3.989	5.379	2.818	2.597	3.070	4.060	3.946	4.092	4.134	3.083	3.038	3.127	2.050	2.051	2.136	**1.707**
E&P	Combined	Total	2.231	4.770	2.602	2.281	2.780	3.626	3.592	3.947	3.971	3.467	4.179	3.978	1.860	1.842	1.888	**1.504**
E&P	Company	Gravity	208.443	146.415	73.670	87.668	212.756	180.887	72.838	85.257	88.789	76.137	73.580	105.415	29.288	39.774	34.441	**47.257**
E&P	Contractors	Gravity	61.042	293.985	349.365	206.421	73.007	280.109	69.254	70.599	138.690	84.558	181.485	84.949	114.791	70.629	145.110	**123.458**
E&P	Combined	Gravity	152.856	182.395	256.546	135.954	147.310	226.574	70.764	78.978	117.956	80.649	129.142	94.096	83.200	59.193	110.298	**97.943**
E&P	Company	Lost Workdays	1.937	1.754	1.858	1.674	1.829	3.447	3.385	2.446	2.355	2.813	3.775	6.234	0.776	0.675	0.635	**0.558**
E&P	Contractors	Lost Workdays	3.654	2.779	2.133	2.746	1.893	2.210	2.289	2.289	1.878	1.224	1.131	1.705	0.760	0.720	1.143	**0.958**
E&P	Combined	Lost Workdays	2.585	2.238	2.009	2.094	1.872	2.497	2.650	2.354	2.076	1.777	2.082	3.217	0.764	0.709	0.983	**0.826**
E&P	Company	Fatalities	0.073	0.081	0.030	0.026	0.030	0.029	0.008	0.072	0.017	0.019	0.016	0.023	0.028	0.013	0.009	**0.014**
E&P	Contractors	Fatalities	0.067	0.092	0.070	0.096	0.070	0.041	0.043	0.064	0.043	0.026	0.021	0.040	0.050	0.010	0.020	**0.041**
E&P	Combined	Fatalities	0.071	0.088	0.054	0.070	0.057	0.037	0.031	0.067	0.034	0.024	0.019	0.034	0.045	0.010	0.017	**0.034**
Refining																		
Refining	Company	Total	10.543	4.337	2.667	1.999	2.815	3.719	2.660	3.822	4.000	3.642	6.398	3.294	2.752	2.368	1.895	**1.560**
Refining	Contractors	Total	4.872	8.356	2.832	2.699	3.523	8.967	4.741	5.613	6.118	4.706	4.272	4.699	3.080	3.294	2.097	**1.486**
Refining	Combined	Total	9.748	6.368	2.713	2.209	3.036	5.585	3.402	4.568	4.904	4.080	5.434	3.876	2.879	2.627	1.976	**1.530**
Refining	Company	Gravity	87.293	81.486	99.711	118.139	262.201	263.005	64.077	47.367	101.506	60.388	73.248	48.707	61.117	47.402	113.196	**42.314**
Refining	Contractors	Gravity	31.669	626.472	463.375	339.274	525.086	630.935	118.871	160.858	60.941	40.412	46.484	55.182	41.469	52.112	28.868	**41.386**
Refining	Combined	Gravity	79.491	156.027	252.275	153.953	301.468	325.390	72.034	78.747	85.394	52.660	61.542	51.075	54.945	48.872	84.822	**42.004**
Refining	Company	Lost Workdays	2.447	1.092	2.186	2.029	2.001	5.394	1.654	2.518	2.095	5.110	2.909	4.345	1.623	1.234	1.050	**1.137**
Refining	Contractors	Lost Workdays	3.057	2.788	4.638	8.981	1.707	3.206	1.897	3.085	2.497	8.543	1.299	1.789	0.967	0.676	0.706	**0.648**
Refining	Combined	Lost Workdays	2.532	1.333	2.682	3.038	1.906	4.292	1.738	2.743	2.255	6.523	2.170	2.786	1.369	1.023	0.934	**0.974**
Refining	Company	Fatalities	0.016	0.013	0.030	0.026	0.025	0.060	0.028	0.011	0.049	0.044	0.057	0.033	0.018	0.012	0.041	**0.000**
Refining	Contractors	Fatalities	0.096	0.148	0.151	0.091	0.041	0.073	0.103	0.038	0.007	0.040	0.020	0.023	0.056	0.058	0.026	**0.059**
Refining	Combined	Fatalities	0.027	0.048	0.064	0.045	0.030	0.064	0.055	0.022	0.031	0.042	0.040	0.029	0.033	0.029	0.035	**0.024**
Pipelines																		
Pipelines	Company	Total	1.319	0.529	1.786	1.475	2.192	5.042	5.744	2.143	2.380	1.590	4.811	2.716	2.036	1.346	1.150	**1.074**
Pipelines	Contractors	Total	1.093	6.215	1.631	1.225	1.754	8.042	7.431	4.261	2.893	3.351	3.123	2.891	2.043	1.574	1.411	**0.984**
Pipelines	Combined	Total	1.265	0.975	1.719	1.353	1.956	7.169	6.877	3.321	2.635	2.632	3.730	2.827	2.041	1.500	1.333	**1.018**
Pipelines	Company	Gravity	92.626	44.051	66.453	54.432	185.335	214.104	46.918	21.505	41.120	25.910	29.977	25.393	57.342	28.740	20.410	**24.103**
Pipelines	Contractors	Gravity	8.153	0.000	10.192	26.136	29.478	33.931	27.681	38.982	27.730	40.909	152.685	22.808	14.090	38.364	15.882	**21.074**
Pipelines	Combined	Gravity	72.450	41.816	39.440	48.044	163.410	177.237	42.433	26.016	34.572	34.787	108.580	23.778	28.623	35.186	17.283	**22.262**
Pipelines	Company	Lost Workdays	1.451	0.815	0.967	1.239	1.782	2.348	3.000	1.330	1.381	0.941	1.656	1.541	0.994	0.769	0.767	**0.710**
Pipelines	Contractors	Lost Workdays	1.093	0.000	0.718	1.480	1.356	1.550	1.008	1.353	1.182	1.004	0.978	1.051	0.552	0.483	0.606	**0.313**
Pipelines	Combined	Lost Workdays	1.365	0.707	0.920	1.276	1.549	2.185	1.694	1.343	1.284	0.978	1.237	1.191	0.699	0.575	0.656	**0.469**
Pipelines	Company	Fatalities	0.026	0.000	0.017	0.018	0.042	0.000	0.039	0.000	0.017	0.000	0.024	0.082	0.047	0.000	0.000	**0.017**
Pipelines	Contractors	Fatalities	0.336	0.396	0.067	0.055	0.054	0.038	0.000	0.032	0.000	0.000	0.026	0.012	0.000	0.034	0.010	**0.032**
Pipelines	Combined	Fatalities	0.100	0.056	0.038	0.036	0.049	0.027	0.013	0.018	0.008	0.000	0.025	0.038	0.016	0.023	0.007	**0.026**
Distribution																		
Distribution	Company	Total	10.013	15.857	4.642	4.364	2.617	2.024	4.662	4.985	4.700	7.881	5.485	4.081	2.540	1.806	1.684	**2.242**
Distribution	Contractors	Total	2.483	1.867	2.203	1.991	1.439	2.266	3.162	2.530	2.691	2.970	2.104	2.289	2.234	0.850	1.727	**1.891**
Distribution	Combined	Total	7.268	11.296	3.773	3.467	2.189	2.110	3.917	3.987	3.771	5.934	4.211	3.446	2.412	1.297	1.700	**2.125**
Distribution	Company	Gravity	78.701	95.350	92.071	74.798	74.511	98.448	56.815	30.489	69.055	79.820	62.334	60.666	37.623	21.143	96.943	**37.791**
Distribution	Contractors	Gravity	33.557	28.241	26.401	31.468	19.532	30.793	34.618	40.859	40.878	127.176	22.337	23.255	34.973	12.347	458.961	**32.731**
Distribution	Combined	Gravity	62.248	85.829	70.102	61.742	62.087	87.951	47.456	33.278	57.873	97.948	49.745	48.087	36.606	17.987	223.265	**36.228**
Distribution	Company	Lost Workdays	7.640	11.789	4.089	4.117	2.006	2.420	3.119	4.149	4.664	7.287	3.882	5.115	2.187	1.302	0.943	**1.274**
Distribution	Contractors	Lost Workdays	1.572	1.339	1.497	1.601	1.004	0.946	1.314	1.811	1.093	1.880	0.881	1.092	0.821	0.333	0.817	**0.577**
Distribution	Combined	Lost Workdays	5.429	9.830	3.184	3.292	1.642	1.634	2.223	3.246	3.066	5.143	2.750	3.252	1.617	0.786	0.899	**1.059**
Distribution	Company	Fatalities	0.024	0.024	0.027	0.027	0.010	0.016	0.000	0.000	0.000	0.000	0.050	0.015	0.000	0.000	0.000	**0.032**
Distribution	Contractors	Fatalities	0.000	0.084	0.049	0.117	0.084	0.247	0.071	0.111	0.105	0.257	0.273	0.136	0.164	0.018	0.057	**0.096**
Distribution	Combined	Fatalities	0.015	0.037	0.035	0.060	0.036	0.098	0.035	0.045	0.050	0.101	0.134	0.058	0.069	0.010	0.021	**0.054**
Others																		
Others	Company	Total	1.030	6.879	3.441	2.011	1.784	1.880	2.235	2.903	3.701	2.403	2.350	2.180	1.402	1.669	0.993	**0.840**
Others	Contractors	Total	0.046	2.775	1.877	1.573	1.050	3.425	3.959	2.767	2.530	2.323	2.217	2.033	2.501	2.176	1.763	**1.933**
Others	Combined	Total	0.559	4.318	2.441	1.718	1.320	2.933	3.368	2.807	2.846	2.340	2.253	2.066	2.277	2.039	1.554	**1.523**
Others	Company	Gravity	30.757	59.755	80.054	62.328	70.119	58.436	28.131	29.100	48.379	17.594	16.696	26.965	21.655	28.111	27.450	**27.760**
Others	Contractors	Gravity	0.000	40.308	749.648	206.377	13.799	83.378	84.504	19.148	42.262	48.340	57.390	62.079	73.495	63.372	81.113	**43.779**
Others	Combined	Gravity	16.039	84.015	406.346	80.217	67.041	59.707	31.010	28.035	44.011	41.326	46.015	53.944	62.411	56.163	65.651	**37.193**
Others	Company	Lost Workdays	1.724	2.755	2.652	1.756	1.499	1.648	1.013	2.100	1.525	1.384	0.871	2.213	1.091	1.178	0.783	**0.710**
Others	Contractors	Lost Workdays	2.428	3.521	1.619	5.919	1.050	0.852	0.907	0.769	0.601	0.546	0.583	0.803	0.840	0.671	0.636	**0.782**
Others	Combined	Lost Workdays	2.061	3.144	2.262	2.071	1.212	1.241	0.943	1.195	0.865	0.728	0.660	1.022	0.891	0.773	0.678	**0.752**
Others	Company	Fatalities	0.000	0.035	0.014	0.000	0.009	0.000	0.009	0.008	0.000	0.007	0.005	0.013	0.000	0.000	0.000	**0.005**
Others	Contractors	Fatalities	0.046	0.051	0.054	0.041	0.020	0.045	0.019	0.020	0.011	0.004	0.011	0.013	0.014	0.004	0.006	**0.000**
Others	Combined	Fatalities	0.022	0.044	0.040	0.028	0.016	0.031	0.015	0.016	0.008	0.005	0.010	0.013	0.012	0.003	0.004	**0.002**
Total																		
Total	Company	Total	5.320	5.319	2.784	2.167	2.351	2.811	2.869	3.579	3.723	3.835	5.061	4.130	1.805	1.658	1.296	**1.164**
Total	Contractors	Total	2.709	5.462	2.484	2.196	2.381	4.542	4.232	3.842	3.748	2.967	2.772	2.828	2.297	2.071	1.949	**1.690**
Total	Combined	Total	4.494	5.415	2.632	2.183	2.368	3.808	3.671	3.738	3.738	3.287	3.609	3.291	2.149	1.895	1.740	**1.494**
Total	Company	Gravity	119.188	101.406	85.615	89.572	174.093	166.014	60.290	54.950	78.952	57.608	54.537	68.018	38.087	36.546	55.542	**37.789**
Total	Contractors	Gravity	34.963	320.162	356.408	188.257	115.214	295.429	65.242	83.563	84.600	62.625	102.874	66.155	79.891	61.238	109.592	**79.583**
Total	Combined	Gravity	92.562	150.936	228.874	118.290	157.413	202.007	62.330	64.096	82.174	60.496	82.393	66.925	64.434	42.983	89.356	**61.160**
Total	Company	Lost Workdays	2.668	2.973	2.276	2.054	1.838	3.183	2.313	2.479	2.226	3.387	2.738	4.695	1.167	0.969	0.800	**0.805**
Total	Contractors	Lost Workdays	2.817	2.783	2.260	3.390	1.555	1.952	1.817	1.834	1.431	1.733	0.904	1.251	0.795	0.671	0.862	**0.803**
Total	Combined	Lost Workdays	2.715	2.907	2.269	2.410	1.679	2.402	2.023	2.120	1.771	2.343	1.573	2.216	0.907	0.760	0.839	**0.804**
Total	Company	Fatalities	0.034	0.043	0.026	0.021	0.022	0.028	0.017	0.032	0.021	0.020	0.022	0.025	0.019	0.009	0.013	**0.010**
Total	Contractors	Fatalities	0.074	0.095	0.074	0.080	0.055	0.061	0.044	0.048	0.029	0.025	0.024	0.029	0.037	0.013	0.016	**0.033**
Total	Combined	Fatalities	0.047	0.067	0.050	0.053	0.040	0.047	0.033	0.042	0.026	0.023	0.023	0.028	0.031	0.012	0.015	**0.024**

7.3.2. Reactive indicators (E&P Offshore)

Indicator	Category	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total	Company	2.03	2.98	3.20	2.79	5.64	3.90	5.43	9.75	9.31	4.123	0.810	0.769	1.347
Total	Contractors	1.46	3.40	3.35	1.62	6.86	3.55	2.39	2.38	2.68	5.586	0.893	1.421	6.250
Total	Combined	1.73	3.11	3.27	2.17	6.13	3.77	4.43	7.72	7.29	5.053	0.849	0.990	2.967
Gravity	Company	114.22	126.48	103.24	79.26	125.55	66.57	52.69	43.74	22.06	223.027	47.365	5.059	89.068
Gravity	Contractors	11.29	10.58	81.04	28.58	59.84	215.16	87.12	113.89	129.24	65.938	73.474	17.915	15.861
Gravity	Combined	110.27	122.46	97.37	52.12	108.88	91.38	57.73	50.36	58.06	123.142	49.240	8.029	76.730
Lost Workdays	Company	1.97	3.25	7.44	2.36	4.10	3.18	4.41	6.41	12.19	4.022	0.767	0.769	1.260
Lost Workdays	Contractors	1.03	2.71	2.85	1.20	6.39	5.36	1.95	3.32	2.44	5.413	0.813	1.751	2.358
Lost Workdays	Combined	1.93	3.07	4.58	1.74	4.68	3.55	3.60	6.12	9.49	4.907	0.789	0.996	1.445
Fatalities	Company	0.06	0.02	0.00	0.00	0.19	0.00	0.00	0.01	0.01	0.000	0.014	0.000	0.087
Fatalities	Contractors	0.09	0.17	0.04	0.01	0.61	0.03	0.03	0.04	0.03	0.000	0.000	0.000	0.704
Fatalities	Combined	0.08	0.07	0.02	0.01	0.36	0.01	0.01	0.02	0.02	0.000	0.008	0.000	0.291

7.3.3. Proactive indicators

Task Planned Observations Indicator (Company)											
Function	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
E&P	1.83	1.07	1.28	1.01	4.87	1.45	3.12	8.69	7.76	17.98	6.39
Refining	2.21	0.99	1.60	2.51	7.05	15.93	5.22	4.06	5.36	6.69	4.71
Pipelines	1.18	1.59	0.92	1.25	2.42	3.81	1.98	2.05	2.56	4.16	2.97
Distribution	2.63	1.36	1.38	1.64	1.24	1.01	1.88	2.02	0.01	0.19	0.40
Others	0.28	1.44	0.57	1.41	3.23	1.29	2.19	2.56	2.29	1.07	4.45
Global	**1.96**	**1.15**	**1.12**	**1.35**	**3.93**	**3.70**	**3.27**	**4.59**	**4.98**	**8.39**	**4.14**

Safety Training Intensity (Company)											
Function	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
E&P	0.62	0.21	0.22	0.14	0.10	0.32	0.30	0.29	0.51	0.63	0.40
Refining	0.29	0.26	0.21	0.21	0.30	0.83	0.35	0.59	0.80	0.81	0.65
Pipelines	0.10	2.54	1.19	1.68	0.16	2.49	0.97	0.45	1.00	0.94	1.29
Distribution	0.08	0.15	0.10	1.13	0.10	0.19	0.19	0.28	0.58	0.58	0.39
Others	0.19	0.11	0.02	0.10	0.26	0.32	0.18	0.44	0.62	0.21	0.33
Global	**0.36**	**0.24**	**0.18**	**0.20**	**0.17**	**0.45**	**0.30**	**0.42**	**0.57**	**0.59**	**0.55**

8. REFERENCES

1. ARPEL User's Manual – Safety benchmarking in the oil and gas industry in Latin America and the Caribbean – 6ª Edition, 2012. ARPEL.

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REGIONAL ASSOCIATION OF
OIL, GAS AND BIOFUELS SECTOR COMPANIES
IN LATIN AMERICA AND THE CARIBBEAN

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