

Benchmarking on Environmental Performance in the Oil and Gas Industry in Latin America and the Caribbean – Information of ARPEL Member Companies for 2011



ARPEL ENVIRONMENTAL REPORT

Benchmarking on Environmental Performance in the Oil and Gas Industry in Latin America and the Caribbean – Information of ARPEL Member Companies for 2011

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This is a document developed within the context of the activities of the **ARPEL Environment**, **Health and Safety Committee**.

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ARPEL Environment, Health and Safety Committee

The work of the Environment, Health and Safety Committee cuts across upstream and downstream operations and focuses on health and prevention of occupational incidents, the integrity of operations, and the improvement of environmental management performance - with special attention to oil spill preparedness and response.

The Committee seeks to identify emerging environment, health and safety issues and challenges, and works with members to understand their impact on the industry and to develop regional strategies and actions to address them. The Environment, Health and Safety Committee provides best practice guidance on environment, health and safety processes and management systems, and annually compiles safety performance statistics and produces a comprehensive environmental benchmarking report for the industry in the region. It actively liaises with other industry associations to maximize its industry impact.

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1. Executive summary

Starting in 2008, the Regional Association of Oil, Gas and Biofuels Sector Companies in Latin America and the Caribbean (ARPEL) started collecting -annually- environmental information from its member companies. The objective of this program has been to allow its member companies to compare their performance with other companies of the sector, leading to a more efficient performance.

This report summarizes the information of the activities corresponding to: Exploration and Production, Pipelines, Terminals, Distribution/Transport, Refining and Petrochemicals of ARPEL member companies that contributed with their 2011 data. A total of 17 members with operations in 15 countries of Latin America and the Caribbean¹ reported their data for the elaboration of this report. The information is integrated as "company-country" and is presented for the following environmental indicators:

- Hydrocarbons' spills in all the functions
- o Produced Water discharges and re-injection in Exploration and Production activities
- o Water and oil discharged as process effluents in all the functions
- Disposal of hazardous and non-hazardous solid wastes in all the functions

As a whole, these companies represent 72 % of the refining activity, 50 % of the oil production and 43 % of gas production activity of Latin America and the Caribbean in 2011².

The number of reporting companies increased from 16 (in 2010) to 17 (in 2011), as well as the number of "companies-country", which increased from 25 to 28.

¹ Latin America and the Caribbean include: South America, Central America, the Caribbean and Mexico

² According to <u>BP Statistical Review of World Energy (2011)</u> the total of Latin America and the Caribbean for 2010 is: 292,410x10³ tonnes of products refined, 525.0x10⁶ tonnes of oil produced, and 220.2x10⁹ cubic meters of gas produced. The information on gas production reported by the companies used a conversion factor of 0.9 Tonnes per 1,000 cubic meters.



2. Introduction and scope of the reported data

Starting in 2008, the Regional Association of Oil, Gas and Biofuels Sector Companies in Latin America and the Caribbean (ARPEL) started collecting -annually- environmental information from its member companies. The ultimate objective of this effort is to provide a representative assessment of the environmental performance of the oil and gas industry operating in Latin America and the Caribbean.

Periodically measuring environmental performance is an important management strategy to accomplish continuous improvement. By comparing (benchmarking) their environmental performance, oil and gas companies may compare their performance with industry trends and with other companies in the sector. Environmental management improvement is promoted through the ARPEL Environment, Health and Safety Committee (CASYSIA) through the exchange of experiences with those companies having a better environmental performance.

Data is integrated as "companies-country" and presented for the following environmental indicators:

- Hydrocarbons' spills in all the functions
- o Produced Water discharges and re-injection in Exploration and Production activities
- o Water and oil discharged as process effluents in all the functions
- Disposal of hazardous and non-hazardous solid wastes in all the functions

Data is collected annually for each of the categories above-mentioned, based on definitions agreed to by the CASYSIA. Indicators agreed to by the CASYSIA in this stage are described in the "Users Manual – ARPEL Database – Benchmarking on Environmental Performance in the Oil and Gas Industry in Latin America and the Caribbean" (2nd edition, 2011).

The Manual provides definitions, procedures, and instructions for those responsible of collecting and reporting environmental data to ARPEL, of which we highlight:

- The indicators are classified in 6 functions: Exploration and Production, Pipelines, Terminals, Distribution/Transport, Refining and Petrochemical. The scope of these functions is defined in the Manual.
- The information shown is for oil and natural gas operations in Latin America and the Caribbean.
- Companies report data of their environmental performance by consolidating 100 percent of the data or information of indicators or information of operations over which they have management control and NOT data from operations they do not manage. For the purposes of this Manual, oil and gas companies define the operated boundary as all of those facilities where the company's management has accountability and authority for sustainability policies, systems and performance (health, safety, environmental, social and/or economic) related to the facility.
- The "Total operation" shown in Tables 2, 3, 4, 5 and 6 refers to the amount of product transported, processed, produced, etc., as defined in Chapter 6.1 of the User Manual ARPEL Database Benchmarking of environmental performance in the oil and gas in Latin America and the Caribbean" (2nd revised edition, 2011)



This is the fourth environmental benchmarking report of ARPEL. In the future, it is expected to continue adding more indicators that can be agreed on and that are useful for the objectives of continuous improvement of the environmental performance of ARPEL Member Companies and the oil and natural gas industry in general.

The Member Companies that reported data for this report are the ones shown in Table 1. It should be pointed out that:

- some companies reported data of more than one country (of the Region), resulting in a total of 28 "companies-country", which were codified so that confidentiality of the information is kept.
- not all the companies have activity in all the functions or reported data for all the indicators, so not all the indicators that appear in the following chapters contain the 28 "companies-country"
- as a whole, the magnitude of the activities of these companies represent 72 % of the refining activity, 50 % of the oil production activity and 43 % of the gas production activity of Latin America and the Caribbean in 2011³.

Ancap	Petrobras
Ecopetrol	Petroperu
Enap	Petrotrin
EP-Petroecuador	Pluspetrol
Esso Petrolera Argentina	Recope
Hocol	Refidomsa
Ocensa	Repsol
PCJ	Staatsolie
Pemex	

Table 1: Companies that participated in the 2011 Report

³ Idem 2.



Table 2 details the number of "companies-country" and the consolidated magnitude of the activities reported for each function⁴.

Function	# Companies- country that reported data	Total operations (10^3 Ton)
E&P offshore	7	220.284
E&P onshore	17	126.398
E&P Total	18	346.682
Pipelines transportation	10	15.292.540
Terminals Movement	9	93.145
Distribution / Transport	11	442.570
Refining	14	211.429
Petrochemical	1	7.517
Total	28	16.393.882

Table 2: Data consolidation (in 10³ Tonnes)

⁴ If in a mixed operation, the quantities are not collected separately for onshore and offshore, the quantities are entered as **Undefined**



3. Environmental Indicators

3.1 Hydrocarbon spills

Spills represent a very important environmental performance indicator for the oil and natural gas industry as they have a visible impact on the environment. The degree of environmental impact is highly dependent on the nature of the spill, where it happened and how it was handled.

For the purpose of this report, spills include all the releases from the facilities operated by the company, but they do NOT include primary and/or secondary containment or other impermeable surfaces if they do not reach the environment.

Table 3 details the number of "companies-country", the consolidated magnitude of the activities reported for each function in the "Hydrocarbon spills" indicator, the average value of "hydrocarbon spills" indicator for each function, the number of spills, total volume spilled and the average volume by spill.

The "Hydrocarbon spills" indicator is classified by:

- the destination of the spill, in which case the information is classified by spill into "In land", "In water" and "Total".
- in the case of Exploration and Production, it is –also- divided by the source of the activity, i.e., "E&P offshore", "E&P onshore" and "E&P undefined". There are no spills in land from offshore operations. "E&P undefined" spills show that the companies that report do not differentiate (in their own environmental information management systems) the source of the E&P activity that caused the spill reported.

Benchmarking on Environmental Performance in the Oil and Gas Industry in Latin America and the Caribbean – Information of ARPEL Member Companies for 2011



Function	Land/Water	# Companies- country	Vol Oper. (Ton)	Bbl/10^6 Ton	# spills/10^6 Ton	Bbl/Spills	Total Bbl Spilled	Total # Spills
E&P offshore	Water	7	220.284	2,49	0,50	4,9	549	111
E&P onshore	Land	16	125.478	30,99	5,00	6,2	3.888	628
	Water	16	125.478	5,33	0,69	7,8	669	86
	Total	17	126.398	36,16	5,80	6,2	4.571	733
E&P (offshore+onshore)	Total	18	346.682	14,77	2,43	6,1	5.120	844
Pipelines	Land	9	15.291.615	1,46	0,02	87,4	22.291	255
	Water	9	15.291.615	0,28	0,00	712,9	4.277	6
	Total	10	15.292.540	1,74	0,02	76,2	26.608	349
Terminals	Land	9	93.145	5,49	0,26	21,3	511	24
	Water	9	93.145	0,00	0,01	0,2	0	1
	Total	9	93.145	5,49	0,27	20,5	511	25
Distribution/Transport	Land	10	442.113	2,55	0,05	51,2	1.126	22
	Water	10	442.113	0,00	0,00	0,0	0	0
	Total	11	442.570	2,57	0,06	45,4	1.136	25
Refining	Land	13	211.028	15,66	0,22	71,8	3.305	46
	Water	13	211.028	0,41	0,04	9,7	87	9
	Total	14	211.429	16,04	0,26	61,7	3.392	55

Table 3: "Hydrocarbon Spills"



SUGGESTIONS FOR COMPANIES IN RELATION TO INDICATORS ASSOCIATED WITH SPILLS:

- Separate in your environmental information management systems:
 - The **source** of Exploration and Production spills. Some companies report in Table 3 "E&P onshore" and "E&P offshore", but they cannot report the spill source (Table 4) and they do it in Undefined E&P and the information processed in this way is not useful.
 - The **destination** of spills for all the functions. Some companies cannot inform if the spill was in land or in water and they load it in "Total". Environmental impact implications, as well as for the environmental, social and economic management are different if the spill was in land than if it was in water.
 - o The **size** of the spills. Some companies do not classify the spills by its size and they report a total of spilled barrels. The decisions to be taken by the company in the future are different if they had 100 spills of 1 barrel than if they had 1 spill of 100 barrels.

3.2 Produced water: discharges and re-injection

The hydrocarbons' production implies the extraction of water, usually called "produced water". This produced water can be discharged to the environment as it is extracted, or it can be previously treated. Whatever the treatment is, there is always some dissolved hydrocarbon in the produced water. The discharge of produced water to the surrounding environment can have a negative impact on the environment. Produced water can also be re-injected to the production well. The "produced water re-injection" is key for showing the environmental operative excellence during the hydrocarbons' production.

The indicators presented in this chapter include:

- the quantity of produced water discharged (including the water that is treated and discharged on land)
- the quantity of hydrocarbon discharged in the produced water, and
- the quantity of water re-injected as a disposal management method.

Table 4 details the number of "companies-country", the indicators "Produced water discharge", "Oil discharged in produced water" and "Produced water re-injection", and the consolidated magnitude of the activities reported for them. These indicators are classified by the source of the activity, that is: "E&P offshore", "E&P onshore".

	Prod	uced Water D	Discharged	Oil discharged in produced water			
Function	# Companies- Vol Oper. Prod. Water disch country (Ton) (m3/10^3 Ton)		# Companies- country	Vol Oper. (Ton)	Oil disch. In prod. water (Ton/10^6 Ton)		
E&P offshore	7	220.284	502,8	N/A*	N/A	N/A	
E&P onshore	17	111.147	506,8	8	39.921	0,05	
E&P Total	18	331.431	504,1	N/A*	N/A	N/A	

Table 4: "Discharge and re-injection of produced water"

* There were not enough data reported to calculate a benchmarking

	Water re-injected						
Function	# Companies- country	Vol Oper. (Ton)	Water re-injected (m3/10^3 Ton)				
E&P offshore	5	219.042	76,5				
E&P onshore	16	125.763	2.100,9				
E&P Total	17	344.804	814,9				

SUGGESTIONS FOR COMPANIES IN RELATION TO INDICATORS ASSOCIATED WITH PRODUCED WATER:

- It is vital that companies measure the quantity of oil associated to the discharge of produced water and that they split, in their environmental information management system, if these quantities correspond to onshore or offshore E&P operations. Not doing it is an inadequate environmental practice that could even have legal implications since the oil content in the produced water discharged is regulated.
- When analyzing the information on indicators associated with produced water, aspects that are not analyzed in this report should be taken into account. For example: a mature production field can have a great quantity of water associated to its production.

3.3 Controlled water and hydrocarbons discharges in process effluents

The use of water in the industry processes determines the possible environmental impact, due to the consumption of fresh water as well as to the quantity of dissolved or discharged hydrocarbons associated with the effluents. This indicator refers to the Exploration and Production, Pipelines, Terminals, Refining, Petrochemical and Distribution/Transport functions and it is used to establish the quantity of hydrocarbon discharged as effluent of facility processes- including onshore discharges to drain structures that connect to watercourses – for the reporting year. It has two elements:

- The quantity of water discharged (in m³) normalized by the magnitude of the activity in each Function;
- The quantity of hydrocarbon discharged (in tonnes) normalized by the magnitude of the activity in each Function;

The ratio between the second and the first element is the concentration of hydrocarbons in the water discharged and the table calculates it automatically in the last column.

For the Exploration and Production function, these indicators DO NOT include produced water discharges or oil associated to produced water since they do not correspond to processes



associated to the extraction of hydrocarbons but rather to the extraction of hydrocarbons itself and were already recorded in chapters 3.2.

Table 5 details the number of "companies-country", the indicators "Water discharged as process effluent" and "Hydrocarbon discharges in process effluents" and the consolidated magnitude of the activities reported for each function on these indicators. The indicator "Concentration of hydrocarbons in process effluents" is automatically calculated for those companies that reported information for the two first⁵.

Effluent water discharged				Oil di	Concentration		
Function	# Companies- Country	Vol Oper. (Ton)	Effluent water disch. (m3/10^3 Ton)	# Companies- Conutry	Vol Oper. (Ton)	Oil disch. in water (Ton/10^9 Ton)	Concentration (mg HC/liter)
E&P offshore	3	218.865	37,7	1*	N/A	N/A	N/A
E&P onshore	11	94.014	70,6	7	79.070	752,4	10,1
E&P Total	13	312.879	47,6	7	N/A	N/A	N/A
Pipelines transportation	7	15.289.860	0,1	5	15.193.870	0,1	0,7
Terminals Movement	7	85.347	186,7	5	57.471	2.713,0	9,8
Distribution / Transport	9	436.780	0,7	6	436.295	0,0	0,1
Refining	12	204.150	1.404,3	10	184.862	7.823,7	5,4

Table 5: "Process effluents"

• Only one company reported data, so is not possible to calculate the benchmarking.

SUGGESTIONS FOR COMPANIES IN RELATION TO INDICATORS ASSOCIATED WITH WATER AND HYDROCARBONS IN PROCESS EFFLUENTS:

- When analyzing the information on indicators associated with water and hydrocarbons in process effluents, aspects that are not analyzed in this report should be taken into account. For example: a more complex refinery may require a greater process water consumption than one that is less complex.
- Process effluents CAN NOT have 0 (zero) concentration of hydrocarbons. Should it be so, it would look like what is being measured is cooling water or other type of water stream that -although it might be part of the environmental information system, it must NOT be added to the calculation of water requested in this part since this indicator does NOT include "Water used in utilities and does not get in contact with hydrocarbons and is returned to the source" (see chapter 5.2.2 of the "Users Manual – ARPEL Database – Benchmarking on Environmental Performance in the Oil and Gas Industry in Latin America and the Caribbean" – 2nd edition, 2011)
- A larger data recording of water and hydrocarbons is noted for the Refining function, which seems logical given that the environmental control of refineries has long history in the countries

⁵ If companies report (zero) in "Water discharged as process effluent", then the "Concentration of hydrocarbons in process effluents" is not calculated.



of the region. However, it is recommended to measure and/or discriminate in the environmental information management system the concentration of hydrocarbons in the process effluents of all Functions.

• Hydrocarbons concentration in Refining process effluents for some companies is quite higher to the commonly accepted standard of 10 mgHC/L⁶. They should consider this issue and try to implement better practices to reduce this concentration to stricter standards.

3.4 Disposal of hazardous and non-hazardous solid wastes

Effective waste management is an indicator of operational efficiency. Some hazardous wastes, when not properly managed, can have significant environmental, social and economic impacts. For the purpose of this report, "hazardous wastes" includes all waste that is defined as hazardous, toxic, listed, priority, special, or some other similar term as defined by an appropriate local regulatory agency or authority. "Local" refers to the point of waste generation. Disposal can then include: land filling or burning without waste recovery for energy; and/or management of waste other than with reuse purposes, recycling, reclamation or other beneficial use.

The following is NOT part of the results reported by companies for this report:

- In downstream operations, major shutdowns and periodic maintenance activities that can result in short term increases in hazardous waste generated.
- Large one-time construction projects, remediation activities, and high-volume aqueous wastes
- For upstream operations, drilling operations, large one-time construction projects, remediation activities, and high-volume aqueous wastes that can result in large variations in hazardous wastes generated

Table 6 details the number of "companies-country", the "Disposal of hazardous wastes" and "Disposal of non-hazardous wastes" indicators and the consolidated magnitude of the activities reported for each Function on these indicators.

⁶ See IFC's Environmental, Health, and Safety Guidelines for Petroleum Refining (April 2007)



		Hazardous w	NON-Hazardous waste			
Function	# Companies- Country	Vol Oper. (Ton)	Regulated Hazardous waste disposed (Ton/10^6 Ton)	# Companies- Country	Vol Oper. (Ton)	Non-Hazardous waste disposed (Ton/10^6 Ton)
E&P offshore	6	220.234	140,4	4	218.991	1,0
E&P onshore	15	126.016	308,2	17	126.398	2.643,4
E&P Total	17	346.249	201,3	18	345.388	968,0
Pipelines transportation	8	15.291.364	8,62	8	15.291.364	0,0
Terminals movement	6	76.379	411,29	6	76.379	72,7
Distribution / Transport	8	436.780	26,9	8	436.780	3,7
Refining	12	204.616	899,9	11	106.159	734,4

Table 6: "Waste disposal"

SUGGESTIONS FOR COMPANIES IN RELATION TO HAZARDOUS AND NON-HAZARDOUS WASTES INDICATORS:

- When analyzing the benchmarking information on solid wastes in operations, aspects that are not analyzed in this report should be taken into account. For example: a more complex refinery may generate fewer wastes than one that is less complex.
- A larger data-recording of wastes from E&P and Refining functions is noted, compared to other functions. It is recommended to measure/discriminate this information -in the environmental information management system- for all the Functions.
- Do not report the "exceptional" generation of solid wastes (see chapter 5.3 of the 2nd edition of the User's Manual – ARPEL Database "Benchmarking on Environmental Performance in the Oil and Gas Industry in Latin America and the Caribbean", 2011)

Regional Association of Oil, Gas and Biofuels Sector Companies in Latin America and the Caribbean

ARPEL is a non-profit association gathering oil, gas and biofuels sector companies and institutions in Latin America and the Caribbean. Founded in 1965 as a vehicle of cooperation and reciprocal assistance among sector companies, its main purpose is to actively contribute to industry integration and competitive growth, and to sustainable energy development in the region.

Its membership currently represents over 90% of the upstream and downstream activities in the region and includes national, international and independent operating companies, providers of technology, goods and services for the value chain, and national and international sector institutions.

Since 1976, ARPEL holds Special Consultative Status with the United Nations Economic and Social Council (ECOSOC). In 2006, the association declared its adherence to the UN Global Compact principles.

Mission

To foster and facilitate sector integration and development, continuous operational improvement and effective management of environmental and social issues, by:

- sharing, enhancing and disseminating best practices;
- carrying out studies that translate in information of value;
- broadening knowledge and helping build required competences;
- promoting networking, interaction and cooperation among members and stakeholders.

Vision

A growing, competitive and integrated oil and gas industry that achieves excellence in its operations and products, and effectively contributes to a sustainable energy development in Latin America and the Caribbean.

Value proposition

ARPEL offers a unique mean for networking, sharing knowledge, joining efforts and building synergies in favor of the sector's integration, growth and sustainability. Without any distinction, Members have the opportunity to alternatively lead activities and projects, contribute with their know-how to their development, or learn from the experiences of other members.

ARPEL's value is also reflected in its condition of strategic information center about sector activities in the region and cost-effective vehicle for the development of publications on best practices and benchmarking, as well as on sectoral studies and executive reports aimed at diverse stakeholders. The Association additionally stands out for its regional conferences, forums and seminars of high impact in the industry.

ARPEL is a recognized regional body of representation for the sector that seeks to advocate in favor of the common interests of its Membership and to enhance the industry's public image and reputation.

Socio-environmental sustainability Operational excellence Sectoral development







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