

ANNUAL LIQUIDS PIPELINE

REPORT

2018

2017 PERFORMANCE REPORT





KEY PERFORMANCE INDICATORS

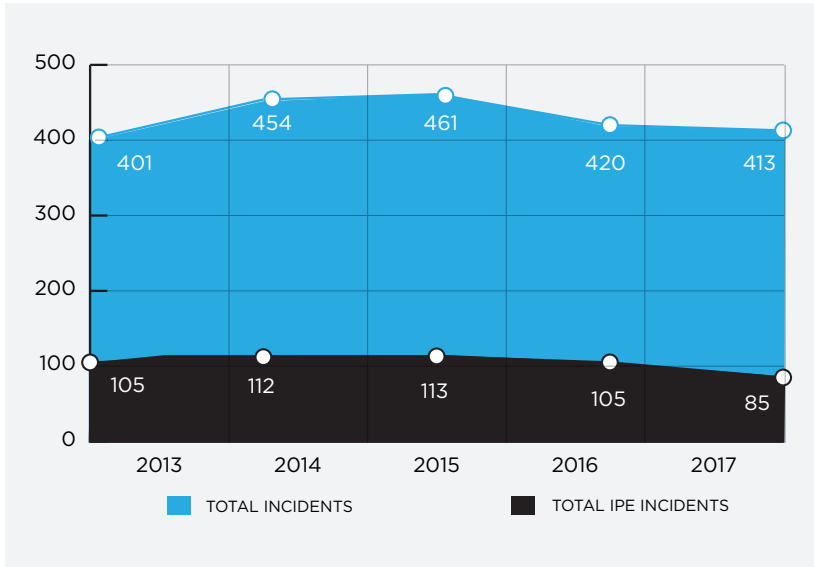
Pipeline operators and PHMSA collect hundreds of different data points measuring how safely pipelines are operating and the reasons behind pipeline incidents when they occur. Particularly useful measures of pipeline safety examine incident size, location, commodity and cause.

Each one of the following measures is used by the liquids pipeline industry to better understand pipeline incident trends and develop strategies for improving pipeline safety. However, the liquids pipeline industry also tracks a core set of Key Performance Indicators (KPIs) as a sign of overall pipeline safety performance. These KPIs are based primarily on incidents impacting people or the environment (IPE). They are newly created measures introduced in 2017 following a collaborative effort between PHMSA, public pipeline safety advocates represented by the Pipeline Safety Trust and the liquids pipeline industry. They reflect the highest priority we place on protecting people or the environment.

The four industry-wide KPIs are **1) Total Incidents Impacting People or the Environment; 2) IPE Incidents due to Integrity Management (IM) Causes; 3) IPE Incidents due to Operations and Maintenance (O&M) Causes; 4) and Participation in Pipeline Safety Management System (PSMS) Programs.** Integrity management causes are those pipe issues designed to be prevented by operator programs focused on assessment of line pipe integrity, including corrosion and cracking. Operations and maintenance causes are typified by equipment failure or incorrect operations.

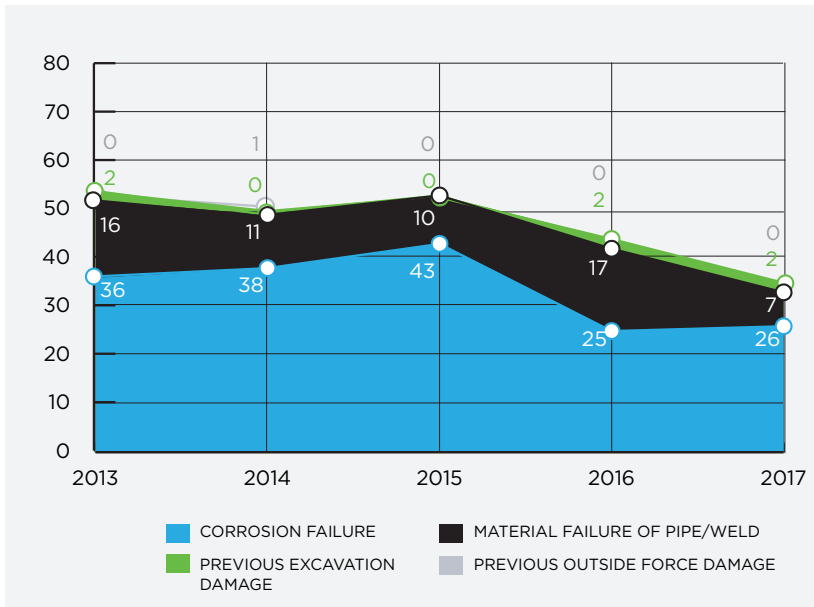
Key Performance Indicators

#1: TOTAL INCIDENTS & TOTAL IPE INCIDENTS (2013-2017)

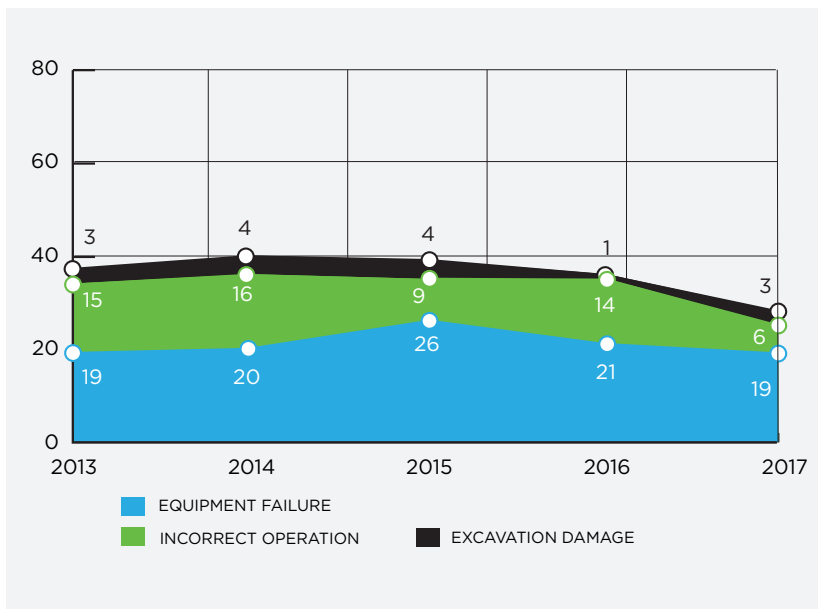


In 2017, approximately 85 incidents impacted the people or the environment, 20 fewer incidents than 2016, a 19% decrease in IPE incidents from 2016 as well as 2013. IPE incidents in 2017 represented 21% of total incidents (413) in that year. A full description of the specific types of incidents falling under the IPE criteria can be found on page 46.

#2: INTEGRITY MANAGEMENT IPE INCIDENTS (2013-2017)

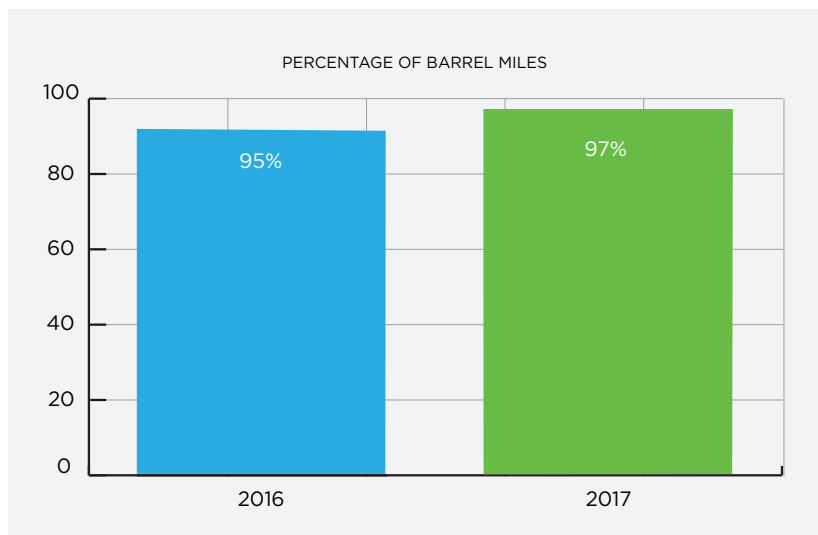


Integrity Management (IM) IPE releases are caused by failures of the pipeline, such as corrosion, cracking or a failure of the pipe metal or weld. Over the last 5 years, total IM IPE releases are down 35% from 54 to 34, and incidents caused by corrosion are down approximately 31%. Incidents caused by a failure of pipe metal or weld seams are down approximately 60%.



#3: OPERATIONS AND MAINTENANCE (O&M) IPE INCIDENTS

O&M IPE incidents reflect actions by operators during their day-to-day activities operating their pipeline network. Operations activities, such as installing and maintaining equipment and operating the pipeline and its valves, pumps and storage equipment, make up O&M IPE. Total O&M incidents are down 24% over the last five years. Equipment failure remained consistent from 2013 to 2017 and incorrect operations decreased by 60% from over the last 5 years.

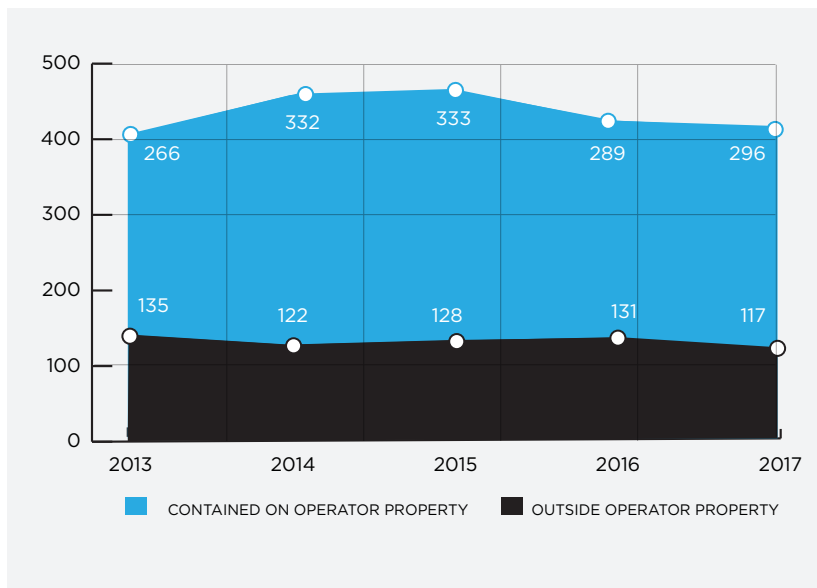


#4: PSMS OPERATOR COMMITMENT

In 2017, the pipeline industry increased operator commitment to pipeline safety management systems from 95% of barrel miles to 97% of barrel miles.

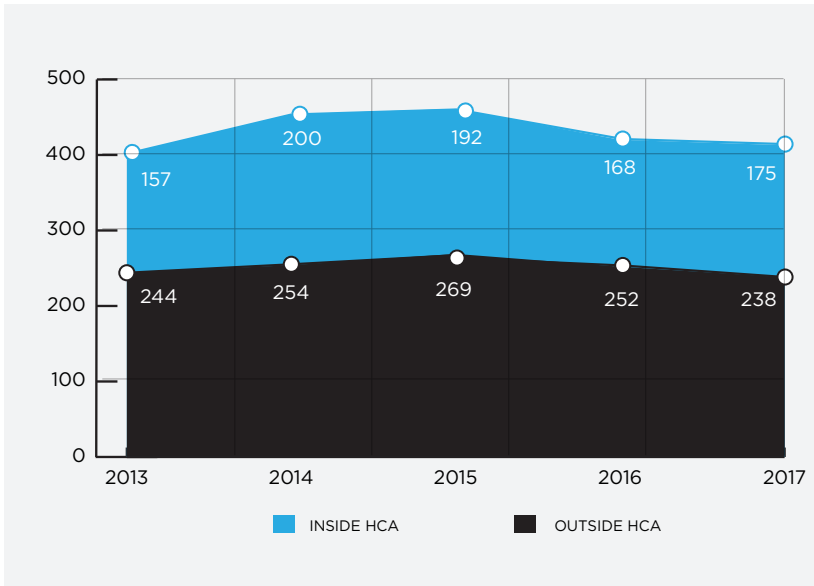
Incidents by Location

The location of a pipeline incident matters both when gauging the impact of an incident and developing strategies to prevent incidents in the future. Pipeline operators place the greatest emphasis on preventing and minimizing impacts to people or the environment (IPE). Tracking IPE incidents helps operators focus on this priority. Additional measures of incident impacts are whether they are contained on operator property or outside the operator’s facilities, specifically in high consequence areas (HCAs), a regulatory term used by PHMSA.



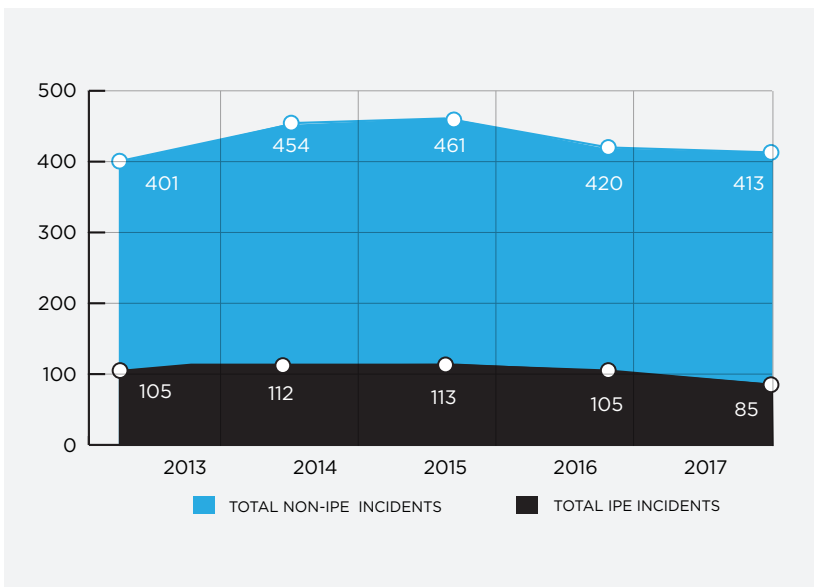
#5: PIPELINE INCIDENTS INSIDE AND OUTSIDE OF OPERATOR PROPERTY (2013-2017)

In 2017, 72% of incidents from liquids pipelines were wholly contained within an operator’s property. Specifically, in 2017, there were 296 operator property contained incidents and 117 had impacts outside of operator property. Examples of pipeline operator property include pump stations, tank farms and terminals. Pipeline operators report incidents contained on operator property to PHMSA. While incidents in public spaces constituted only 28% of total incidents, reducing this number is a top priority for industry.



#6: PIPELINE INCIDENTS INSIDE HCAS (2013-2017)

Through federal regulation, PHMSA tracks incidents defined as occurring in high-consequence areas (HCAs). HCAs are defined as areas of population concentration, commercially navigable waterways, or sensitive environmental locations. IPE data differs from HCA data in that it can include incidents wholly contained within an operator’s property if that property is within the boundaries of a surrounding HCA, even if that inside property-contained incident had no impact on the people or the environment. In 2017, 42% of total incidents were in HCAs.



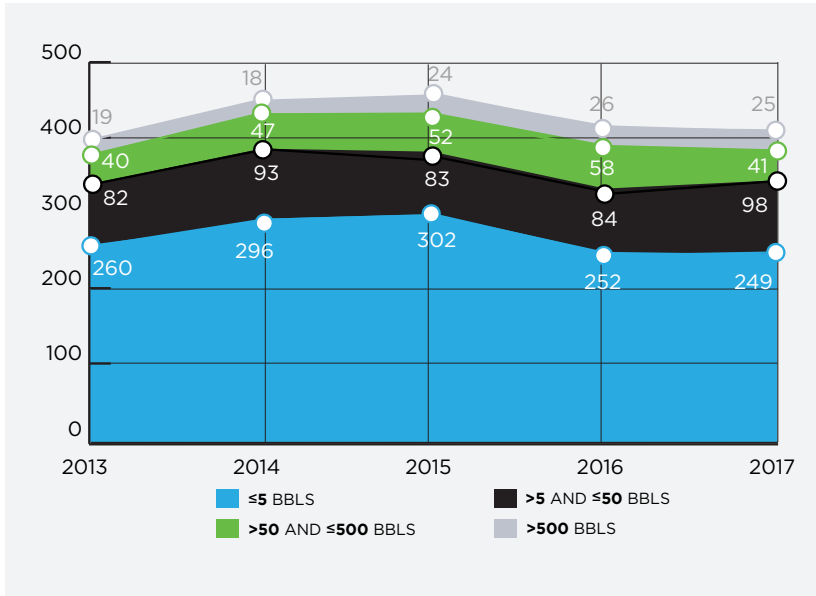
#7: TOTAL INCIDENTS & TOTAL IPE INCIDENTS (2013-2017)

In 2017, approximately 85 incidents impacted the people or the environment, 20 fewer incidents than 2016, reflecting 4% decrease in IPE incidents from 2016. IPE incidents in 2017 represented 21% of total incidents in that year. A full description of the specific types of incidents falling under the IPE criteria can be found on page 46.

Incidents by Size

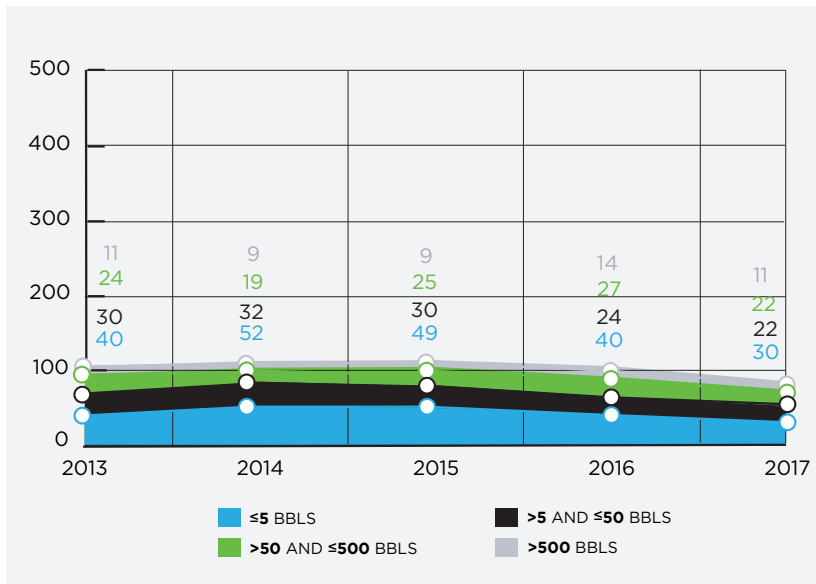
#8: LIQUID PIPELINE INCIDENTS BY SIZE (2013-2017)

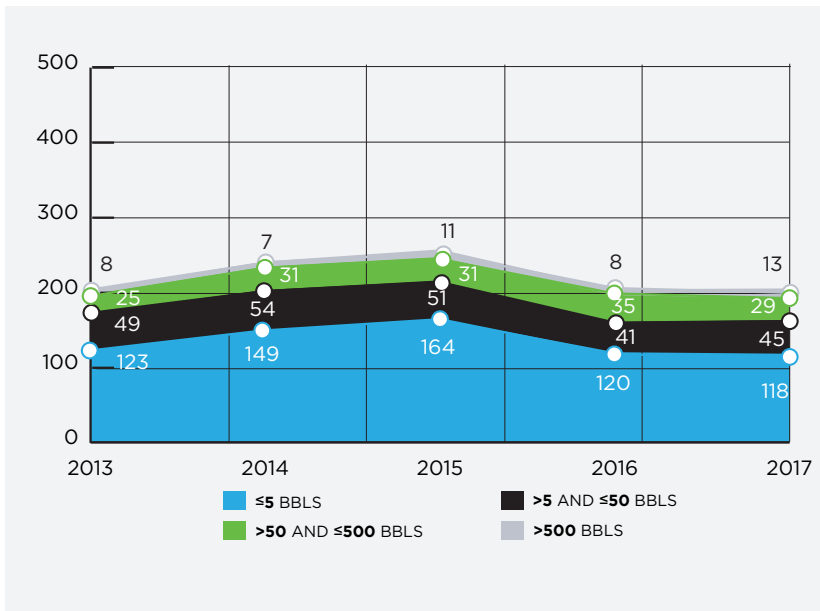
Most pipeline incidents are small in size. In 2017, 60% of the incidents were less than 5 barrels (1 barrel = 42 gallons) and 84% were less than 50 barrels. In 2017, only 6% of incidents were 500 barrels or larger.



#9: IPE INCIDENTS BY SIZE (2013-2017)

Most IPE incidents are small in size. In 2017, approximately 61% of the IPE incidents were less than 50 barrels, with 12% of the incidents 500 barrels or larger.

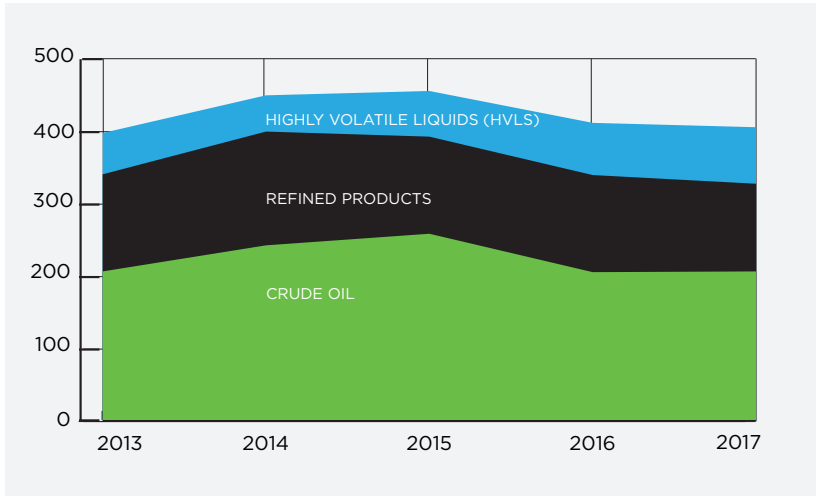




#10: CRUDE OIL INCIDENTS BY SIZE (2013-2017)

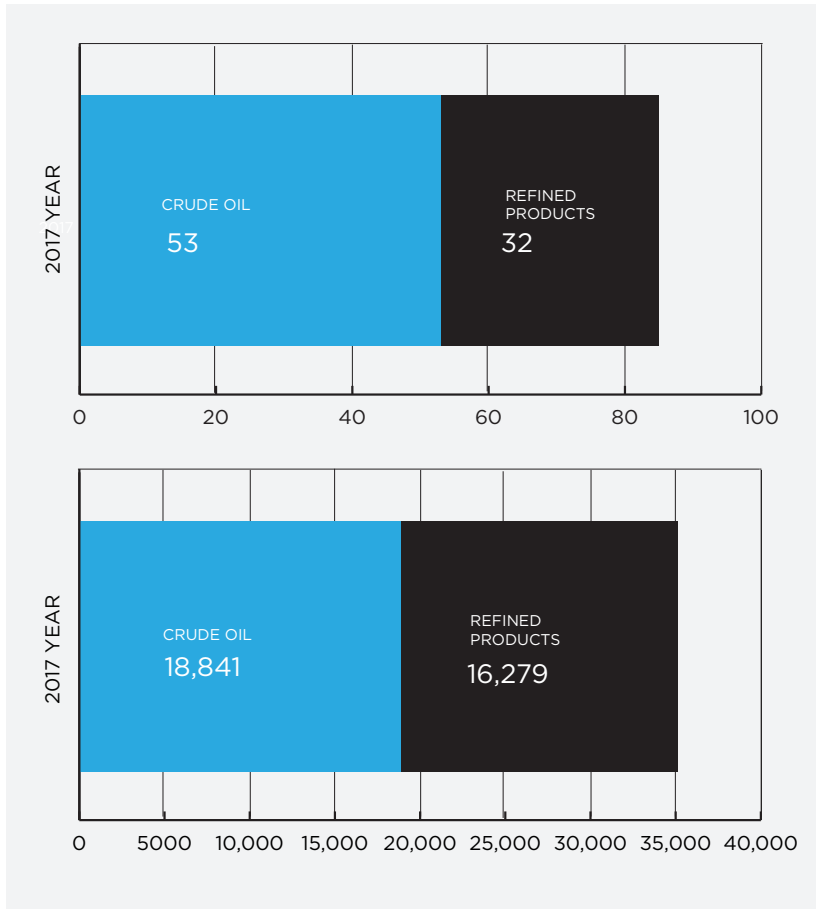
Similar to total incident trends, the majority of crude oil incidents are small in size. In 2017, 58% of crude oil incidents were 5 barrels or smaller. Over the last 5 years, crude oil incidents less than 5 barrels decreased 4% from 123 to 118 and the number of crude oil incidents 500 barrels or larger increased 40% from 8 to 13. Over the same period, total crude oil releases remained the same at 205 incidents.

Incidents by Commodity



#11: ALL INCIDENTS BY COMMODITY (2013-2017)

In 2017, crude oil incidents represented 50% of total incidents, with refined products at 29% and natural gas liquids at 19% of total incidents. The number of annual crude oil incidents are down 20% from their peak in 2015 and unchanged from 2013.

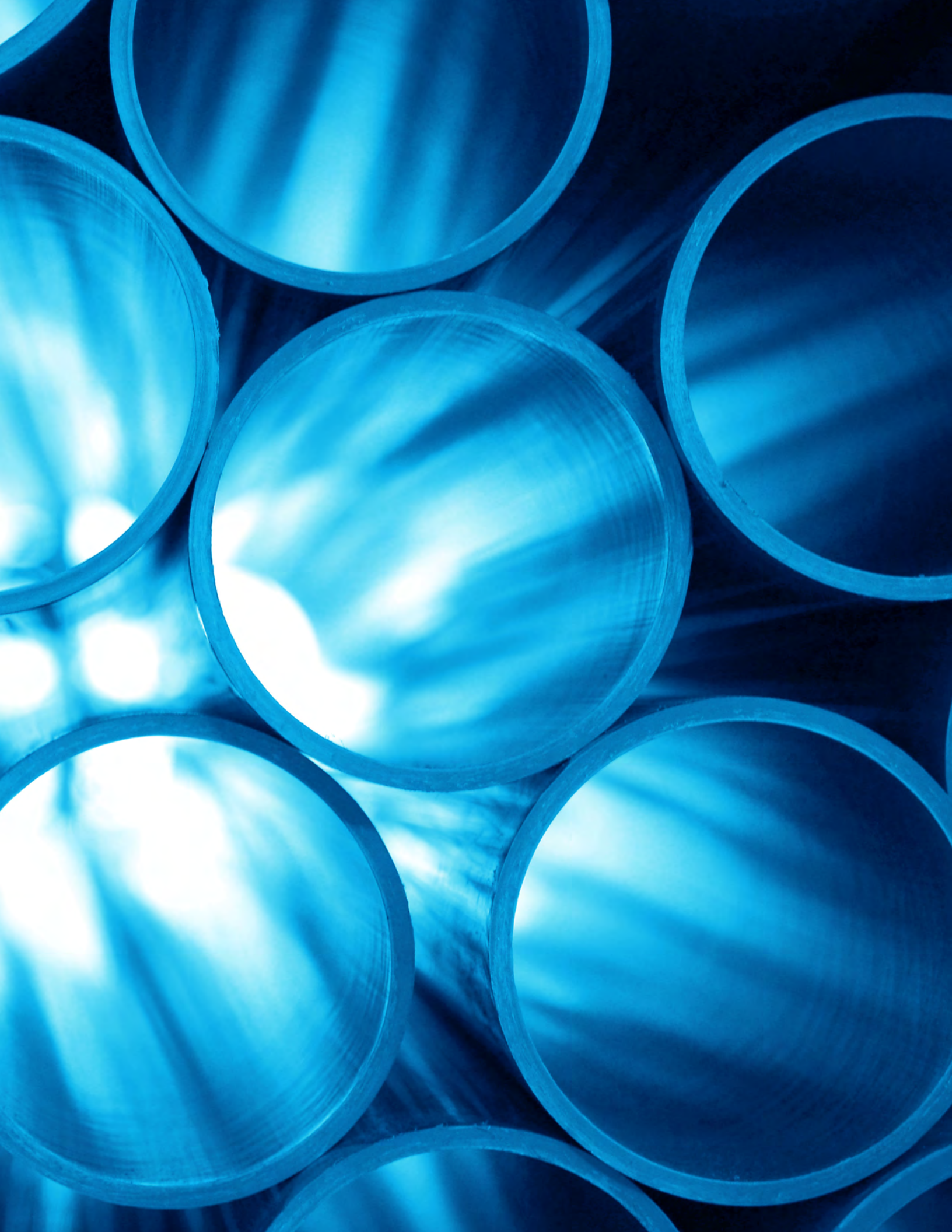


#12: IPE INCIDENTS BY COMMODITY (2017)

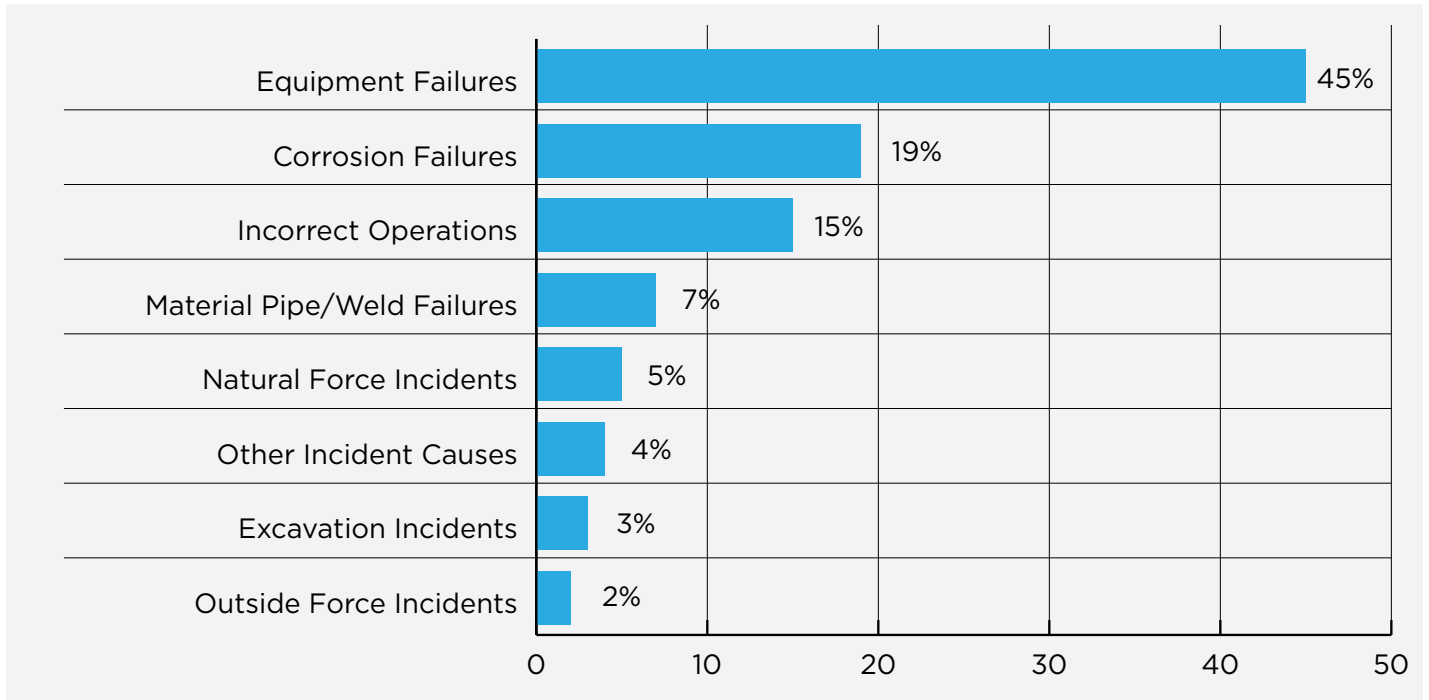
In 2017, there were 53 crude oil IPE incidents and 32 refined products IPE incidents.

#13: PERCENTAGE OF IPE BARRELS RELEASED BY COMMODITY (2017)

Crude oil incidents impacting the people or the environment (IPE) in 2017 represented 62% of total IPE incidents and 54% of total IPE incident barrels. Over the last 5 years, the percentage of crude oil IPE incidents is down 24%.

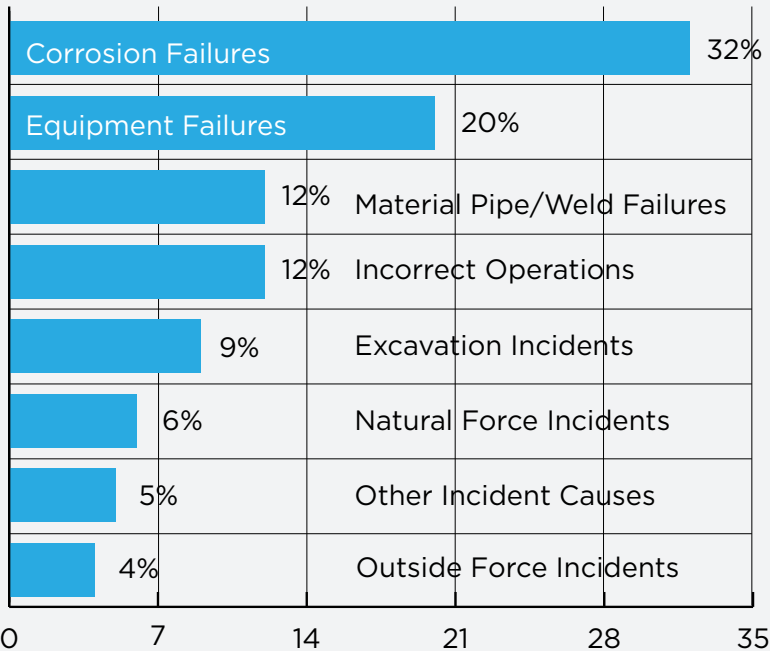


Incidents by Cause



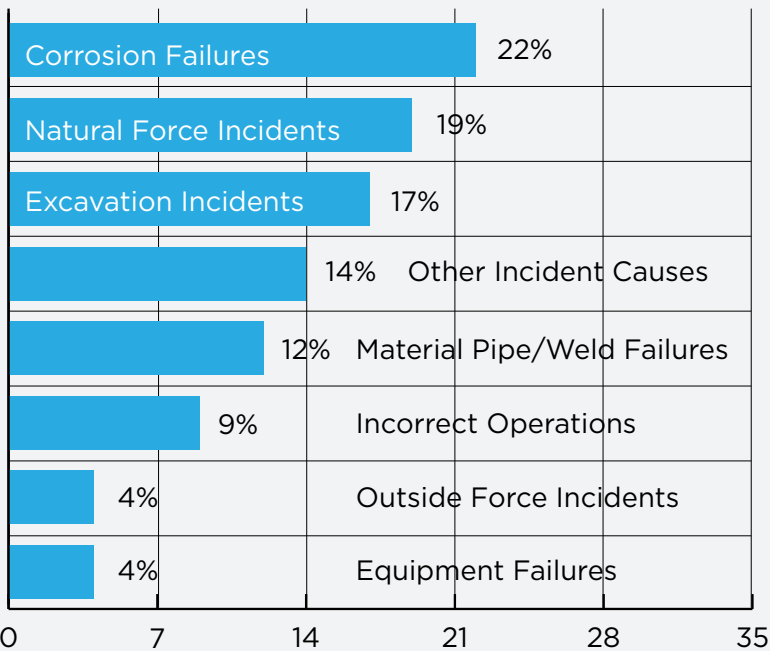
#14: LIQUIDS PIPELINE INCIDENTS BY CAUSE (2013-2017)

Equipment failure is the most frequent cause of liquids pipeline incidents. Over the last 5 years, equipment failure represented 45% of incidents, corrosion failure 19% and incorrect operation 15% of incidents. Material pipe/weld failures include cracking, a primary source of large volume releases, but represented only 7% of incidents over the last 5 years.



#15: LIQUIDS IPE PIPELINE INCIDENTS BY CAUSE (2013-2017)

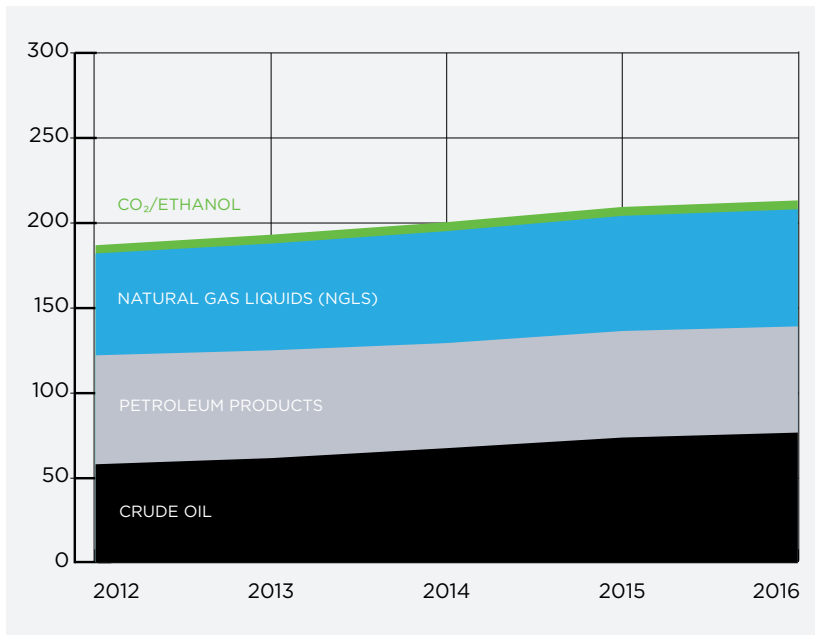
The most frequent cause of IPE incidents over the last 5 years was corrosion at 32% of total IPE incidents.



#16: PERCENTAGE OF IPE BARRELS RELEASED BY CAUSE (2013-2017)

Corrosion was responsible for the largest number of barrels released from IPE incidents at 22%. Equipment failure, the most frequent cause of all incidents, was the cause of only 4% of IPE incident barrels released, reflecting the reduced proportion of operator property incidents impacting the people or the environment and the smaller average size of equipment failure incidents. Natural force incidents (19%) and excavation incidents (17%) account for 36% of the IPE barrels released over the last five years (such as flooding, earthquakes, and lightning).

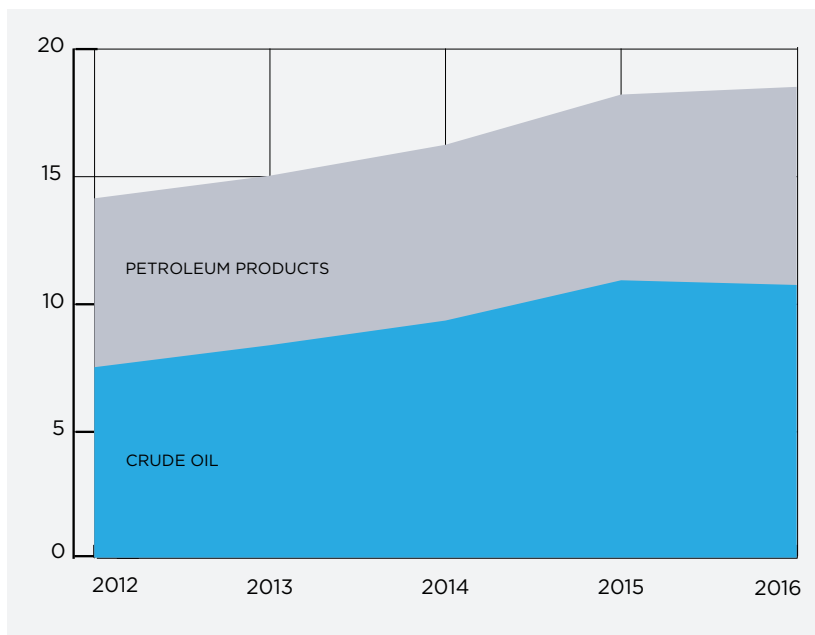
Pipeline Miles & Barrels Delivered



#17: MILES OF U.S. LIQUIDS PIPELINES BY PRODUCTS (2012-2016)

(Thousands)

At the end of 2016, there were 212,568 total miles of liquid pipelines, with crude oil pipelines representing 36% of the total. Over the last five years, the total miles of pipeline have increased by 26,346 or 14%.



#18: BARRELS DELIVERED BY U.S. LIQUIDS PIPELINE (2012-2016)

(Billions)

In 2016, there were a total of 18,447,912 barrels delivered by pipeline, with crude oil representing approximately 58% of the barrels delivered. Over the last five years, crude oil barrels delivered by pipeline have increased by approximately 31% or 4,368,303,450 barrels.



Data Appendix

GRAPH #1: TOTAL INCIDENTS & TOTAL IPE INCIDENTS (2013-2017)		
Year	Total IPE Incidents	Total Incidents
2013	105	401
2014	112	454
2015	113	461
2016	105	420
2017	85	413
% Change from 2013	-19%	3%

Source: Pipeline and Hazardous Materials Safety Administration, PHMSA Pipeline Safety as of March 2018.

GRAPH #2: IM IPE RELEASES (2013-2017)					
Year	Corrosion Failure	Material Failure of Pipe/Weld	Previous Excavation Damage	Previous Outside Force Damage	Total Incidents
2013	36	16	2	0	54
2014	38	11	0	1	50
2015	43	10	0	0	53
2016	25	17	2	0	44
2017	26	7	2	0	35
% Change from 2013	-28%	-56%	0%	0%	-35%

Source: Pipeline and Hazardous Materials Safety Administration, PHMSA Pipeline Safety as of March 2018.

GRAPH #3: O&M IPE INCIDENTS (2013-2017)				
Year	Equipment Failure	Incorrect Operation	Excavation Damage	Total Incidents
2013	19	15	3	37
2014	20	16	4	40
2015	26	9	4	39
2016	21	14	1	36
2017	19	6	3	28
% Change from 2013	0%	-60%	0%	-24%

Source: Pipeline and Hazardous Materials Safety Administration, PHMSA Pipeline Safety as of March 2018.

GRAPH #4: PSMS OPERATOR COMMITMENT (BARREL MILES)	
Year	% Commitment
2016	95
2017	97

Source: API and AOPL Membership Survey.

GRAPH #5: PIPELINE INCIDENTS INSIDE AND OUTSIDE OF OPERATOR PROPERTY			
Year	Outside Operator Property	Contained on Operator Property	Total Incidents
2013	135	266	401
2014	122	332	454
2015	128	333	461
2016	131	289	420
2017	117	296	413
Total	633	1,516	2,149
% Change from 2013	-13%	11%	6%

Source: Pipeline and Hazardous Materials Safety Administration, PHMSA Pipeline Safety as of March 2018.

GRAPH #6: PIPELINE INCIDENTS IMPACTING HCAS			
Year	Outside HCA	Inside HCA	Total Incidents
2013	244	157	401
2014	254	200	454
2015	269	192	461
2016	252	168	420
2017	238	175	413
Total	1,257	892	2,149
% Change from 2013	-2%	11%	6%

Source: Pipeline and Hazardous Materials Safety Administration, PHMSA Pipeline Safety as of March 2018.

GRAPH #7: TOTAL INCIDENTS & TOTAL IPE INCIDENTS (2013-2017)		
Year	Total IPE Incidents	Total Incidents
2013	105	401
2014	112	454
2015	113	461
2016	105	420
2017	85	413
% Change from 2013	-19%	3%

Source: Pipeline and Hazardous Materials Safety Administration, PHMSA Pipeline Safety as of March 2018.

Data Appendix

GRAPH #8: LIQUID PIPELINE INCIDENTS BY SIZE (2013-2017)					
Year	≤ 5 Bbls	> 5 and ≤ 50 Bbls	> 50 and ≤ 500 Bbls	> 500 Bbls	Total Incidents
2013	260	82	40	19	401
2014	296	93	47	18	454
2015	302	83	52	24	461
2016	252	84	58	26	420
2017	249	98	41	25	413
% Change from 2013	-4%	20%	3%	32%	3%

Pipeline and Hazardous Materials Safety Administration, PHMSA Pipeline Safety as of March 2018.

GRAPH #9: IPE INCIDENTS BY SIZE (2013-2017)					
Year	≤ 5 Bbls	> 5 and ≤ 50 Bbls	> 50 and ≤ 500 Bbls	> 500 Bbls	Total Incidents
2013	40	30	24	11	105
2014	52	32	19	9	112
2015	49	30	25	9	113
2016	40	24	27	14	105
2017	30	22	22	11	85
Total	211	138	117	54	0
% Change from 2013	-25%	-27%	-8%	0%	0%

Source: Pipeline and Hazardous Materials Safety Administration, PHMSA Pipeline Safety as of March 2018.

GRAPH #10: CRUDE OIL INCIDENTS BY SIZE (2013-2017)					
Year	≤ 5 Bbls	> 5 and ≤ 50 Bbls	> 50 and ≤ 500 Bbls	> 500 Bbls	Total Incidents
2013	123	49	25	8	205
2014	149	54	31	7	241
2015	164	51	31	11	257
2016	120	41	35	8	204
2017	118	45	29	13	205
% Change from 2013	-4%	-8%	16%	63%	0%

Source: Pipeline and Hazardous Materials Safety Administration, PHMSA Pipeline Safety as of March 2018.

GRAPH #11: INCIDENTS BY COMMODITY (2013-2017)						
Year	Crude Oil	Refined Products	Highly Volatile Liquids (HVLs)	CO ₂	Biofuel/Ethanol	Total Incidents
2013	205	134	57	5	0	401
2014	241	157	50	5	1	454
2015	257	134	63	7	0	461
2016	204	134	72	9	1	420
2017	205	121	78	9	0	413
% Change from 2013	0%	-10%	37%	80%	0%	3%

Source: Pipeline and Hazardous Materials Safety Administration, PHMSA Pipeline Safety as of March 2018.

GRAPH #12: INCIDENTS BY COMMODITY (2017)		
Year	Crude Oil	Refined Products
2013	70	35
2014	71	41
2015	75	38
2016	70	35
2017	53	32
% Change from 2013	-24%	-9%

Source: Pipeline and Hazardous Materials Safety Administration, PHMSA Pipeline Safety as of March 2018.

GRAPH #13: PERCENTAGE OF IPE BARRELS RELEASED BY COMMODITY (2013-2017)		
Year	Crude Oil	Refined Products
2013	78%	22%
2014	45%	55%
2015	65%	35%
2016	64%	36%
2017	54%	46%
% Change from 2013	-49%	53%

Source: Pipeline and Hazardous Materials Safety Administration, PHMSA Pipeline Safety as of March 2018.

Data Appendix

GRAPH #14: LIQUIDS PIPELINE INCIDENTS BY CAUSE (2013-2017)		
Cause	Total Incidents	Percentage
Equipment Failures	968	45%
Corrosion Failures	418	19%
Incorrect Operations	322	15%
Material Pipe/Weld Failures	149	7%
Natural Force Incidents	101	5%
Other Incident Causes	80	4%
Excavation Incidents	69	3%
Outside Force Incidents	42	2%
Total	2,149	

Source: Pipeline and Hazardous Materials Safety Administration, PHMSA Pipeline Safety as of March 2018.

GRAPH #15: TOTAL IPE INCIDENTS BY CAUSE (2013-2017)		
Cause	Total Incidents	Percentage
Corrosion Failures	168	32%
Equipment Failures	105	20%
Material Pipe/Weld Failures	61	12%
Incorrect Operations	60	12%
Excavation Incidents	47	9%
Natural Force incidents	30	6%
Other Incident Causes	26	5%
Outside Force incidents	23	4%
Total	520	

Source: Pipeline and Hazardous Materials Safety Administration, PHMSA Pipeline Safety as of March 2018.

GRAPH #16: IPE BARRELS RELEASED BY CAUSE (2013 -2017)

Cause	Barrels Released	Percentage
Corrosion Failures	40,577	22%
Natural Force Incidents	34,817	19%
Excavation Incidents	30,675	17%
Other Incident Causes	25,936	14%
Material Pipe/Weld Failures	21,279	12%
Incorrect Operations	16,973	9%
Outside Force Incidents	6,712	4%
Equipment Failures	6,483	4%

Source: Pipeline and Hazardous Materials Safety Administration, PHMSA Pipeline Safety as of March 2018.

GRAPH #17: MILES OF U.S. PIPELINE AND BARRELS DELIVERED (2012-2016)

	2012	2013	2014	2015	2016
Crude Oil	57,463	61,087	66,943	73,171	76,092
Petroleum Products	64,042	63,351	61,767	62,634	62,435
Natural Gas Liquids (NGLs)	59,861	62,768	65,792	67,667	68,831
CO ₂ /Ethanol	4,856	5,206	5,292	5,256	5,210
Total Miles	186,221	192,412	199,793	208,728	212,568

Source: Pipeline and Hazardous Materials Safety Administration, PHMSA Pipeline Safety as of March 2018.

GRAPH #18: MILES OF U.S. PIPELINE AND BARRELS DELIVERED (2012-2016)

	2012	2013	2014	2015	2016
Crude Oil	7,460,710,613	8,324,012,774	9,289,972,460	10,868,122,224	10,683,361,776
Petroleum Products	6,618,479,649	6,643,084,825	6,888,545,527	7,278,500,447	7,764,131,936
Total Barrels	14,079,190,262	14,967,097,599	16,178,517,987	18,146,622,671	18,447,493,712

Source: U.S. Federal Energy Regulatory Commission

DEFINITIONS & NOTES

BARRELS

One barrel of crude oil or petroleum products contains 42 gallons.

BARRELS RELEASED

Pipeline operators report to PHMSA the number of barrels released unintentionally during each pipeline incident. Unintentionally released barrels of crude oil and petroleum products forms the basis of barrels released data and analysis in this report. PHMSA also requires operators to report intentional releases of natural gas liquids in gas form into the atmosphere during maintenance activities. This process, called “blowdown,” vents the gas product from the section of pipeline set to undergo maintenance. Barrels released data in this report does not include intentional blowdown releases.

IN-LINE INSPECTION DEVICE OR “SMART PIG”

An in-line inspection (ILI) device, commonly referred to as a “smart pig”, is a diagnostic tool that travels inside the pipeline scanning the pipe walls for imperfections and recording the data for later analysis.

NATURAL GAS LIQUIDS

Petroleum products that are liquid when traveling through a pipeline under high pressure and a gas at atmospheric pressure are referred to generally as natural gas liquids (NGLs). Examples of NGLs transported by pipeline include: propane, ethane and butane. They occur naturally in petroleum deposits and are produced along with crude oil or natural gas (methane). NGLs are separated from the crude oil and natural gas after production and sent to manufacturers (ethane, butane) as an industrial raw material or to other commercial, agricultural or residential uses (propane).

INCIDENTS IMPACTING PEOPLE OR THE ENVIRONMENT (IPE) CRITERIA

If either criterion 1 or 2 below is met for a crude oil or refined products pipeline the incident counts as IPE:

TIER 1. Regardless of location of incident:

- Fatality; or
- Injury requiring in-patient hospitalization; or
- Ignition; or
- Explosion; or
- Evacuation; or
- Wildlife impact; or
- Water contamination = ocean/seawater, groundwater, or drinking water or public/non-operator private property damage

TIER 2. For location of incident “Not totally contained on operator-controlled property”

Unintentional release volume greater than or equal to 5 gallons and in an HCA; or
 Unintentional release volume greater than or equal to 5 barrels and outside of an HCA;
 or Water contamination;
 or Soil contamination

PHMSA INCIDENT REPORTING

Pipeline operators regulated by PHMSA are required to report data related to pipeline incidents including location, cause and consequences. PHMSA compiles this information in a publicly available online database. The pipeline safety data used in this report was obtained from PHMSA in March 2018.

API RECOMMEND PRACTICE

Documents that communicate proven industry practices; RPs may include both mandatory and non-mandatory provisions.

REFINED PRODUCTS

Products derived from the process of refining crude oil. Examples of refined products include: gasoline, kerosene, and lubricating oil.

CRUDE OIL

Includes condensate, light, medium, and heavy unrefined hydrocarbons extracted from underground petroleum formations.