



1999 Process Safety Performance Measurement Report

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April 2000

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Data published in the 1999 API Process Safety Performance Survey Report are based on data voluntarily reported by petroleum companies operating in the United States. Although API reviews reported data to identify internal inconsistencies and unusual period-to-period changes, in general API is not able to verify the accuracy of reported data. API therefore cannot guarantee the accuracy of the reported data, and disclaims any liability in connection with the data.

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Executive Summary

The Process Safety Performance (PSP) report is limited to domestic U.S. oil refineries and gas processing companies. It is envisioned that with the successful introduction of this 1999 report, other operating segments such as transportation, exploration, production and marketing terminals will be included in the future.

The Report

The PSP survey was designed by API's Safety and Fire Protection Subcommittee to collect and report statistical data on process related incidents such as fires, explosions, and chemical releases. This first year report is an aggregate of data voluntarily submitted to the American Petroleum Institute (API) by 23 refining and gas processing companies. This sample represents a response rate of 47% of the total U.S. operable refining capacity and 6% of the total U.S. operable gas processing capacity.

In 1999, 56% of the twenty-three respondents reported zero incidents. The 44% of respondents with incidents reported a total of 89 incidents, which resulted in 22 injuries and one fatality.

Refining

Fourteen refining companies responded to the survey and six (43%) of these respondents reported zero incidents.

The eight refineries with incidents reported a total of 85 incidents. The total incident rate reported is 0.0115 incident per thousand barrels of operable capacity. The majority of these incidents were spills, representing 71%. Fires represented 21%, explosions were 6% and fires & explosions were 2%.

More than half of the reported incidents indicated damage costs of less than \$25K, while 11% of reported incidents had damages totaling more than \$1 million.

Gas Processing Plants

Nine gas processing companies responded to the survey and seven (78%) of these respondents reported zero incidents.

The two gas processing companies with incidents reported a total of 4 incidents. The total incident rate reported is 0.0005 incidents per million cubic feet of processed natural gas. There were no fires or fires & explosions reported. Fifty percent of the incidents reported were spills and 50% were explosions.

Fifty percent of the total incidents reported indicated damage costs of less than \$25K. No incidents reported damage costs exceeding \$1 million.

1999 PSP Data Summary (Refining Companies)

General Summary for Refineries

Number of Responding Companies	14
Number of Companies with Zero Incidents	6
Number of Responding Facilities	46
Number of Facilities with Zero Incidents	21
U.S. Refining Capacity (thousand bbls)	15,802*
Refining Capacity of Respondents (thousand bbls)	7,400
PSP Response Rate	47%
Total Incident Rate for Respondents (per thousand bbls)	0.0115

Types of Incidents	Number	Proportion
Fires	18	21%
Explosions	5	6%
Spills	60	71%
Fire/Explosion	2	2%
Total	85	100%

Costs of Incidents	Number	Proportion
<\$25K	50	59%
\$25K-\$250K	17	20%
\$250K-\$500K	1	1%
\$500K-\$1MM	3	4%
\$1MM-\$5MM	8	9%
>\$5MM	2	2%
No Cost Given	4	5%
Total	85	100%

*Department of Energy 1998 Petroleum Supply Annual, Volume 1
1999 DOE data will not be available until June 2000

**1999 Cost Frequency Table
(Refining Companies)**

Onsite Fires		
Cost	Number of Fires	Proportion
< \$25	1	6%
\$25-\$250K	5	31%
\$250-\$500K	0	0%
\$500-\$1M	3	19%
\$1M-\$5M	6	38%
>\$5M	1	6%
No cost given	0	0%
Total	16	100%

Offsite Fires		
Cost	Number of Fires	Proportion
< \$25	1	50%
\$25-\$250K	1	50%
\$250-\$500K	0	0%
\$500-\$1M	0	0%
\$1M-\$5M	0	0%
>\$5M	0	0%
No cost given	0	0%
Total	2	100%

Onsite Explosions		
Cost	Number of Explosions	Proportion
< \$25	0	0%
\$25-\$250K	3	75%
\$250-\$500K	0	0%
\$500-\$1M	0	0%
\$1M-\$5M	1	25%
>\$5M	0	0%
No cost given	0	0%
Total	4	100%

Offsite Explosions		
Cost	Number of Explosions	Proportion
< \$25	1	100%
\$25-\$250K	0	0%
\$250-\$500K	0	0%
\$500-\$1M	0	0%
\$1M-\$5M	0	0%
>\$5M	0	0%
No cost given	0	0%
Total	1	100%

Onsite Spills		
Cost	Number of Spills	Proportion
< \$25	23	70%
\$25-\$250K	5	15%
\$250-\$500K	0	0%
\$500-\$1M	0	0%
\$1M-\$5M	1	3%
>\$5M	1	3%
No cost given	3	9%
Total	33	100%

Offsite Spills		
Cost	Number of Spills	Proportion
< \$25	24	89%
\$25-\$250K	1	4%
\$250-\$500K	1	4%
\$500-\$1M	0	0%
\$1M-\$5M	0	0%
>\$5M	0	0%
No cost given	1	4%
Total	27	100%

Onsite Fire/Explosion		
Cost	Number of F/E	Proportion
< \$25	0	0%
\$25-\$250K	2	100%
\$250-\$500K	0	0%
\$500-\$1M	0	0%
\$1M-\$5M	0	0%
>\$5M	0	0%
No cost given	0	0%
Total	2	100%

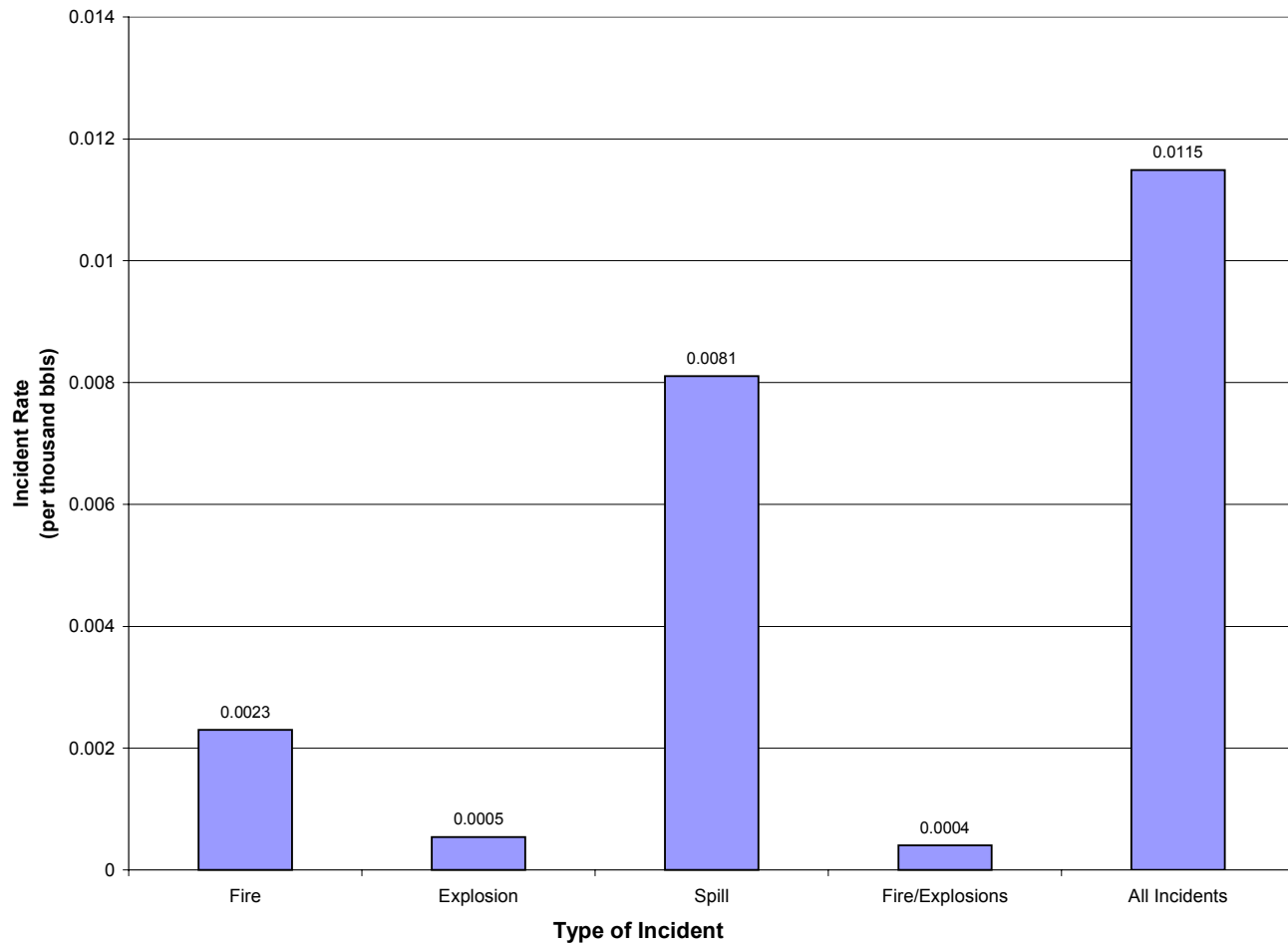
Offsite Fire/Explosion		
Cost	Number of F/E	Proportion
< \$25	0	0%
\$25-\$250K	0	0%
\$250-\$500K	0	0%
\$500-\$1M	0	0%
\$1M-\$5M	0	0%
>\$5M	0	0%
No cost given	0	0%
Total	0	0%

All Onsite Incidents		
Cost	No. of Incidents	Proportion
< \$25	24	44%
\$25-\$250K	15	27%
\$250-\$500K	0	0%
\$500-\$1M	3	5%
\$1M-\$5M	8	15%
>\$5M	2	4%
No cost given	3	5%
Total	55	100%

All Offsite Incidents		
Cost	No. of Incidents	Proportion
< \$25	26	87%
\$25-\$250K	2	7%
\$250-\$500K	1	3%
\$500-\$1M	0	0%
\$1M-\$5M	0	0%
>\$5M	0	0%
No cost given	1	3%
Total	30	100%

All Incidents		
Cost	No. of Incidents	Proportion
< \$25	50	59%
\$25-\$250K	17	20%
\$250-\$500K	1	1%
\$500-\$1M	3	4%
\$1M-\$5M	8	9%
>\$5M	2	2%
No Cost Given	4	5%
Total	85	100%

1999 Total Incident Rates (Refining Companies)



**1999 Incident Location Frequency Table
(Refining Companies)**

Location	Fires	Proportion
Other	5	28%
Vacuum Crude Distillation	4	22%
Hydrotreater	2	11%
Pressured Storage	2	11%
Atmospheric Crude Distillation	1	6%
Heavy Oils Unit	1	6%
Hydrocracking Unit	1	6%
Hydrogen Production	1	6%
Naphtha Reformer	1	6%
All Others	0	0%
Total	18	100%

Location	Explosions	Proportion
Gas Plant Operation	2	40%
Atmospheric Storage	1	20%
Other	1	20%
Utilities Area	1	20%
All Others	0	0%
Total	5	100%

Location	Fires/Explosions	Proportion
Fluidized Catalytic Unit	1	25%
Heavy Oils Unit	1	25%
Hydrotreater	1	25%
Other	1	25%
All Others	0	0%
Total	4	100%

Location	Spills	Proportion
Sulfur Recovery Unit	20	29%
Other	14	20%
Vacuum Crude Distillations	6	9%
Fluidized Catalytic Cracking Unit	4	6%
Pipeline Between Units/Areas	4	6%
Atmospheric Crude Distillation	3	4%
Atmospheric Storage	3	4%
Heavy Oils Unit	3	4%
Hydrotreater	3	4%
Marine Facilities	2	3%
Waste Water Treatment	2	3%
HF Alkylation Unit	1	1%
Hydrocracking Unit	1	1%
Naphtha Reformer	1	1%
Pressured Storage	1	1%
Storage Cavern Operations	1	1%
Sulfuric Alkylation Unit	1	1%
All Others	0	0%
Total	70	100%

Location	All Incidents	Proportion
Other	21	22%
Sulfur Recovery Unit	20	21%
Vacuum Crude Distillation	10	10%
Hydrotreater	6	6%
Fluidized Catalytic Cracking Unit	5	5%
Heavy Oils Unit	5	5%
Atmospheric Crude Distillation	4	4%
Atmospheric Storage	4	4%
Pipeline Between Units/Areas	4	4%
Gas Plant Operation	2	2%
Hydrocracking Unit	2	2%
Marine Facilities	2	2%
Naphtha Reformer	2	2%
Pressured Storage	2	2%
Waste Water Treatment	2	2%
HF Alkylation Unit	1	1%
Hydrogen Production	1	1%
Storage Cavern Operations	1	1%
Sulfuric Alkylation Unit	1	1%
Utilities Area	1	1%
All Others	0	0%
Total	96	100%

Other Locations	Frequency	Proportion
Solvent Extraction	1	5%
Tank	1	5%
SCOT Tailgas Unit	1	5%
Plantwide Power Failure	1	5%
Petrochemicals-Cumene Unit	1	5%
Petrochemical-Aromatic Desulfurizer	1	5%
Loss of Plant Electricity	1	5%
General Plant Electrical Outage	1	5%
Flare System	5	24%
Dimersol Depropanizer	1	5%
Desulfurizer	2	10%
C4 Recovery	1	5%
Catalytic Reformer Unit (lube skid)	1	5%
Catalytic Polymerization Unit	1	5%
Butane Lading Rack	1	5%
No location Given	1	5%
Total	21	100%

Note: Several incidents, spills in particular, reported more than one location for a single incident.

1999 PSP Data Summary (Gas Processing Companies)

General Summary for Gas Processing Plants

Number of Responding Companies	9
Number of Companies with Zero Incidents	7
Number of Responding Facilities	50
Number of Facilities with Zero Incidents	46
U. S. Gas Processing Capacity (million cu ft)	68,261*
Gas Processing Capacity of Respondents (million cu ft.)	8,587
PSP Response Rate	13%
Incident Rate for Respondents (per million cu ft)	0.0005

Types of Incidents	Number	Proportion
Fires	0	0%
Explosions	2	50%
Spills	2	50%
Fire/Explosion	0	0%
Total	4	100%

Costs of Incidents	Number	Proportion
<\$25K	2	50%
\$25K-\$250K	1	25%
\$250K-\$500K	0	0%
\$500K-\$1MM	1	25%
\$1MM-\$5MM	0	0%
>\$5MM	0	0%
No Cost Given	0	0%
Total	4	100%

* From *Oil & Gas Journal*, June 14, 1999 -- data is for 1998
1999 data will not be available until June 2000

**1999 Cost Frequency Table
(Gas Processing Plants)**

Onsite Fires		
Cost	Number of Fires	Proportion
< \$25	0	0%
\$25-\$250K	0	0%
\$250-\$500K	0	0%
\$500-\$1M	0	0%
\$1M-\$5M	0	0%
>\$5M	0	0%
No cost given	0	0%
Total	0	0%

Offsite Fires		
Cost	Number of Fires	Proportion
< \$25	0	0%
\$25-\$250K	0	0%
\$250-\$500K	0	0%
\$500-\$1M	0	0%
\$1M-\$5M	0	0%
>\$5M	0	0%
No cost given	0	0%
Total	0	0%

Onsite Explosions		
Cost	Number of Explosions	Proportion
<\$25K	0	0%
\$25-\$250K	1	50%
\$250-\$500K	0	0%
\$500K-\$1M	1	50%
\$1M-5M	0	0%
>\$5M	0	0%
No cost given	0	0%
Total	2	100%

Offsite Explosions		
Cost	Number of Explosions	Proportion
<\$25K	0	0%
\$25-\$250K	0	0%
\$250-\$500K	0	0%
\$500K-\$1M	0	0%
\$1M-5M	0	0%
>\$5M	0	0%
No cost given	0	0%
Total	0	0%

Onsite Spills		
Cost	Number of Spills	Proportion
<\$25K	2	100%
\$25-\$250K	0	0%
\$250-\$500K	0	0%
\$500K-\$1M	0	0%
\$1M-5M	0	0%
>\$5M	0	0%
No cost given	0	0%
Total	2	100%

Offsite Spills		
Cost	Number of Spills	Proportion
<\$25K	0	0%
\$25-\$250K	0	0%
\$250-\$500K	0	0%
\$500K-\$1M	0	0%
\$1M-5M	0	0%
>\$5M	0	0%
No cost given	0	0%
Total	0	0%

Onsite Fire/Explosion		
Cost	Number of F/E	Proportion
< \$25	0	0%
\$25-\$250K	0	0%
\$250-\$500K	0	0%
\$500-\$1M	0	0%
\$1M-\$5M	0	0%
>\$5M	0	0%
No cost given	0	0%
Total	0	0%

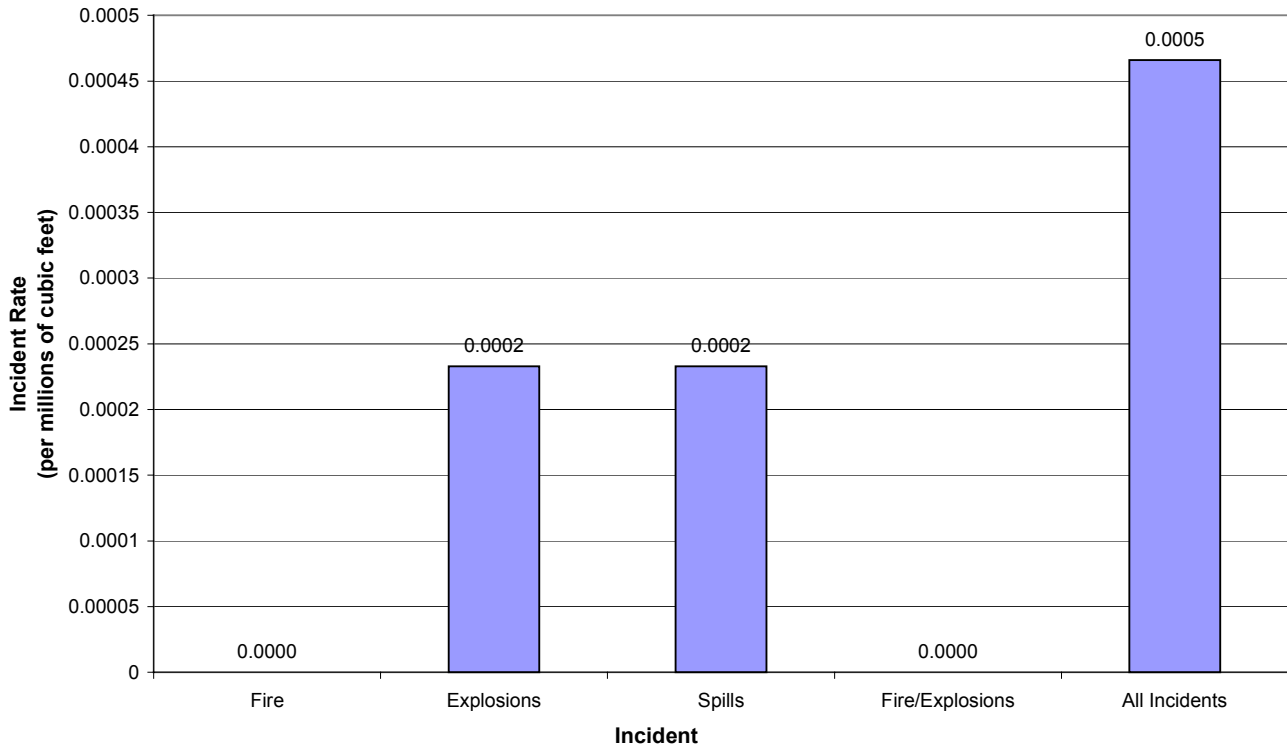
Offsite Fire/Explosion		
Cost	Number of F/E	Proportion
< \$25	0	0%
\$25-\$250K	0	0%
\$250-\$500K	0	0%
\$500-\$1M	0	0%
\$1M-\$5M	0	0%
>\$5M	0	0%
No cost given	0	0%
Total	0	0%

All Onsite Incidents		
Cost	Number of Incidents	Proportion
<\$25K	2	50%
\$25-\$250K	1	25%
\$250-\$500K	0	0%
\$500K-\$1M	1	25%
\$1M-5M	0	0%
>\$5M	0	0%
Total	4	100%

All Offsite Incidents		
Cost	Number of Incidents	Proportion
<\$25K	0	0%
\$25-\$250K	0	0%
\$250-\$500K	0	0%
\$500K-\$1M	0	0%
\$1M-5M	0	0%
>\$5M	0	0%
Total	0	0%

All Incidents		
Cost	Number of Incidents	Proportion
<\$25K	2	50%
\$25-\$250K	1	25%
\$250-\$500K	0	0%
\$500K-\$1M	1	25%
\$1M-5M	0	0%
>\$5M	0	0%
Total	4	100%

**1999 Total Incident Rate
(Gas Processing Companies)**



**1999 Incident Location Frequency Table
(Gas Processing Plants)**

Location	Explosions	Percentage
Gas Plant Operation	2	100%
All Others	0	0%
Total	2	100%

Location	Spills	Percentage
Storage Cavern Operations	1	50%
Pipeline between Units	1	50%
All Others	0	0%
Total	2	100%

Note: There were no fire or fire/explosion incidents

Participating Companies

Amerada Hess Corporation
BP Amoco
Burlington Resources Inc.
Calumet Lubricants
Cenex Harvest States
Citgo Petroleum Corporation
Devon Energy Production Company
Equilon Enterprises LLC
Exxon/Mobil
FINA Inc.
Frontier
Kentucky Hydrocarbon
Marathon/Ashland Petroleum LLC
Mitchell Energy Corporation
Motiva Enterprises LLC
Mustang Fuel Corporation
Tesoro Petroleum Companies, Inc.
Texaco
Union Pacific Resources
United Refining Company
Unocal Corporation
Williams Alaska Petroleum Inc.
Williams Energy Group

Company Information Form (PS-1)

1999 Data

Submit one (1) form for each company

The following company information is needed for quality assurance purposes and will remain confidential. The API report will not include this information.

Company Name: _____

Company Address: _____

Company Contact Person: _____

Phone Number: _____

Fax Number: _____

E-mail Address: _____

Number of Facility Information Forms attached: _____

Number of Incident Report Forms attached: _____

Number of refineries considered for survey: _____

Total Capacity of refineries: _____ BBL/Day

Number of gas processing plants considered for survey: _____

Total Capacity of gas processing plants: _____ CU FT/Day

Facility Information Form (PS-2)
1999 Data

**Incident Report Form (PS-3)
1999 Data**

Fill out this form for each reportable incident

Company Name: _____ **Facility Name:** _____

Required: Date _____ Time _____ AM or PM (circle one)

Section A: Reportable Incidents:

Check the boxes of all reporting criteria that apply.

- Fire causing more than \$25,000 in property damage
- Explosion causing more than \$25,000 in property damage
- Release of chemical greater than 40 CFR 355.40 reportable quantity for extremely hazardous substances or a release of more than 5,000 pounds of flammable or combustible material
- Serious injury, illness or fatality resulting from a fire, explosion, or chemical accidental release

Section B: Incident Characteristics: Input all applicable information

B1. Chemical Release Information:

Chemical or Material Name (Attach additional sheets if necessary)	CAS No.	Pounds Released

B2. Injury/Illness/Fatality Information:

	Injury/Illness	Fatality
Number ONSite		
Number OFFsite		

B3. Incident Costs: Check appropriate range of property damages associated with incident (fire, explosion, release, or injury/illness/fatality)

	ONsite	OFFsite
Less Than \$25,000	<input type="checkbox"/>	<input type="checkbox"/>
\$25,000 - \$250,000	<input type="checkbox"/>	<input type="checkbox"/>
\$250,000 - \$500,000	<input type="checkbox"/>	<input type="checkbox"/>
\$500,000 - \$1MM	<input type="checkbox"/>	<input type="checkbox"/>
\$1MM - \$5MM	<input type="checkbox"/>	<input type="checkbox"/>
More than \$5MM	<input type="checkbox"/>	<input type="checkbox"/>

B4. Other Impacts

Check applicable impacts

- OFFsite Emergency Responders used
- Significant Media Coverage
- OFFsite population protection
Evacuation: Number of person _____
Reportable Shelter-in-place: Number of persons _____

B5. Location of Incident

- | | | |
|--|--|---|
| <input type="checkbox"/> Acid Plant Operation | <input type="checkbox"/> HF Alkylation Unit | <input type="checkbox"/> Pressured Storage |
| <input type="checkbox"/> Amine Treating Unit | <input type="checkbox"/> Hydrocracking Unit | <input type="checkbox"/> Slop Oil Systems |
| <input type="checkbox"/> Atmospheric Crude Distillation | <input type="checkbox"/> Hydrogen Production | <input type="checkbox"/> Storage Cavern Operations |
| <input type="checkbox"/> Atmospheric Storage | <input type="checkbox"/> Hydrotreater | <input type="checkbox"/> Sulfur Recovery Unit |
| <input type="checkbox"/> Coker | <input type="checkbox"/> Isomerization Unit | <input type="checkbox"/> Sulfuric Alkylation Unit |
| <input type="checkbox"/> Cooling Tower | <input type="checkbox"/> Laboratory | <input type="checkbox"/> Utilities area |
| <input type="checkbox"/> Fluidized Catalytic Cracking Unit | <input type="checkbox"/> Marine Facilities | <input type="checkbox"/> Vacuum Crude Distillation |
| <input type="checkbox"/> Gas Plant Operation | <input type="checkbox"/> Naphtha Reformer | <input type="checkbox"/> Vapor Recovery Unit |
| <input type="checkbox"/> Gasoline Treating/Blending | <input type="checkbox"/> Oil/Gas Separation | <input type="checkbox"/> Waste Water Treatment |
| <input type="checkbox"/> Heavy Oils Unit | <input type="checkbox"/> Pilot Plant | <input type="checkbox"/> Pipeline between units/areas |
| <input type="checkbox"/> Other: _____ | | |