



Engineering Site Report Citgo Petroleum, Co. Lemont, IL

Prepared for:

U.S. Environmental Protection Agency

Engineering and Analysis Division
Office of Water
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CONTENTS

	Page
1. SITE DISCUSSED AND DATES	1
2. ATTENDEES.....	1
3. BACKGROUND AND OBJECTIVES	1
4. REFINERY OVERVIEW	1
4.1 Crude and Production	2
4.2 Unit Operations	2
4.3 General Refinery Water and Wastewater	4
5. WASTEWATER SOURCES AND PRETREATMENT.....	4
5.1 Crude Oil Desalting	5
5.2 Coker.....	6
5.3 FCCU Air Pollution Control.....	7
5.4 Catalytic Reformers	8
5.5 Sour Water Stripper	8
6. END-OF-PIPE WASTEWATER TREATMENT.....	9
7. WATER REUSE	13
8. REFERENCES	13
APPENDIX A.....	8-1
APPENDIX B.....	B-1

LIST OF TABLES

	Page
Table 4-1. 2014 Production Capacity, Citgo, Lemont	2
Table 4-2. Major Unit Operations, Citgo, Lemont	3
Table 5-1. Wastewater from Adjacent Facilities Entering the Wastewater Treatment Plant	4
Table 5-4. 2015-2016 WGS and PTU Effluent Data	8
Table A-1. List of Attendees	A-1
Table B-1. List of Potential Sampling Points	B-1

LIST OF FIGURES

	Page
Figure 5-1. Desalter Treatment Train Diagram	5
Figure 5-2. Coker Drums System	7
Figure 5-3. Sour Water Stripper.....	9
Figure 6-1. Wastewater Treatment Plant Diagram	12
Figure B-1. Lemont Water Diagram with End-of-Line Sampling Point	B-2
Figure B-2. Lemont Water Diagram with End-of-Line Sampling Point Detailed.....	B-3

1. SITE DISCUSSED AND DATES

Company: Citgo Petroleum Corporation Lemont Refinery
135th Street and New Avenue
Lemont, IL 60439

Call Dates: June 19th, 2015 (initial call)
August 12th, 2015 (follow-up call)

2. ATTENDEES

Appendix A includes an attendance list for both the initial and the follow-up calls.

3. BACKGROUND AND OBJECTIVES

Section 304(m) of the Clean Water Act (CWA) requires EPA to develop and publish a biennial plan that establishes a schedule for the annual review and revision of national effluent limitations guidelines and standards (ELGs) required by CWA section 304(b). In the *Final 2012 and Preliminary 2014 Effluent Guidelines Program Plans*, EPA selected the Petroleum Refining Point Source Category (40 CFR Part 419) for a detailed study. As part of the detailed study, EPA is collecting and summarizing information on refinery operations, analyzing discharge data, and reviewing treatment technology information to investigate whether changes to the existing regulation are warranted. These calls are part of the detailed study data collection.

EPA and its contractor, Eastern Research Group, Inc. (ERG), participated in an initial call with Citgo Lemont (Lemont) on June 19th, 2015 and a follow-up call on August 12th, 2015. The purpose of the initial call was to answer Lemont's introductory questions concerning the study and what information EPA is interested in collecting from these conference calls. The purpose of the follow-up call was to: 1) gather information about the plant's operations, the wastewater discharges from the plant, and the wastewater management practices used to control the discharges; and 2) determine the feasibility of collecting and analyzing wastewater samples from wastewater sources and wastewater treatment operations. The call focused on the major sources of wastewater at the refinery, which include crude oil desalting, coker system, wet air pollution control system, and sour water stripper. Refinery personnel provided diagrams and background information on the refinery and the wastewater treatment plant.

4. REFINERY OVERVIEW

The refinery was originally constructed in the 1920s. In the late 1960s and early 1970s, the Lemont refinery grew to its current footprint of approximately 900-acres of land adjacent to the Chicago Sanitary and Ship Canal, in Will County, Illinois. The refinery operates 24 hours a day, 365 days per year and employs approximately 800 refinery personnel and contractors.

4.1 Crude and Production

Lemont refines an average of 167,000 barrels per day (bpd) of heavy, sour crude oils (Citgo Lemont, 2011).¹ Crudes are transported mainly by pipeline, though the refinery has the capability to receive and load barges. Lemont personnel noted the purchased crude's API gravity ranges from 25 to 30 degrees, while sulfur content ranges from 2 to 3 percent by weight.²

The refinery produces gasoline, diesel fuel, turbine fuel, aromatic solvents, aliphatic solvents, and molten sulfur (Citgo Petroleum, Co., 2012). The refinery falls under the Cracking Subcategory (Subcategory B) in the current ELGs (40 CFR 419). Table 4-1 lists the products produced in 2014 as reported to the Energy Information Administration (EIA) and how each product is transported.

Table 4-1. 2014 Production Capacity, Citgo, Lemont

Products	Quantity (barrels/stream day) ^a	Transport By:
Alkylates	21,000	Pipeline, Railroad
Aromatics	9,400	Barge Truck and Railroad (Except Benzene)
Desulfurization, Diesel Fuel	90,000	Pipeline
Desulfurization, Kerosene and Jet	13,000	Pipeline, Railroad
Desulfurization, Other	6,800	Pipeline, Barge
Hydrogen (MMCFD)	12	Pipeline
Petcoke, Market	12,000	Barge, Truck
Sulfur (Short Tons/Day)	504	Railroad, Truck

Source: U.S. EIA, 2014

^a The number of barrels the refinery can produce running at full capacity for 24 hours of continuous operation. Hydrogen and sulfur units as noted in table.

4.2 Unit Operations

Lemont personnel provided multiple documents which describe the main refinery operations at Lemont and their purpose, as summarized in Table 4-2. Steam that has come into contact with the hydrocarbon streams is referred to as sour water. Table 4-2 shows which units generate sour water. All sour water generated by the unit operations is routed to a sour water stripper (SWS) prior to the onsite wastewater treatment plant (WWTP). Section 5 discusses wastewater sources and the SWS in greater detail.

¹ The permit factsheet reports that the refinery processes an average of 168,600 barrels of crude per day (Citgo Petroleum, Co., 2012). This difference was not noted during the discussions.

² American Petroleum Institute (API) gravity is the measure (reported in degrees) of how heavy or light a petroleum liquid is compared to water. Lighter crudes have higher API gravities (greater than or equal to 35 degrees). Heavy crudes have lower API gravities (less than or equal to 27 degrees). Sour crudes have greater than 0.5% sulfur content, while sweet crudes of less than 0.5%.

Table 4-2. Major Unit Operations, Citgo, Lemont

Unit Operations	Purpose	Sour Water? ^a
Alkylation Unit	Coverts low molecular weight hydrocarbons (C3, C4, C5) to higher octane gasoline components.	No.
Coke Pit	Water from coke quarry pit is collected in a sump and routed to the WWTP. Lemont does not monitor this wastestream. See Section 5.3 for additional details.	No.
Cokers and Sponge Coker Steam Out System	Cracks heavy ends into usable products. Lemont has two cokers.	Yes. Also produces wastewater from removing coke from the drums.
Crude Unit (Atmospheric and Vacuum Distillation)	First step in refining process to separate the raw crude into fractions, used to produce motor fuels and the base oil stocks for lubricants (Citgo Lemont, 2010a).	Yes. Sour water recycled back through desalter process.
Desalter	Removes salts from the raw crude prior to processing. See Section 5 for additional information about this unit.	No. Stripped sour water is reused in the desalter process.
Fluidized Catalytic Cracking Unit (FCCU)	Cracks heavy fractions into more desirable gasoline and diesel using a catalyst. The FCCU is the largest source of air emissions at a refinery. Lemont uses a wet gas scrubber (WGS) to control sulfur dioxide (SO ₂) emissions and selective catalytic reduction (SCR) to control nitrogen oxides (NO _x). See Section 5 for additional details on the FCCU scrubber. (Citgo Lemont, 2010b).	Yes. Sour water is also recycled back through FCCU process.
Hydrotreaters	Removes sulfur (for both light and diesel distillate). Upstream of the distillate blending unit.	Yes.
Naphtha Desulfurizer	Removes sulfur. Upstream of Lemont's CRs.	Yes.
Semi-regenerative Catalytic Reformer(s) (CRU)	Converts naphthenes to aromatics, a high octane blending component. Also generates hydrogen which is used in other refinery operations.	No.
Sulfur Recovery Unit (SRU)	Hydrogen sulfide (H ₂ S) is collected by the refinery amine system; the H ₂ S is further processed in the SRU downstream of the amine regenerators. Ammonium bisulfide concentrates in the reflux of the amine regenerators. The reflux streams (which are very corrosive) are purged to the sour water system to control ammonia (NH ₃) levels and reduce corrosion potential.	Yes.
Sulfur Tail Gas Unit (TGU)	Stretford TGU (U121) and Flexsorb TGU (U119) are the Tail Gas Units downstream of the SRU trains. The TGU converts the SO ₂ to H ₂ S prior to TGU treatment and recovery of the acid gas. Quench towers (containing caustic) are used to capture any SO ₂ that was not converted. The spent caustic is processed through the sour water system.	Yes.
Flare Knock Out Drums, Flare Stacks, and Slop-oil System	Water from flares, knock out drums, flare stacks, and the slop oil system. Produces "refinery slop water."	Yes.

Source: Citgo Lemont, 2015.

^a All sour water flows to the SWS prior to the WWTP.

4.3 General Refinery Water and Wastewater

Chicago Sanitary and Ship Canal water is used as the primary water source to refinery boilers, cooling towers, miscellaneous refinery processes, and the fire water system. Lemont personnel estimated the daily intake as 6.5 – 7.0 million gallons per day (MGD). The refinery treats intake water intended as boiler feed water prior to use by hot lime softening followed by zeolite softening and deaeration to enhance water quality. Intake water used as utility or fire water is not treated before use.

Refinery wastewaters are directed to an onsite WWTP prior to discharge to the Chicago Sanitary Ship Canal via outfall 001. Based on information in the 2010 permit renewal application, a stormwater management system collects and retains refinery surface water runoff from throughout the refinery, and directs stormwater to a stormwater basin with a capacity of 52 MGD.

Stormwater from the stormwater basin is treated in the onsite WWTP prior to discharge to the Chicago Sanitary and Ship Canal (see Section 6). To prevent uncontrolled overflow from the stormwater containment areas, during extreme wet weather events the refinery is permitted to discharge untreated stormwater via outfall 002 to the Illinois and Michigan Canal (Citgo Petroleum, Co., 2012). Lemont personnel noted discharge of untreated stormwater via outfall 002 occurs less than once per year on average.

5. **WASTEWATER SOURCES AND PRETREATMENT**

Wastewater that is generated at the refinery and treated in the onsite WWTP prior to discharge includes process oily wastewater, wet gas scrubber purge water, sour water, stormwater, cooling tower blowdown, boiler blowdown, service water, steam condensate, sanitary sewage, and additional industrial discharges from adjacent facilities. Appendix B presents the process water diagram provided by Lemont along with sampling points. Table 5-1 lists wastewaters received from adjacent facilities, which are included in the refinery's 2010 permit renewal application. The off-site wastewater sources were not discussed during the calls, and are not discussed further in this report. This discussion focused on wastewater generated from the crude oil desalter, coker, FCCU, catalytic reformer, and sour water stripper wastewater which are discussed in greater detail, including pretreatment, in the following subsections.

Table 5-1. Wastewater from Adjacent Facilities Entering the Wastewater Treatment Plant

Adjacent Refinery	Type of Wastewater	
	Stormwater runoff	Process
Linde	☑	☑
Oxbow	☑	☑
Seneca		☑
ExxonMobil Terminal	☑	
ONEOK	☑	

Source: Citgo Petroleum Co., 2010.

5.1 Crude Oil Desalting

The first step in the refining process is the removal of salts, sediments, and water present in raw crude oil before processing in the crude unit. Figure 5-1 shows the crude oil desalting system. The desalter uses electric charge to separate the salts from the crude. The water containing salts and other solids separates from the crude oil and is removed from the bottom of the desalter. Desalter effluent flows to the hydroclone at around 300-400 gallons per minute (gpm) and is monitored for oil and grease, pH, and chemical oxygen demand (COD).³ The desalted oil flows to the crude unit.

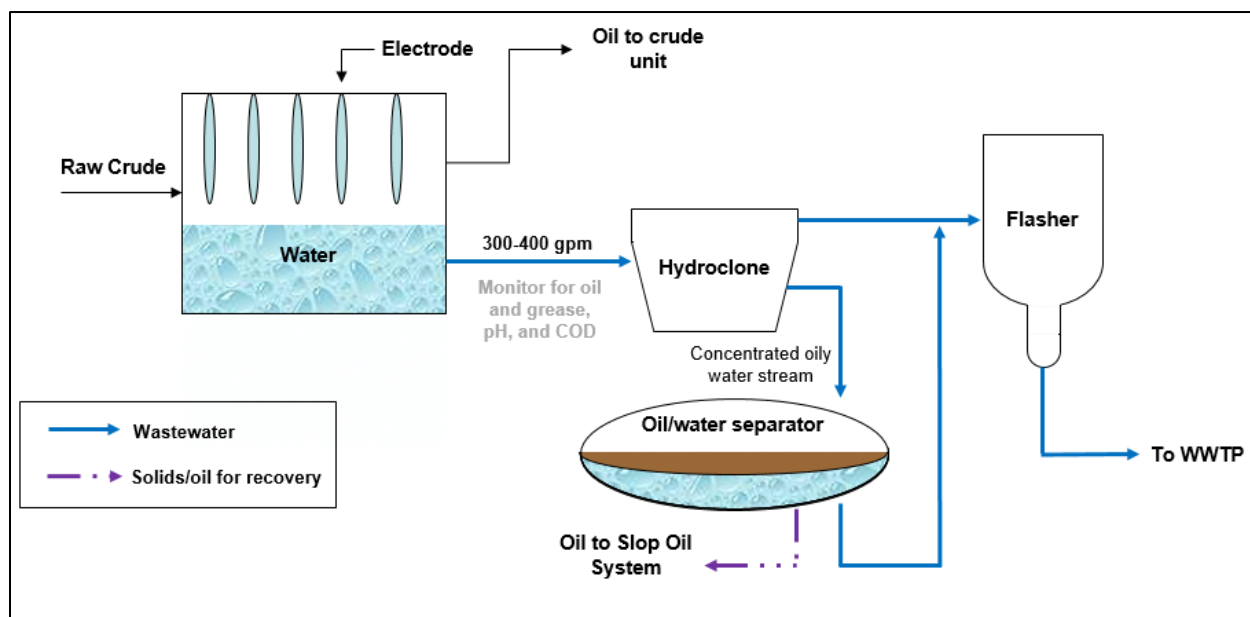


Figure 5-1. Desalter Treatment Train Diagram

Wastewater from the desalter flows to a hydroclone which works as a centrifuge to break the oil water emulsions and separate out the benzene. The Benzene Waste Operations National Emission Standards for Hazardous Air Pollutants (NESHAP) or BWON (40 CFR Part 61, Subpart FF) establishes standards to reduce benzene emissions from facility waste. Lemont selected the six megagram per year (Mg/yr) option (known as 6BQ) for compliance with BWON.⁴ Desalter effluent is treated in the hydroclone as part of the refinery's benzene compliance program.

The water leaves the hydroclone and is routed directly to the flasher inlet. The concentrated oily water stream from the hydroclone is sent to an oil/water separator to ensure good separation before the water is sent to the flasher inlet. The reject oil from the oil/water

³ There is a sampling location, #17, for the desalter effluent, before the hydroclone (see Appendix B, Figure B-2).

⁴ Facilities at which the total annual benzene (TAB) quantity from facility waste is equal to or greater than 10 Mg/yr must comply with the BWON. The 6BQ option allows facilities to manage and treat the waste such that the benzene quantity is equal to or less than 6.0 Mg/yr. Lemont provided their BWON end-of-line (EOL) sampling plan prior to the follow-up call. The refinery also provided a copy of their Benzene Waste NESHAP Annual TAB Report for year 2014 after the visit. The annual TAB report lists all the wastestreams that are monitored for benzene.

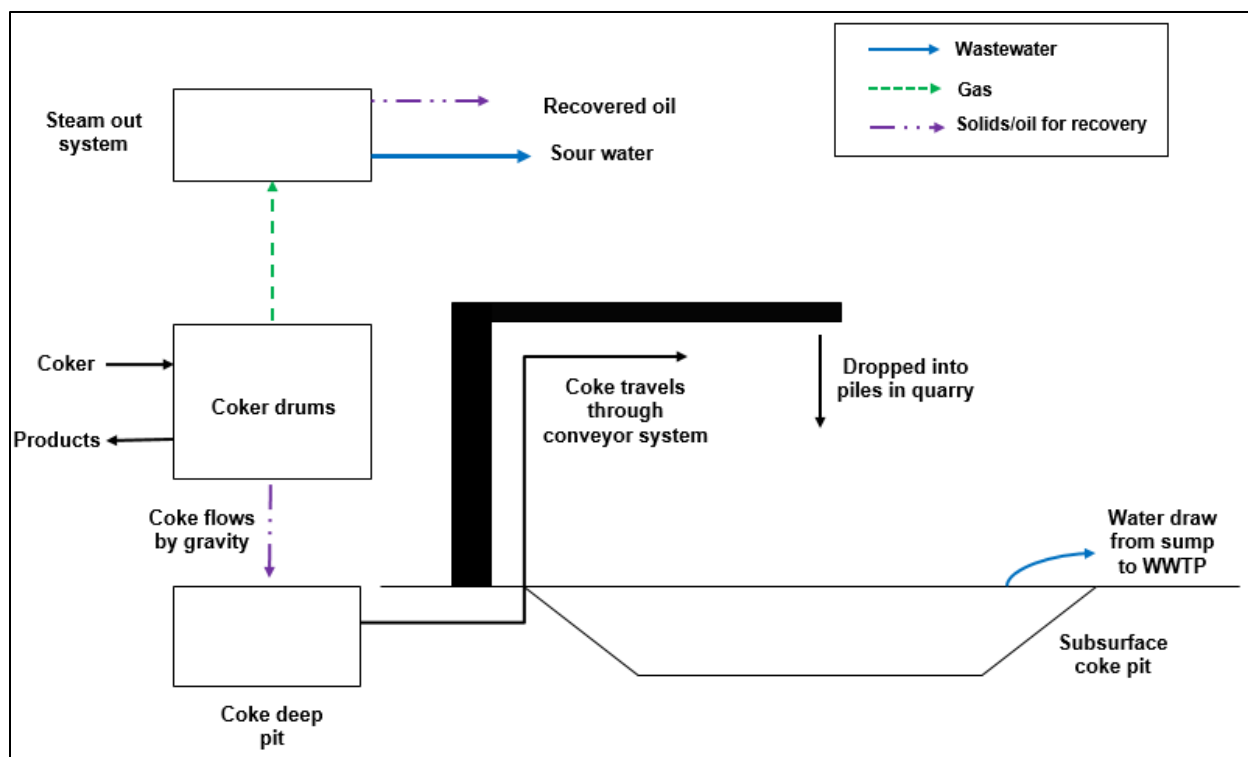
separator is routed to the refinery slop system. The benzene-rich gas goes to flare gas recovery system. A stream of desalter washwater and a 125-pound steam preheater are used to control the temperature at the inlet to the flasher. Lemont personnel noted the temperature of the flasher (240°F) is the key control point to make sure benzene is removed effectively.

5.2 Coker

A coker uses thermal cracking to break apart the heavier residuals from the crude vacuum distillation unit into more valuable products such as gasoline. A side product of this process is petroleum coke (pet coke). A delayed coker is a batch process that allows a coke drum to cool to remove the build-up of pet coke.

Lemont has two delayed cokers, but only one, Unit 113 (U113), is currently operating. Lemont uses hydraulic jets to cut out the pet coke that accumulates in the coker drums (Citgo Lemont Co., 2015). Coke from U113 is placed in the refinery's coke pit. This pit is unique to Lemont as it is a former quarry that predates the construction of the refinery and allows for subsurface temporary storage. From the quarry, coke from U113 is loaded onto covered haul trucks for hauling to an adjacent barge dock. A third-party vendor manages the coke transport. The wastewater generated during coke removal may be reused as cutting fluid or may be sent to the refinery's coke pit along with the pet coke. Any wastewater that accumulates in the pit is transferred to the WWTP. Figure 5-2 shows the coker system.

The second coker, Unit 108 (U108), was shut down in March 2010, but put back into service to produce sponge coke (type of fuel grade pet coke). After intermittent operations, U108 has been down (idled) since December 2012. When U108 was in operation, coke from U108 was transferred directly from its deep pit via a covered conveyor system to a neighboring coke calciner. The third-party calciner also owned the conveyor system. The calciner ceased operation in late 2013.



Source: Citgo Lemont, 2015.

Figure 5-2. Coker Drums System

5.3 FCCU Air Pollution Control

The FCCU is typically the largest source of air emissions at the refinery. Flue gas from the FCCU flows to a carbon monoxide (CO) boiler to oxidize and reduce CO before being directed to a selective catalytic reduction (SCR) system to convert NO_x to nitrogen. A combined wet gas scrubber (WGS) and wet electrostatic precipitator (WESP) controls SO₂ emissions, unreacted NH₃, and particulate matter. The WGS was constructed to comply with the refinery's 2005 settlement with EPA and was on-line by 2007.⁵

Hot flue gases from the FCCU are directed to a chamber where the gas passes through a series of caustic solution (NaOH) spray curtains which remove coarse particulates and SO₂. Smaller particles and sulfur trioxide (SO₃) mist is removed in the WESP. The gas enters the WESP via a gas distribution screen and flows from bottom to top. The particles separate from the gas flow due to the electric current and flow downward into the scrubber area. A small purge stream, 125-155 gpm, containing NH₃ and solids is discharged to the purge treatment unit (PTU) (Citgo Lemont, 2015). The purge stream is based on flow or density rather than total suspended solids (TSS) levels and is set by the console operators to reduce foaming in the WGS. WGS effluent is monitored for pH, specific gravity, NH₃, and chlorine. Makeup to the WGS is about 300-500 gpm.

⁵ Information from Citgo Global Refinery Settlement. Available online at: <http://www2.epa.gov/enforcement/citgo-global-refinery-settlement>

The PTU removes solids from the purge stream and uses a breakpoint chlorination system to convert NH_3 to nitrogen through chlorine addition. Sodium bisulfite is added to neutralize the chlorine. The refinery also adds a coagulant to influent to the PTU. The refinery monitors the purge stream for TSS, NH_3 , and COD. An Oberlin Belt Press dewateres solids removed from the PTU before disposal offsite as nonhazardous waste. PTU effluent routes through a small cooling tower for temperature control and then routes to the treated water basin (TWB) located at the end of the WWTP (see Section 6). Table 5-2 presents data provided by Citgo for some of the pollutants monitored in the WGS and PTU effluent streams. Citgo did not provide data for all the pollutants monitored.

Table 5-2. 2015-2016 WGS and PTU Effluent Data

Parameter	WGS effluent	PTU effluent
Specific gravity	1.04	N/A
NH_3 (ppm)	16.3	0.6
TSS (ppm)	N/A	8.2

N/A = Not Applicable

5.4 Catalytic Reformers

The refinery has two semi-regenerative CRUs that only need to be regenerated every few years. The south plant CRU (U116) was last regenerated in April 2016 and will need to be regenerated next in 2020 (every four years), while the north plant CRU (U123) was last regenerated October 2009 and is currently scheduled for regeneration in 2017. The length of time between regenerations is dictated mostly by catalyst deactivation. As the catalyst deactivates, additional heat is required to achieve a specific octane target. A higher octane target and higher reactor temperatures decrease the time between regenerations because the catalyst deactivates faster.

Due to the relatively infrequent regenerations, Lemont does not have permanent scrubbers in place for air emissions control during regeneration, rather the refinery uses temporary caustic scrubbers as needed. During regeneration, scrubber effluent routes to a “pump-out” header which is connected to a flare drum. Water from the flare drum routes to the wet slop oil system. Wet slop oil system effluent routes to the SWS for oil and H_2S removal prior to routing to the WWTP. During regeneration, wastewater is monitored for pH, total suspended solids (TSS), iron, and alkalinity.

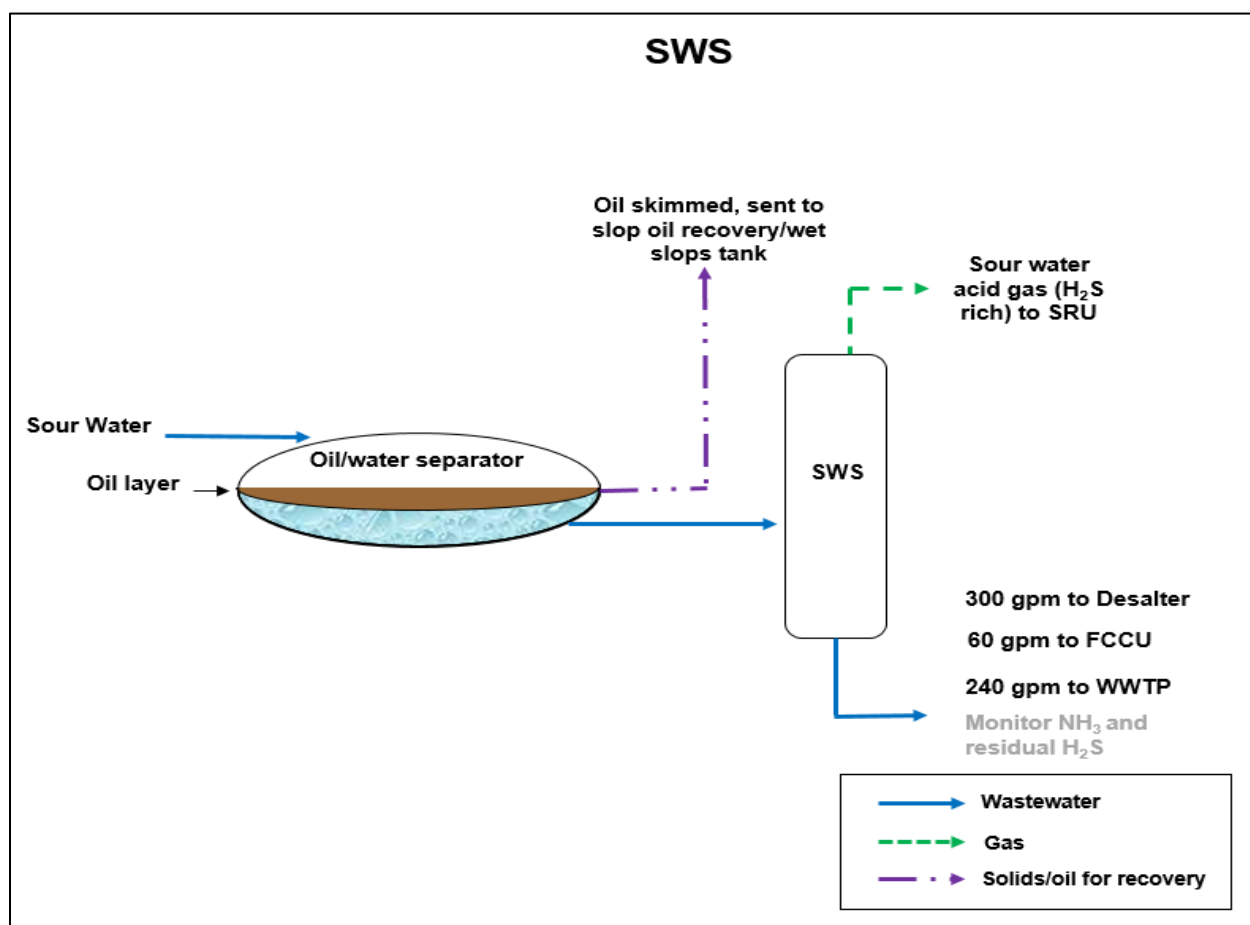
5.5 Sour Water Stripper

Steam used as the stripping medium within the refinery distillation and separation processes is condensed and directed to the refinery’s SWS. Table 4-2 lists the refinery units which generate sour water. Sour water typically contains H_2S , NH_3 , and entrained oil.

Figure 5-3 shows a simplified diagram of the SWS process. Lemont has two SWS designed to handle two separate wastewater streams. Each sour water stream first enters a sour water oil separator. Recovered oil is sent to the refinery slop tanks that route to the coker for processing. Water from the separator is fed into a SWS, where steam is used to strip the H_2S and NH_3 from the wastestream. The overhead H_2S rich acid gas is directed to the SRUs where the sulfur is converted to elemental sulfur. The SWS effluent stream flowrate is about 600 gpm.

which equates to about 98 percent of the charge into the SWS. SWS effluent is reused in the crude unit desalter (about 300 gpm) and the FCCU (60 gpm), while the remainder (240 gpm) routes to the WWTP. The stripped wastewater enters the WWTP prior to the induced gas flotation (IGF) unit (see Section 6) (Citgo Lemont, 2015).

To ensure the SWS is operating properly, the refinery monitors the stripper effluent for NH_3 and total residual sulfides. Stripper effluent with less than 10 ppm NH_3 and 50 ppm residual sulfides is cooled and reused in process units (i.e., FCCU and desalter); otherwise, the stripper effluent is sent to the onsite WWTP (Citgo Lemont, 2015). The refinery may make small adjustments to the stripping steam rates or stripper top temperature to improve stripping. If the refinery observes poor stripped water quality, the main focus becomes identifying a potential source of the sour water contaminant in the feed. Poor stripped sour water quality is typically due to a change in the sour water quality, such as high COD or high and/or low pH influent stream.



Source: Citgo Lemont, 2015.

Figure 5-3. Sour Water Stripper

6. END-OF-PIPE WASTEWATER TREATMENT

Process wastewater is directed to the onsite WWTP for treatment prior to discharge to the Chicago Sanitary and Ship Canal via outfall 001. Outfall 001 has a daily average design flow of

5.79 MGD and maximum design flow of 8.35 MGD. Figure 6-1 shows the WWT operations, which includes process water storage tanks which are used instead of an API or corrugated plate interceptor (CPI) separator, IGF, biological treatment in aeration basins followed by clarifiers, and storage in a treated water basin before discharge.

Figure 6-1 provides a general WWTP diagram for the refinery and a brief description of each unit follows:

- **Non-Process Water Storage Tank** – Stormwater and off-site stormwater (listed in Table 5-1) are routed to the refinery’s stormwater basin then to a 0.25 million gallon storage capacity equalization tank. Refinery sanitary wastewater is also routed to the equalization tank. The wastewater from the equalization tank routes to a sedimentation tank prior to the aeration basins. Stormwater basin overflow is intermittently discharged from outfall 002 during extreme weather.
- **Process Water Storage Tanks** – Lemont uses three floating roof (covered) process water storage tanks as oil-water separators and has a fourth covered tank which is used as an emergency diversion tank. The process water tanks provide equalization of BOD/COD which allows for a more consistent feed to the WWTP. North and South plant process water are routed to the designated tanks for each.

Lemont personnel noted the refinery no longer uses its two corrugated plate interceptors (CPI) due to performance issues. The process water storage tanks are designed to settle solids and float free hydrocarbons contained in wastewater streams. A proprietary coagulant is injected by a third party to the process water upstream of the tanks to aid in the settling of high BOD/COD solids and the separation of oil. Settled solids and sludge are collected in the bottom of the process water tanks and processed by a third party. After conditioning (processing for desired particle size, percent solids, and oil content), the sludge is transferred to the coker for MOSC (Mobil Oil Sludge Coker) processing. Refuse and large particles removed during conditioning are put in drums and processes as hazardous waste.

Recovered oil from the surface is skimmed and transferred to refinery oil recovery systems (TK 434). Oil from TK 434 is routed to TK 435 and then returned to the coker unit for reprocessing. Citgo Lemont personnel noted the oil skimming process is intermittent and infrequent.

Though a sampling point, #36, is located right after the process water storage tanks, Citgo Lemont personnel noted that sampling the IGF influent stream is more appropriate to capture effluent from all the process water tanks (see Appendix B for sampling point locations). The IGF influent tap is sampled regularly to visually check water quality, but no analytical testing is regularly performed.

- **IGF** – The refinery maintains one IGF unit that uses nitrogen gas to float suspended materials. The refinery adds a coagulant (i.e., polymer) to the

wastewater as it leaves the process water storage tanks and is pumped to the IGF. The IGF removes residual suspended oily solid materials using fine gas bubbles to float suspended materials to the surface. The suspended solids create an oily float on the top of the wastewater. This oily float is skimmed, collected, and returned to the head of the WWTP.

Citgo Lemont personnel noted the most representative process water sample is downstream of the IGF unit. The sample is analyzed for oil and grease, TSS, and hexavalent chromium. The inlet to the activated sludge system (aeration units), includes the IGF effluent and effluent from the non-process water tanks and is analyzed for COD, BOD, alkalinity, NH_3 , phenol, sulfides, nitrates, fluorides, cyanide, and chromium.

- **Activated Sludge System** – IGF unit effluent is directed to three aeration basins which work in parallel, where microorganisms reduce the organic compounds in the wastewater. The retention time in the aeration basins is approximately nine hours during normal operation where flow to the aeration basins is about 4,000 gpm. Phosphoric acid (H_3PO_4) is added to ensure nutrient sources for growth. Biologically treated wastewater from the aeration basins undergoes solids settling within one of the two secondary clarifiers. The refinery may add polymer flocculant if needed to improve settling in the clarifier. Most of the settled biological material from the clarifiers is returned to the head of the activated sludge treatment system as return activated sludge. Waste activated sludge from the secondary clarifiers is routed to the stormwater basin. The stormwater basin is periodically dredged to remove solids.
- **TWB** – Secondary clarifier effluent is gravity fed to a storage tank referred to as the TWB. Wastewater from the PTU is routed directly to the TWB. Though the TWB is not a sedimentation tank by design, it is periodically dredged to remove solids. A dispersant and antifoam is added before the final effluent is discharged via outfall 001 or recycled into the refinery fire water system (about 500 gpm). Wastewater may be held in the TWB or diverted to the stormwater basin for reprocessing at the WWTP, if necessary.

7. WATER REUSE

This section summarizes water reuse currently implemented at Lemont. Wastewater characteristics need to be considered when reusing water since it could negatively impact equipment through fouling and scaling.

- Fire Protection System – As mentioned in Section 6, the refinery uses a portion of the WWTP effluent for the fire protection system.
- SWS Effluent – As stated in Section 5.4, the effluent from the SWS may be reused in the desalter and FCCU.
- Stormwater basin – When stormwater basin levels are high, the refinery uses stormwater for cooling water makeup and utility water.
- Crude overhead – About 40 gpm of crude overhead sour water is reused for the liquid ring vacuum vent gas compressor and is routed to the sour water system.

8. REFERENCES

1. Citgo Lemont. 2011. About Us | Citgo Refining. Available online at: <http://www.citgorefining.com/lemont/about-us>.
2. Citgo Lemont. 2015. Non-CBI_Citgo (FOIA) Information (WWTP Docs, Permit, BWON). (July). DCN PR00001
3. Citgo Petroleum Co. 2010. Permit Renewal Application for IL0001589. (December). DCN PR00121
4. Citgo Petroleum Co. 2012. Public Notice/Fact Sheet of Draft Reissued of NPDES Permit IL0001589. (October 12). DCN PR00120
5. U.S. Energy Information Administration (EIA). 2014. Production Capacity. Available online at: <http://www.eia.gov/petroleum/refinerycapacity/>.

APPENDIX A

CALL ATTENDEE LIST

Table A-1 presents the individuals who attended the initial call on June 19th, 2015 and those individuals who attended the follow-up call August 12th, 2015.

Table A-1. List of Attendees

Name	Affiliation	Email Address	Initial Call (6/19/15)	Follow Up Call (8/12/15)
Michael Mee	Citgo Lemont	mmee@citgo.com	☒	☒
Larry Tyler	Citgo Lemont	ltyler@citgo.com	☒	☒
Matt Klickman	Citgo Lemont	mklickman@citgo.com	☒	☒
Samantha Lewis	EPA	lewis.samantha@epa.gov	☒	☒
Lori Weiss	ERG (contractor to EPA)	lori.weiss@erg.com	☒	☒
Cortney Itle	ERG (contractor to EPA)	cortney.itle@erg.com		☒
Kara Edquist	ERG (contractor to EPA)	kara.edquist@erg.com		☒

APPENDIX B

WATER DIAGRAM AND POTENTIAL SAMPLING POINTS

Figure B-1 and Figure B-2 are diagrams with end-of-line (EOL) sampling points from Lemont's BWON documentation. Table B-1 presents a list of potential sampling points and monitored parameters.

Table B-1. List of Potential Sampling Points

Figure	Sampling Point #	Description	Parameters Currently Monitored
B-2	2	Unit 112 – FCCU. (WGS Effluent and WGS purge stream)	pH, specific gravity, NH ₃ , Cl TDS, TSS, and benzene
B-2	4/5	Unit 111 – Crude Unit. (Desalter Influent)	Benzene
B-2	8	Unit 114/116 – CR #2. (CR Effluent)	Benzene
B-1	17	Desalter Effluent	Benzene, oil and grease, pH, and COD
B-1	24	Clarifier (and/or PTU) Effluent/TWB Influent	TSS, NH ₃ , COD, benzene, ethylene, toluene, and xylene
B-1	27	Sedimentation Tank Effluent/ Aeration Tank Influent	COD, BOD, alkalinity, NH ₃ , phenol, sulfides, nitrates, fluorides, cyanide, chromium, benzene, ethylene, toluene, and xylene
B-1	36	Process Water Storage Tank Effluent	Benzene
B-1	45	Stormwater Basin Effluent/Equalization Tank Influent	Benzene, ethylene, toluene, and xylene
B-1	48	IGF Effluent/Aeration Tank Influent	Oil and grease, TSS, hexavalent chromium, and benzene

Source: Citgo Lemont, 2015 (Figure B-1, Figure B-2).

