

SUMMARY OF PASADENA REFINING'S YEAR 1 ANNUAL REPORT ON CONSENT DECREE COMPLIANCE

Under the Consent Decree, Pasadena Refining System, Inc. (PRSI) must submit Annual Reports tracking its compliance with all of the requirements of the settlement. This is a summary of their first Annual Report (which contains several hundred pages of information).

The bottom line: the Pasadena Refinery has dramatically reduced its upset emissions compared to the five years prior to the filing of the lawsuit, and has upgraded both equipment and operating procedures to reduce the likelihood of future emission violations.

NOTE: On May 1, 2019, both the Pasadena Refinery and PRSI itself were purchased by Chevron, so PRSI is now a subsidiary of Chevron instead of Petrobras – but PRSI is still responsible for compliance with the Consent Decree. Also noteworthy is that, according to a Reuters news story, Chevron held up final approval of the purchase until PRSI could “prove the refinery would operate as promised.”

Excess Emissions: Paragraph 7 (a)(i-iii&v) of Consent Decree

The Consent Decree requires PRSI to demonstrate two consecutive years of “substantial compliance” with its emission limits for SO₂ and VOCs from the East and West Flares, for PM from the Electrostatic Precipitator (ESP) Stack, and for PM, SO₂, VOCs, and NO_x from the Seal Pot. These are the emission sources and pollutants responsible for the vast majority of upset emissions that occurred during the five years prior to the filing of the Environment Texas & Sierra Club lawsuit against PRSI.

“Substantial compliance” means any “excess emissions” (emissions that violate hourly or annual permit limits) must be held to less than the very low annual thresholds written into the Consent Decree.

All excess emissions, however, even those that fall below the “substantial compliance” thresholds, trigger \$1/pound stipulated penalties. Excess emissions that exceed the thresholds trigger \$5/pound stipulated penalties AND re-start the clock on demonstrating two consecutive years of substantial compliance.

During the first full year following implementation of the Consent Decree, running from April 1, 2018 to March 31, 2019, PRSI released 8,152.3 lbs of Total Excess Emissions (TEE).

As required by the Consent Decree, PRSI must now pay stipulated penalties totaling \$10,646 for these emission limit violations. And because excess PM emissions from the ESP Stack exceeded the 4,000 lbs/yr threshold in the Consent Decree (by 697 pounds), PRSI must start from scratch in demonstrating 2 consecutive years of substantial compliance with that permit limit.

The Total Excess Emissions during this period included 19.81 lbs of nitrogen oxides (NO_x), 4,991.99 lbs of Particulate Matter (PM₁₀), 2,426.31 lbs of sulfur dioxide (SO₂), and 714.19 lbs of Volatile Organic Compounds (VOCs). These Excess Emissions originated from the East and West Flares, and two sources associated with the Fluid Catalytic Cracking Unit (FCCU) – the Electrostatic Precipitator (ESP) Stack and the Seal Pot. See Table 1 below for a detailed breakdown of the TEE and stipulated payments due for each pollutant from each source from April 1, 2018 to March 31, 2019.

These emission amounts represent a dramatic reduction in unauthorized pollution. PRSI reduced its Total Excess Emissions (TEE) in the first year following the Consent Decree by over 91% compared to the 2012 - 2016 annual average from all reported pollutants. There has been a 98% reduction in unauthorized NO_x emissions, a 94% reduction in VOCs, a 93% reduction in PM₁₀, and a 65% reduction in SO₂. Notably, the 8,152.3 lbs of Total Excess Emissions from April, 2018 to March, 2019 compare very favorably to the 165,566.7 lbs of unauthorized emissions in 2012, the highest emitting year between 2012 and 2016. See Table 2 for a detailed breakdown of comparisons between the 5-year period from 2012 - 2016 and the 4/18 – 3/19 year.

Table 1:

April 1, 2018 – March 31, 2019 Total Excess Emissions (in lbs) and Stipulated Penalties

	Nitrogen Oxides (NO_x)	Particulate Matter (PM₁₀)	Sulfur Dioxide (SO₂)	VOCs	Total
Flares	0	0	2,398.73	713.61	3,112.34
ESP	0	4,696.67	0	0	4,696.67
Seal Pot	19.81	295.32	27.58	0.58	343.29
Total Yearly Excess Emissions	19.81	4,991.99	2,426.31	714.19	8,152.3
Stipulated Penalties Due	\$20	\$7,485	\$2,426	\$715	\$10,646

Table 2:

**Comparison between Total Excess Emissions (from April 1, 2018 - March 31, 2019) and Annual Emissions from STEERS Reports (from 2012 - 2016)
(in lbs)**

	Nitrogen Oxides (NO_x)	Particulate Matter (PM₁₀)	Sulfur Dioxide (SO₂)	VOCs	Total
2012 - 2016 STEERS 5-year average	1,182.36	75,753.9	5,438.32	12,495.3	94,869.88
Highest yearly total between 2012 and 2016	2,165	124,230	15,309	20,828.4	164,742.4
April 2018 - March 2019 TEE	19.81	4,991.99	2,426.31	714.19	8,152.3

Seal Pot Emissions: Paragraph 7(a)(iv & v) of Consent Decree

PRSI provides a table showing each monthly total of the 12-month rolling annual total of PM₁₀ emissions from the Seal Pot and the underlying data supporting these calculations. In April 2018, Pasadena Refinery released 0.47 tons of PM₁₀ from the Seal Pot. Nonetheless, Seal Pot remained within the annual emission limit of 2.57 tons per year (TPY) for the 12-month period between April 1, 2018 and March 31, 2019 such that no stipulated payment is due.

Prior to the filing of the lawsuit, PRSI committed at least 37 consecutive 12-month rolling average PM₁₀ violations from 2014 – 2017.

Semi-Annual Reports for Boiler #4 and Boiler #6: Paragraph 7(a)(vi) of Consent Decree

PRSI provides a copy of the semi-annual New Source Performance Standards (NSPS) compliance reports submitted to the Texas Commission on Environmental Quality (TCEQ) for the period from April 1, 2018 to September 30, 2018 and October 1, 2018 to March 31, 2019 regarding Boiler #4 and Boiler #6. The reports show that PRSI was in compliance with the 1-hour average NO_x emission standard for Boiler #4 and Boiler #6 between April 1, 2018 and March 31, 2019.

Over the past year, the only modifications to Boiler #4 and Boiler #6 were the implementation of carbon monoxide and nitric acid analyzers in December, 2018. These adjustments should have no impact on PRSI's compliance with emissions standards.

For comparison, prior to the filing of the lawsuit, PRSI violated the NO_x emission limit at Boiler #4 for a total of 6,876 hours from 2011 - 2014. Additionally, PRSI committed 330 hours of CO violations at Boiler #4 between 2011 and 2014. PRSI's Boiler #6 was also not in compliance with the CO emissions limit preceding this lawsuit for a total of 1,528 hours from 2011 - 2014.

Maximized ESP Use Report: Paragraphs 7(b) & 8(a - c) of Consent Decree

The Electrostatic Precipitator (ESP), an air pollution control device, is connected to Stack HTRBL010 in the Pasadena Refinery Fluidized Catalytic Cracking Unit (FCCU). The ESP is located downstream of Boiler 10 and the catalyst Regenerator. Normal emissions as well as flue gas from unit shutdowns are routed through the energized ESP (to remove particulate matter) before exiting from Stack HTRBL010. To avoid Emergency Shutdowns during unit startup, however, the ESP has historically been de-energized and re-energized based on the stability of the unit, which is dependent on a number of inter-related variables, including pressures, temperatures, control valve positions, and catalyst circulation. In order to energize the ESP, numerous specific parameters must be met. De-energizing the unit results in a lack of emissions control during those times.

As required by the Consent Decree, PRSI is taking steps to maximize the use of the ESP for control of emissions in either an energized or a non-energized state. PRSI is on track to install, by December 31, 2019, Tunable Diode Laser (TDL) analyzers downstream of Boiler 10 and tied to the existing ESP alarm and shutdown system. The TDL analyzers will have the capacity to directly measure carbon monoxide and methane emissions, as well as to provide additional safety to the operation of the ESP during normal and abnormal unit operating conditions. The analyzers will be configured to an appropriate Safety Integrity Level (SIL) and have the ability to prevent erroneous trips and readings.

Elevated Opacity Event Procedure: Paragraphs 7(b) & 8(d) of Consent Decree

As required by the Consent Decree, PRSI has developed and implemented, as of November 13, 2018, internal procedures to assess elevated opacity events, defined as any opacity of emissions from the ESP Stack that exceeds 20% as a 60-minute average excluding planned start-up and shutdown events. The process for addressing these incidents is through identifying high opacity levels, determining the consequence(s) from this deviation, establishing the possible cause, and taking corrective action to remediate opacity levels. FCCU operators are responsible for procedure review and implementation.

Elevated Opacity Event Summary: Paragraphs 7(b) & 8(d) of Consent Decree

From April 1, 2018 to March 31, 2019, Pasadena Refinery's ESP Stack had five elevated opacity events with hourly average opacity levels greater than 20%.

For two hours on April 14, 2018, Boiler 10 experienced an hourly average opacity as high as 70.79% due to catalyst carryover from the Regenerator and FCC shutdown. PRSI personnel decreased maximum bed level as well as developed and executed a plan to verify cyclone levels in order to reduce opacity.

On April 18, 2018, Boiler 10 reached an hourly average opacity of 42.65% and remained at an average hourly elevated opacity for two hours. This event of elevated opacity occurred during FCC shutdown, and corrective action was taken to change the procedure so that the anti-surge valve would not be manually adjusted unless maintenance was being conducted.

On May 30, 2018, Boiler 10's hourly average opacity reached 25.23% due to catalyst carryover. PRSI personnel took measures to reduce the unit rate and lower the maximum regenerator bed level in order to return opacity to normal levels.

On October 15, 2018, hourly average opacity peaked at 38.72% during FCC shutdown. Shutdown of the unit proceeded due to the loss of a charge pump and opacity levels decreased to below 20%.

On December 26, 2018, Boiler 10 reached an average hourly opacity of 20.74%. Boiler 10 tripped due to insufficient air flow from a draft fan, which was resolved by shutting down the malfunctioning draft fan and starting up a properly functioning draft fan.

Flare Minimization Plan: Paragraph 9(a-b) of Consent Decree

As required by the Consent Decree, PRSI updated its flare minimization plan by November 13, 2018. The plan provides a list of refinery process units, a flare minimization assessment, a description of affected flare systems and flare gas recovery systems, an evaluation of baseline flow, flare startup and shutdown procedures for both the East and West Flares, and a simplified diagram of flow rates and identification of the monitor types used to detect flow rates from the East and West Flares.

Both the East and West Flares are steam assisted flares. The West Flare has a Flare Gas Recovery (FGR) system. The baseline flow for the East Flare is 300,000 scfd and for the West Flare is 1,250,000 scfd.

PRSI has and will continue to take measures to minimize flaring from the East and West Flares. In 2015, PRSI upgraded West Flare Sulfur Recovery Unit valves, rerouted the Universal Dow Extraction (UDEX) off-gas from the flare to the flare fuel system, and installed a Flare Gas Recovery (FGR) unit on the West Flare. PRSI instituted a formal practice for flaring reduction into the site Turnaround planning and execution process and increased service water pressure to the FGR compressors to reduce nuisance trips and thus increase reliability of the system in 2016. In 2017, PRSI made adjustments to the West Flare in order to reduce the potential for flaring resulting from an FGR shutdown, as well as improved reliability of the FGR system during winter conditions. Moving forward, PRSI plans to conduct a third party review of the refinery utility systems, install a vent gas mass spectrometer, and add chemical injection to the FGR to increase system reliability and minimize flaring.

Community Complaint and Response Plan: Paragraph 10 of Consent Decree

As required by the Consent Decree, PRSI has developed and implemented a procedure for addressing community concerns or complaints involving odors or emissions due to Pasadena Refinery's activities. Any person or group in proximity of the refinery with the potential to be impacted by PRSI's activities has the ability to contact PRSI via phone, which is answered 24 hours a day, at (713) 472-4051 or via email, checked daily, at PasadenaRefinery@chevron.com. This contact information is available to the public through PRSI's website, to Citizen Advisory Councils, and to the local government.

Once PRSI is contacted and given information from the caller, an investigation of any complaint within 2 miles of the facility is initiated immediately. Based on the results of the investigation, PRSI will determine whether the government or community must be notified and any corrective action necessary will be performed. If there is no easily identifiable activity or condition related to Pasadena Refinery, a more in depth investigation is warranted, including a potential off-site investigation. The individual who issued the original complaint will be contacted and relayed

information regarding whether or not PRSI is the cause of their concern, any potential impacts related to the incident, corrective measures taken, and a timeframe for the situation. PRSI must also solicit feedback from the caller.

Any concern or complaint made to PRSI must be recorded through the Community Concern & Investigation Log, which includes the name and address of the complainant, the date and time of the complaint, the nature of the complaints, and any associated investigation and corrective actions. These records will be reported in the Monthly HSE Steering Team and retained for six years by the Environmental Department.

Community Complaint Log: Paragraphs 7(b) & 10(c) of Consent Decree

There were no community concerns or complaints filed between November 13, 2018 and April 1, 2019.

Hurricane Preparedness Plan: Paragraph 11 of Consent Decree

As required by the Consent Decree, PRSI submitted a hurricane preparedness plan on March 13, 2019. In event of a hurricane or State-declared emergency, the decision to operate, shut down, and staff or evacuate the Pasadena Refinery is determined by the Refinery Manager and Severe Weather Committee in consideration of forecast conditions and duration; utility, supplier/service, and workforce availability; and City Mayor and County Judge orders. A Severe Weather Decision Guide has been developed to evaluate conditions that directly affect operation of the refinery, such as wind speed, storm surge, and rainfall. For a tropical storm and Category 1 hurricane forecast at the refinery, PRSI may operate if appropriate services are available and operating units remain in stable condition. For a Category 2-5 hurricane, PRSI anticipates shutdown of process units using government issued deadlines to plan the timing of shutdown procedures. The decision to evacuate and secure the plant is based on forecast storm surge at the facility and in the Pasadena area. An Incident Action Plan, including a safety and communication plan guaranteeing food, lodging, and emergency support, must be approved for the duration of the storm. A Post Hurricane Assessment Plan and a Recovery and Restoration Plan must also be approved prior to the release of personnel and to hurricane landfall. These plans include inspection for damaged equipment, damaged installation/asbestos, verification of no releases to secondary containment tanks, removal of water and restoration of secondary containment, maintenance of motors and electrical equipment, and verification of operational readiness consistent with worker safety prior to startup. Post-hurricane or State-declared emergency, PRSI's hurricane preparedness plan is updated to further minimize air emissions.

Preventative Maintenance Report: Paragraph 12 of Consent Decree

As required by the Consent Decree, PRSI updated and submitted on March 13, 2019, a Preventative Maintenance Plan that defines the requirements and guidelines for rotating equipment (such as motors), electrical equipment, and instrumental system preventative maintenance measures that facilitate the reduction of emission event root causes for all PRSI units. An inspection program is implemented for fixed equipment.

Condition monitoring data is tracked, trended, reported, and stored for rotating equipment. The equipment is evaluated for performance, and a “bad actors list” is maintained to prioritize review and improvement for emission event prevention. Electrical equipment is held to National Electrical Testing Association standards, recordkeeping, and reporting that is related to a preventive measures program. A third party specialist contractor also performs condition monitoring and preventive maintenance on electrical equipment. Safety Instrumented Systems are implemented at the refinery, such that equipment and transmitters are inspected and maintained during outages and turnarounds. Routine monitoring by operations may indicate anomalies that are then investigated by the Instrument and Electrical team.

The fixed equipment inspection program is managed by the Inspection Department using updated practices of the National Association of Corrosion Engineers International, American Society of Mechanical Engineers, and American Petroleum Institute. To reduce the likelihood of unplanned events, additional inspection activities have been implemented, such as a retroactive positive material identification program, weekly thermography of fire heaters, and heater tube infrared inspections. Cross-discipline teams have been established to monitor and improve reliability of process units. Monthly reports track threats to reliability, status of actions, inspection recommendations, and future plans.

To work on preventive maintenance, including inspection, construction, or replacement of parts, certain equipment requires the unit to be shut down. The PRSI Maintenance Turnaround Manager coordinates a cross-functional team to plan, execute, and monitor the turnaround. The Management of Change process provides a structured and documented process to assess, review, and approve changes. If an unplanned emissions event occurs, an incident investigation is conducted to determine the root cause of the incident and prevent re-occurrence.

Procedure for External Electric Grid Event: Paragraph 13 of Consent Decree

As required by the Consent Decree, PRSI developed and implemented an Electrical Grid Failure Plan on November 13, 2018, that outlines response measures in the event of a loss or interruption of the refinery’s electric power feed from the power supplier. PRSI outlines a thorough set of procedures to address the loss of electrical power based on process units, oil movements, and

utility areas. All operating procedures are compliant with OSHA Process Safety Management Requirements. To achieve reliability and safety, PRSI has also implemented engineering standards for construction and specification of equipment, preventive maintenance procedures, maintenance repair procedures, condition monitoring for rotating equipment, inspection programs, and utility management systems. PRSI conducts operator training, annual review of operating procedures, and frequent drills involving emergency and operational scenarios. After an external electrical grid failure emissions event, PRSI must review the incident with the electrical utility provider and reassess its preparations for, response to, and equipment and back-up systems affected by the event.

Emission Event (EE) Tracking & Prevention System Procedure: Paragraphs 7(b) & 14 of Consent Decree

As required by the Consent Decree, on November 13, 2018, PRSI developed and implemented a procedure to track emissions events according to the underlying cause and location within the Pasadena Refinery, assess emissions events according to their root cause, develop strategies for prevention of emissions events, and set targets for reduction in occurrence of emissions events.

First, all incidents must be entered into the HSE 004 Incident Reporting and Investigation Procedure System by Environmental and Technical Services engineers, copied into the Environmental Reportable Quantity Workbook, and assessed for categorization as upsets or unscheduled Maintenance, Startup, or Shutdown (MSS). The Operations personnel will assess the emissions event within seven days of the incident, conduct an in-depth investigation on classified reportable emissions events, and perform a Pareto analysis to establish root cause for ongoing and future incidents. The Pareto analysis will be reviewed on a regular basis and used to determine a focus area for prevention strategy of emissions events. Finally, data collected over the past year will be used to establish a baseline of emissions events and the targeted reduction for future recordable and reportable events. No such targets appear to have been set for the coming year.

Actual Emission Events and Annual Targets: Paragraphs 7(b) & 14 of Consent Decree

PRSI set an annual target of 8 emissions events for the period from April 1, 2018 to March 31, 2019. The actual number of reportable emissions events during this time matched the target of 8 events.

Civil Penalty to U.S. Treasury Dept: Paragraph 15 of Consent Decree

PRSI paid \$350,000 to the U.S. Department of Treasury on September 27, 2018 as a civil penalty in settlement of the violations that were the subject of the suit.

Additional Payments to Non-Profits: Paragraph 16 of Consent Decree

PRSI paid \$3,175,000 to the Houston-Galveston Area Council on September 27, 2018, for the purpose of creating the Vehicle Emission Reduction Fund project that aims to improve air quality in the area of Pasadena, Galena Park, and Southeastern Harris County, Texas. The \$10,646 in Stipulated Penalties due will also be paid to the Vehicle Emission Reduction Project.