February 11, 2021

David Joe
Bay Area Air Quality Management District
375 Beale Street, Suite 600
San Francisco, CA 94105
email: djoe@baaqmd.gov
From: Kripa Shah, University of San Francisco, CA.

Re: Comment on 28 May 2020 Draft Amendments to BAAQMD Regulation 6, Rule 5: Particulate Emissions from Refinery Fluidized Catalytic Cracking Units

Dear Mr. Joe:

Myself, Kripa Shah, pursuing Master of Science in Environmental Management from University of San Francisco, is thankful for the opportunity to provide comments regarding the Bay Area Quality Management District's (BAAQMD) proposed regulation on Regulation 6, Rule 5: Particulate Emissions from Petroleum refinery Fluidized Catalytic Cracking Units.

Being the resident, we all know the significance of air quality on the public health living nearby the refineries and on the workers, who are prone to the continuous exposure of particulate matter emissions and hazardous pollutants. I appreciate the work and thought that has gone into the Initial Staff Report and need to provide two recommendations on the proposed amendments on Rule 6-5.

1) **Continuous online monitoring by publishing source testing data by BAAQMD itself of air quality parameters for each refinery.**
   This is required because there are many flare causal reports and incident reports published online which states that the people living nearby the refineries often complain about the smoke seen which affects their health. However sometimes the exceedance of the flue gases limits does not get reflected in the record.
   According to the one study mentioned in the Harvard report [1] 99.7% by weight of crude oil processed at one U.S. oil refinery was converted to useful products, while 0.3% of the crude oil by products were released into the environment. Because the average-size refinery processes over 3.8 million gallons of crude oil each day, this 0.3% results in over 11,000 gallons of oil released daily into the water, land, or air. And this can create large impact on the lives of people. The specific testing methods can be analyzed and communicated to the refineries for reducing particulate matter emissions to comply.

2) **Reduction in limits of SO_x and particulate matter emissions through best control technologies.** Sulphur oxides (SO_2, SO_3, called SO_x) are precursors for acid rain; therefore, environmental protection agencies have established regulations for their control. The amount of sulphur that is emitted as SO_x in the flue gas is directly proportional to the coke amount burned and its sulphur content; however, it also depends

[1] A LIFE CYCLE ANALYSIS OF ITS HEALTH AND ENVIRONMENTAL IMPACTS
http://priceofoil.org/content/uploads/2006/05/OILHarvardMedfullreport.pdf

on operating conditions in both reactors. In the case of the regenerator operation, emissions are inversely proportional to: (i) regenerator temperatures, (ii) oxygen excess, (iii) total pressure, and directly proportional to low coke on regenerated catalyst.
Two strategies exist to reduce SOx emissions: hardware improvements and the use of SOx reduction additives. For hardware solutions, a scrubber can remove SOx from flue gas. This solution involves high capital costs, depending on type, size, and the need for supporting infrastructure but the results are effective as it has been stated on the website of the reduction in emissions from Valero refinery. SOx reduction additives provide an alternative approach to control SOx without the heavy up-front capital investment.[2]
A typical SOx additive contains multiple active ingredients that can include magnesium oxide, cerium oxide, and vanadium pentoxide. The relative amounts of the key ingredients are optimized for the best performance.

The main source of particle emissions is the catalyst attrition, consequence of the continuous movement of solid particles between riser and regenerator. One of the effective mechanisms to control these emissions is wet scrubbing technique.[3] It is a proven, achieved-in-practice technology that removes both filterable particulates and condensable precursors and regularly achieve over 95% collection efficiency for particulates. However, Chevron refinery is against this system mentioning about the freshwater requirements and space availability issues. In this case, BAAQMD need to strictly mandate that the refineries need to follow measures because as climate changes, human behavior will need to (and will) adapt to accommodate it – that is the natural tendency of people and the organizations. So, companies must constantly redesign and modernize their existing plants, or build new and more efficient ones.

Thank you for your consideration.

Sincerely,

Kripa Shah
[redacted]

[2] Nanoporous materials forge a path forward to enable sustainable growth https://doi.org/10.1016/j.micromeso.2017.03.063
[3] The fluidized-bed catalytic cracking unit building its future environment https://doi.org/10.1016/j.fuel.2011.03.045