

## **Comparative Analysis of VOC Emissions between New and Old Plants of a Light Oil Cracking Company**

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### **Extended Abstract**

The emissions of volatile organic compounds (VOCs) were compared between a new and old light oil cracker plant opened in 2013 and 1983, respectively. The old plant showed higher emission intensity due to its lack of effective anti-emission devices. The most significant VOC dissipation and leakage occurred in the low-temperature plant process, followed by the butadiene plant process and the gasoline hydrogenation plant process. Benzene was found to be the highest-emitting pollutant, with a detection rate of 83%. The benzene emission in the low-temperature workshop showed a substantial difference between the third (32.3 ppb) and fourth (2,332 ppb) samplings, with a 73-fold increase. The average emission concentration of BTEX compounds (benzene, toluene, ethylbenzene, and xylene) in the old plant was  $251.1 \pm 419.62$  ppb, while in the new plant, it was  $8.32 \pm 6.27$  ppb. This indicates that the new plant has achieved a remarkable 30-fold reduction in average emission concentration compared to the old one. Additionally, aromatic hydrocarbons, including BTEX compounds, were identified as significant contributors to VOC emissions in both plants. Effectively controlling the emissions of BTEX compounds can lead to substantial improvement in aromatic hydrocarbon emissions. In addition, four sample campaigns detected naphthalene, a toxic compound that affects human health and the environment with a high concentration. Thus, it is recommended to investigate the causes of leakage and implement pollution prevention measures for the processes with evident emissions. Expanding odor investigations to other process areas of the light oil cracker plant can help identify and improve sources of odor leakage. Further investigation of BTEX and naphthalene emissions is advised due to their harmful effects on human health. The findings of this study can serve as a reference for future pollution source identification.