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**Abstract Title:** UPDATE ON OZONE BASED LOW TEMPERATURE OXIDATION FOR CONTROL OF NO<sub>x</sub> EMISSIONS

**Abstract:** At the 2008 and 2016 IOA PAG Conferences, the presenter provided an update of the status of an Ozone application known as Low Temperature Oxidation (LTO) of Nitrogen Oxides and Mercury for removal from flue gases. In 2008, there had been only a handful of significantly sized installations of LTO technology to control NO<sub>x</sub> emissions at industrial and petroleum refinery sites. Applications for Low Temperature Oxidation, developed and commercialized by Linde as “LoTOx™”, continued in refineries and industrial applications, and by 2016 there had been over thirty Fluidized Catalytic Cracking Unit (FCCU) oil refinery applications in operation worldwide and more planned in upcoming years. Several other industrial applications have been designed, installed and are successfully operating. These LoTOx installations represent some of the largest non-water treatment applications for ozone generation. Since 2016, there has been interest in the technology from other NO<sub>x</sub> emitters, including chemical waste incinerator operators, and while most of the installations rely on wet scrubbers to remove the highly soluble oxidized NO<sub>x</sub>, Linde has demonstrated the effectiveness of the technology when used with dry scrubbers.

There has been recent interest by coal fired power plant utilities in the Mountain West region of the US (where Regional Haze emissions regulations were going to require lower plant NO<sub>x</sub> emissions), as well as in Europe (where power utilities are also facing lower NO<sub>x</sub> emission limits due to the BREF requirements).

This presentation will include a review of Low Temperature Oxidation chemistry, an update on LoTOx installations and a summary of the LoTOx demonstrations that were planned for power utility plants that were anticipating NO<sub>x</sub> emission compliance requirements. Those demonstrations were essentially full scale power plant demonstrations, treating the equivalent of 125 MW power plants, requiring 10,000 lbs/day ozone generator capacity for the demonstration. Full scale installations to cover entire 500 MW plant emissions were anticipated to be up to 40,000 lbs/day of ozone.

In addition, as part of a collaboration to provide NO<sub>x</sub> control solutions to their clients, AECOM and Linde are cooperating to incorporate Linde’s patented Ozora™ technology for recycling oxygen from ozone generators, reducing the capital and operating cost for large ozone installations, such as power plant LoTOx applications.

Given the demonstrated success of LoTOx technology, its ease of retrofit in existing power plants and industrial processes and the emergence of the new Linde Ozora oxygen recycle technology, the application of ozone based Low Temperature Oxidation for coal fired power plant and industrial NO<sub>x</sub> emissions control continues to provide a cost effective solution.

Key Words: Ozone; Nitrogen Oxides; Emissions Control; Low Temperature Oxidation, CAIR, CSAPR, IED, BREF, Regional Haze, LoTOx™; Ozora™.