



Novel Multi Pollutants Removal technology based on ClO₂ and unique absorbing liquid

Zach Barnea¹, Hagay Keller¹, Tali Mali¹, Anette Heijnesson Hultén², Pär Nilsson², Marie Samuelsson². 1- Clairion, Clean air technology, Netanya, Israel. Nouryon, Pulp and Paper Performance Chemicals, Bleaching Chemicals SE-445 80 Bohus, Sweden
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NC-MPR Multi Pollutants Removal - Technology Overview: by Nouryon and Clairion

A completely new approach for simultaneous removal of NO_x, SO₂ and Hg from flue gas is described in present work. Unlike most existing solutions, this technology enables an absorption/extraction process in a single solution treating all three pollutants. The NC-MPR solution combines Nouryon's and Clairion's proprietary technologies in order to comply with new emissions limits at lower costs utilizing a smaller operation area compared to the current used combination of traditional single pollutant control systems.

The unique solution is comprised of three main steps:

- 1- Selective gas phase oxidation
- 2- Simultaneous absorption and stabilization
- 3- Selective Separation and extraction

The selective oxidation process is based on oxidation of the relatively insoluble NO to soluble NO₂ using chlorine dioxide (ClO₂) in gas phase. The use of ClO₂ as oxidation chemical secure a very high efficiency and selectivity towards NO independently of flue gas composition.

The absorption and stabilization phase are based on utilizing a proprietary liquid formulation (based on modified ionic liquids) implemented in a wet scrubber. The NO_x SO_x and Hg present in the





flue gas stream react with an oxidation agents in order to form soluble elements that enter the scrubber. The unique absorption liquid is constantly circulated in a “closed cycle” in which the impurities are captured as a stable complex.

In the selective separation phase, the absorbed impurities are separated via a multistage extraction processes into aqua phase via separation units to form useful products with high commercial value. The NO_x ends up as nitrate salt in a concentrated solution or clean crystals of (such as KNO₃) while SO_x is extracted as concentrated sulfuric acids (such as H₂SO₄). The Hg which remains in the absorption liquid can be removed as stable salts (HgS) by a side process while the liquid is regenerated for reuse.

The absorbing liquid’s unique physical properties and the system’s engineering design minimizes the environmental impact and maximizes efficiency levels

The process removes all mentioned pollutants demonstrating exceptional removal rates of NO_x (above 85%), SO₂ (above 90%) and Hg (above 95%) along with significant environmental and financial benefits.

This new approach offers a dramatic change from both economic and environmental perspectives compered to existing used technologies. - Highly efficient simultaneous removal of multiple impurities - Smaller footprint and simpler installation - By products with higher commercial value - Scalability and applicability to wide range of industries plants and processes - Closed and fully regenerative - reduced impact on the environment - Reduced CapEx and OpEx

