Groundbreaking Multi-Pollutant Removal solution:

Removing SO_x and NO_x S

A recent analysis by McIlvaine Company identifies ten major challenges facing the power plants operators around the globe[1]. Top three are related to the coast effectiveness of the existing FGD systems and legal limitations posed on them by the governments, such as Clean Air Act (US), Air Toxic Rule (US), Air Pollution Prevention Law (PRC) and numerous European Council directives and resolutions. Flue gas treatment (FGT) has become a focus of electric utilities and industrial operations due to tightening air, water and soil quality standards. As companies seek to comply with the new regulations and to use more economical fuel sources, the need for innovative flue gas treatment options has grown to increase treatment efficiency and reduce total cost of ownership.

The most widely used and available technology is the limestone/lime-FGD. However, while those systems are the prevailing solution, technologically and environmentally they are outdated. Concurrently with the hazardous air pollutants regulations that mandate the use of FGDs, governments are also tightening surface water discharge trace metals' and salts' limits. Most lime-FGDs discharge wastewaters that are either slurry of waters, dissolved solids, and/or suspended solids laden with heavy metals and salts; the further use of lime-FGD's is in conflict. For example, in most European countries the sludge water is classified as hazardous[2]. Therefore, in developing plans to install Wet FGDs, utilities must also develop a strategy for the associated wastewater treatment systems for the scrubber purge stream.

Figure 1. Limestone handling area (bird's eye view)

Numerous environmental problems have been raised during the years of operation associated with the handling of the solid wastes and byproducts of limestone/lime-FGD. Besides the solid and liquid waste, the process also produces secondary air pollution since the reaction of SO_2 with the limestone ($CaCO_3$) produces gaseous CO_2 :

$$CaCO_3 + SO_{2\ (g)} \rightarrow CaSO_3 + CO_{2\ (g)} \uparrow$$

Moreover, the commercial profitability should be considered. At present, lime–FGD requires investment in the lime stone storage facilities (Figure 1), processing areas, gypsum post processing and loading facilities (Figure 2), access roads and the many acres required to host those. The

clogging of the limestone apparatus and injection nozzles frequently lowers the efficiency of the system and adds downtime that further raises the operational costs.

Figure 2. Gypsum storage hangar

The WFGD byproduct gypsum has for several reasons shown limited market potential and is largely being disposed off in landfills. The recycled gypsum might pose a threat since it might contain high volumes of mercury and other heavy metals. As occurred in many "contaminated dry-walls" cases[3] the hazardous materials find their way to our homes, schools and offices.

The traditional de-NO_x technologies are still lagging behind the present and expected future environmental demands. The current SCR systems also suffer from several inherent technological disadvantages, such as: rocketing SCR CapEx, SO_2 oxidation, honeycombs clogging, etc. Furthermore the SCR demands yet another "monster" on the site, and yearly procurement or regeneration of considerable amount of catalyst.

Lextran's Innovative de-SNOx Alternative

The future of the Flue Gases Treatment technologies lies in new revolutionary technologies. The solutions must address three needs: cost effective hazardous air pollutants removal, no secondary pollution and recyclable commercially valuable by-products.

Lextran's cutting edge process offers comprehensive technological, financially beneficial and environmentally friendly solution. Lextran has developed a proprietary catalyst and process to be used in open spray tower that meets all three requirements. Lextran's Integrated technology enables the absorption of the following pollutants from flue gases in one single pass:

Sulfur oxides (SO_x) - **removal of 99%, unconditional of entrance concentration.**

Nitrogen oxides (NO_x) - **removal up to 90% of entrance concentration.**

This approach is especially appealing for plants with older, smaller units that must balance upgrading pollution control equipment with justifying high capital expenditures. Integrating the three units into one project and structure provides significant cost savings over treating the units separately, and optimizes the use of space.

The Lextran reagent, produced by a proprietary nanotechnology based process, contains an active sulfur-oxygen functional group, having catalytic properties which enhance the oxidation reactions of

SO_x and NO_x into SO_4 and NO_3 anions. The catalyst ends its role once a basic reagent is added to stabilize a byproduct that is typically a fertilizer.

Economical potential and cost-efficiency

After facilitating the initial oxidation, the Lextran catalyst is released and recycled back into the process leaving the pollutants in chemical form amenable to become commercially beneficial by-products (Fertilizers) with a further neutralization by ammonia, KOH, or other basic reagents to control the type of byproduct. The possible byproducts are therefore mainly highly profitable, ammonium nitrate, ammonium sulfate, potassium sulfate, potassium nitrate, and others.

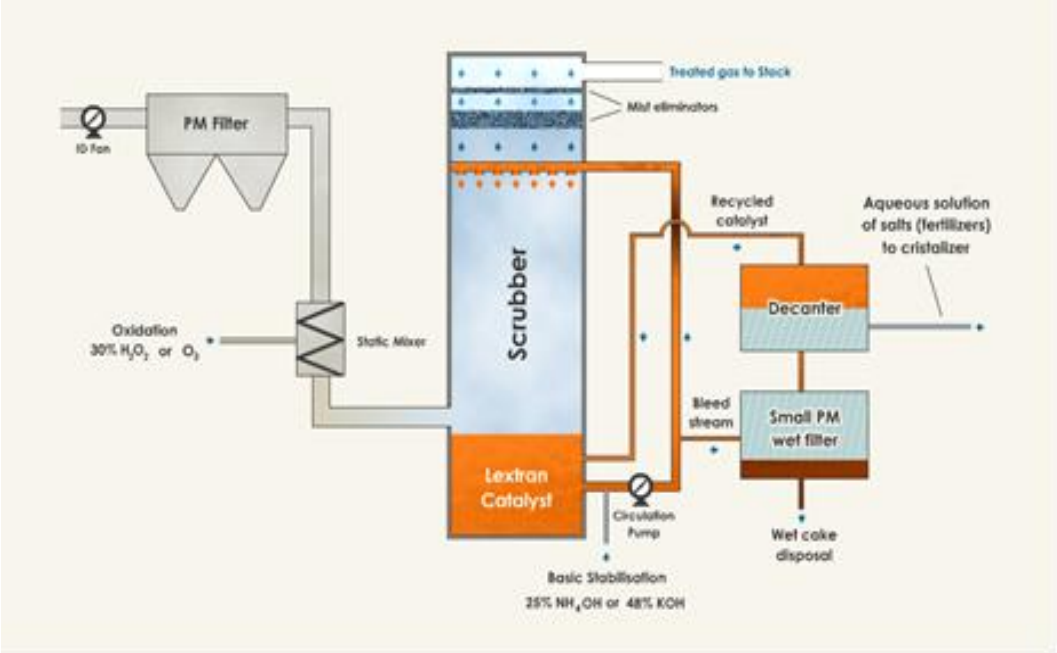

Figure 4. Schematic design of Lextran's WFGD-based operation. Removes NO_x and SO_x from flue gas and converts them into fertilizers.

With a generic 85% cost of lime FGD facility and 50% of the running costs, Lextran 3-in-1 process introduces a dramatic saving compared with traditional dedicated facilities which have to be implemented sequentially. Once the investment in an open spray tower has been made, treating NOx and mercury are virtually for free.

Bottom line – cost saving of at least 40% in construction of APC systems and 50% in operational costs.

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[1] http://home.mcilvainecompany.com/index.php?option=com_content&view=article&id=191

[2] Kikuchi R.," Alternative By-Products of Coal Combustion and Simultaneous $SO_2/SO_3/NO_x$ Treatment of Coal-Fired Flue Gas: Approach to Environmentally Friendly Use of Low-Rank Coal", in Kenneth S. Sajwan et al. ed., *Coal Combustion Byproducts and Environmental Issues*, (New York: Springer, 2006), pp.23-24

[3] http://www.propublica.org/series/tainted-drywall