Neutralizing emissions: EnviNOx® removes N2O – and NOx emissions from nitric acid plants

Nitrous oxide (N2O) is a potent greenhouse gas – 265 times worse than carbon dioxide – due to its longevity in the earth's atmosphere and its infrared radiation absorption properties. N2O released during the

production of nitric acid as an unwanted byproduct, have made nitric acid plants one of the world's largest sources of greenhouse gas emissions amongst industrial manufacturing facilities. In addition, nitric acid plants emit NOx, which is a cause of acid rain and smog. EnviNOx®, the N2O/NOx abatement process from thyssenkrupp, solves both emission problems.

Nitric acid (HNO_3) is needed to manufacture ammonium nitrate for fertilizers and the mining industry, and for plastics and dyes. Its industrial production involves oxidizing ammonia (NH_3) with air over a platinum/rhodium gauze catalyst to nitrogen oxides. The nitrogen oxides are almost all absorbed in water to form nitric acid, the desired product. Unfortunately, the ammonia oxidation step also generates unwanted nitrous oxide (N_2O) which passes unchanged through the plant and enters the atmosphere in the plant's tail gas. Some residual NOx, which even the most efficient process cannot entirely turn into nitric acid, is also emitted with the N_2O. While limits on NOx emissions have long been in force because of concerns about acid rain and smog, N_2O emissions have for a long time not been subject to effective restrictions. However, in the meantime N_2O has been recognized as the powerful climate killer it truly is. One ton of N_2O emissions has the same impact on global warming as 265 tons of CO_2. As an estimated 400,000 tons of N_2O are generated annually in nitric acids plants worldwide, this is a potent problem. Fortunately, the thyssenkrupp EnviNOx® abatement process for nitric acid plants provides an effective solution.

The EnviNOx® N_2O and NOx process is a so-called end-of-pipe technology because it is installed in the waste gas stream of the plant and thus entails no risk of product contamination, nitric acid production loss or fouling of equipment (such as the process gas cooler). A proven solution already installed in multiple nitric acid plants worldwide, the EnviNOx® process is remarkably effective: N_2O removal rates of up to 99% and above, and virtual elimination of NOx down to nearly zero ppm. It is also a highly practical solution as abatement of both pollutants can be combined in a single reactor vessel and only limited quantities of the N_2O and NOx reducing agents are consumed in the process. EnviNOx® technology employs highly active zeolite catalysts that have a long service life and contain no toxic components, ensuring easy handling and disposal.

thyssenkrupp's wealth of experience and expertise has enabled the development of N_2O and NOx abatement solutions that are optimized for particular process conditions and temperature ranges. With this proven technology to remove harmful greenhouse gases, thyssenkrupp is helping nitric acid plant operators make a key contribution to climate protection.

The bottom line: Cutting emissions of greenhouse gases from industrial plants is vital for our future. Nitrous oxide (N2O), an unwanted byproduct of nitric acid plants (which in turn produce a vital raw material for fertilizers), is a potent climate killer, 265 times more powerful than CO2. thyssenkrupp's EnviNOx® technology is an end-of-pipe solution that takes out around 99% of N2O emissions and reduces NOx emissions to nearly nothing. That is good news for our planet.