

## **Non-CO<sub>2</sub> Greenhouse Gases: Nitrous Oxide**

**Source/Sectors:** Industrial Processes/Nitric Acid Production

**Technology:** Options other than catalytic reduction (B.3.1.4)

### **Description of the Technology:**

Nitric acid (HNO<sub>3</sub>) is used in production of synthetic fertilizers, adipic acid, and explosives. Virtually all of the nitric acid production in the United States is manufactured by the catalytic oxidation of ammonia. During this reaction, N<sub>2</sub>O is formed as a by-product and is released from reactor and vented into the atmosphere (USEPA, 2006b).

There are other technological options for nitrous oxide emission reduction, they include:

- Thermal decomposition – Direct thermal decomposition (afterburning) with fuel injection of natural gas or methane is generally not considered as a feasible option because of the relatively low off-gas concentrations of N<sub>2</sub>O from nitric acid production. However, in some cases off-gases could be mixed with high-temperature off-gases of other near-by industrial processes, and it could result in a net reduction of N<sub>2</sub>O. Reduction potential and costs are site-specific and not quantified in the literature (de Jager *et al.*, 2001).
- Photo-catalytic conversion – It was reported in 1920s that absorption of ultraviolet light of 158 or 185 nm would result in the dissociation of N<sub>2</sub>O (Oonk, 1995). Neither reduction potential nor costs have been developed and research on its applicability to off-gases of nitric acid production is required (de Jager *et al.*, 2001).
- Biofiltration of off-gases using denitrifying bacteria – Nitrous oxide might be decomposed biologically. In this option, the N<sub>2</sub>O is dissolved into water and subsequently converted to nitrogen and oxygen gases by denitrifying bacteria (Oonk, 1995). Neither reduction potential nor costs have been developed and research on its applicability to off-gases of nitric acid production is required (de Jager *et al.*, 2001).

**Effectiveness:** Fair

**Implementability:** Fair

**Reliability:** Fair

**Maturity:** Fair

**Environmental Benefits:** It reduces nitrous oxide emission.

**Cost Effectiveness:** None reported.

**Industry Acceptance Level:** Low

**Limitations:** None reported.

### **Sources of Information:**

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