

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

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

**Technology:** Low-temperature catalytic reduction (B.3.1.2)

### 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).

Low-temperature catalytic reduction systems work similarly to high-temperature counterparts, but they do not require additional heat to decompose N<sub>2</sub>O. Some versions of this abatement require propane addition to the gas stream before undergoing the reaction process. The average estimated reduction efficiency is approximately 95% (USEPA, 2006b; IEA, 2000 & 2003).

**Effectiveness:** Good

**Implementability:** Fair

**Reliability:** Fair

**Maturity:** Fair

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

### Cost Effectiveness:

Technology	Lifetime (yrs)	MP (%)	RE (%)	TA (%)	Capital cost	Annual cost	Benefits
Low-temp catalytic reduction with propane addition <sup>1</sup>	10	-	95	100	\$3.64	\$1.81	\$0.00
Low-temp catalytic reduction (Krupp Uhde) <sup>1</sup>	10	-	95	100	\$3.45	\$0.20	\$0.00

Note: MP: market penetration; RE: reduction efficiency; TA: technical applicability; costs are in year 2000 US\$/MT<sub>CO<sub>2</sub>-Eq.</sub>  
1: IEA (2000); IEA (2003); USEPA (2004)

**Industry Acceptance Level:** Good

**Limitations:** They are presently still in experimental and R&D stages

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