

**LoTOx™**

**Low**

**Temperature**

**Oxidation**

Linde Gas

*Linde*

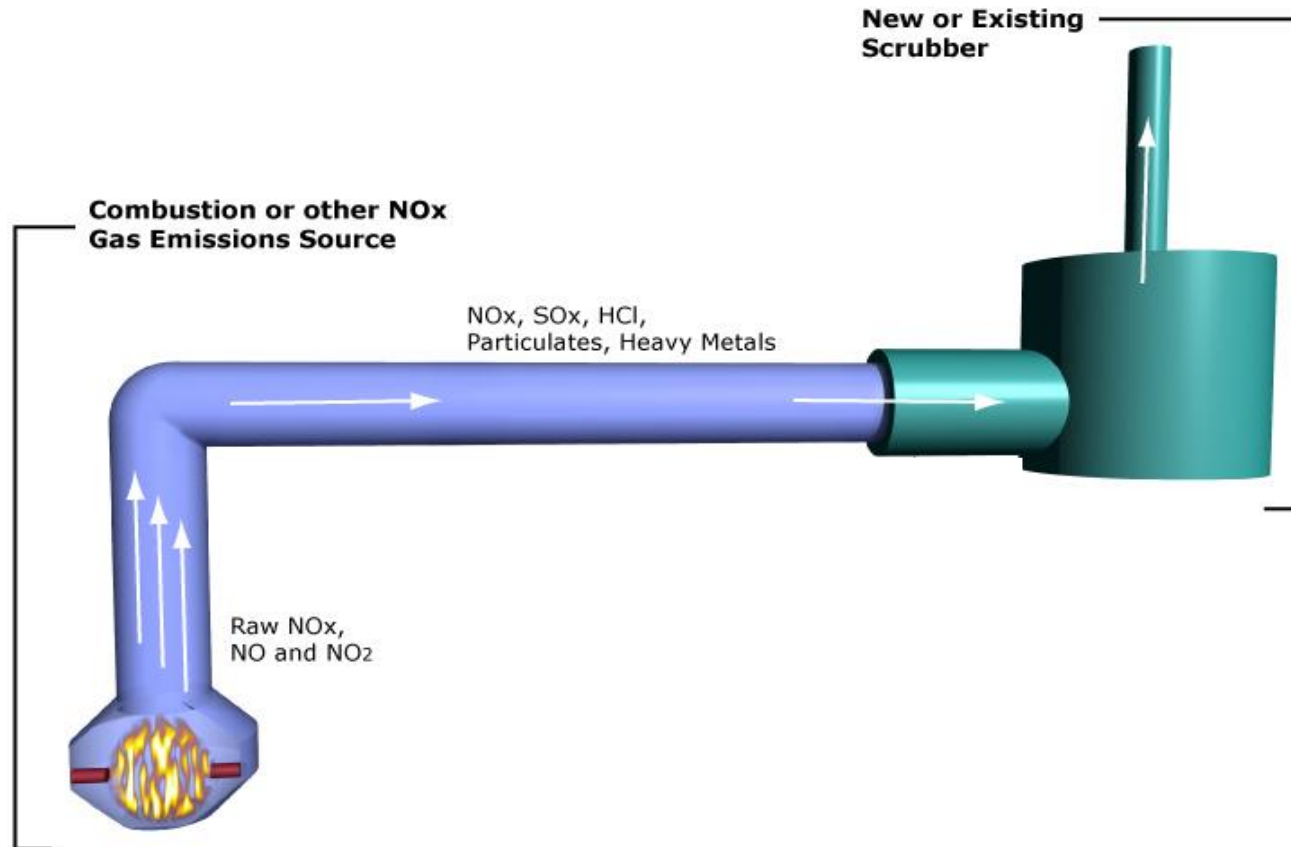
**Bob McIlvaine & Naresh  
Suchak**

**Chemistry & Energy  
July 12, 2012**

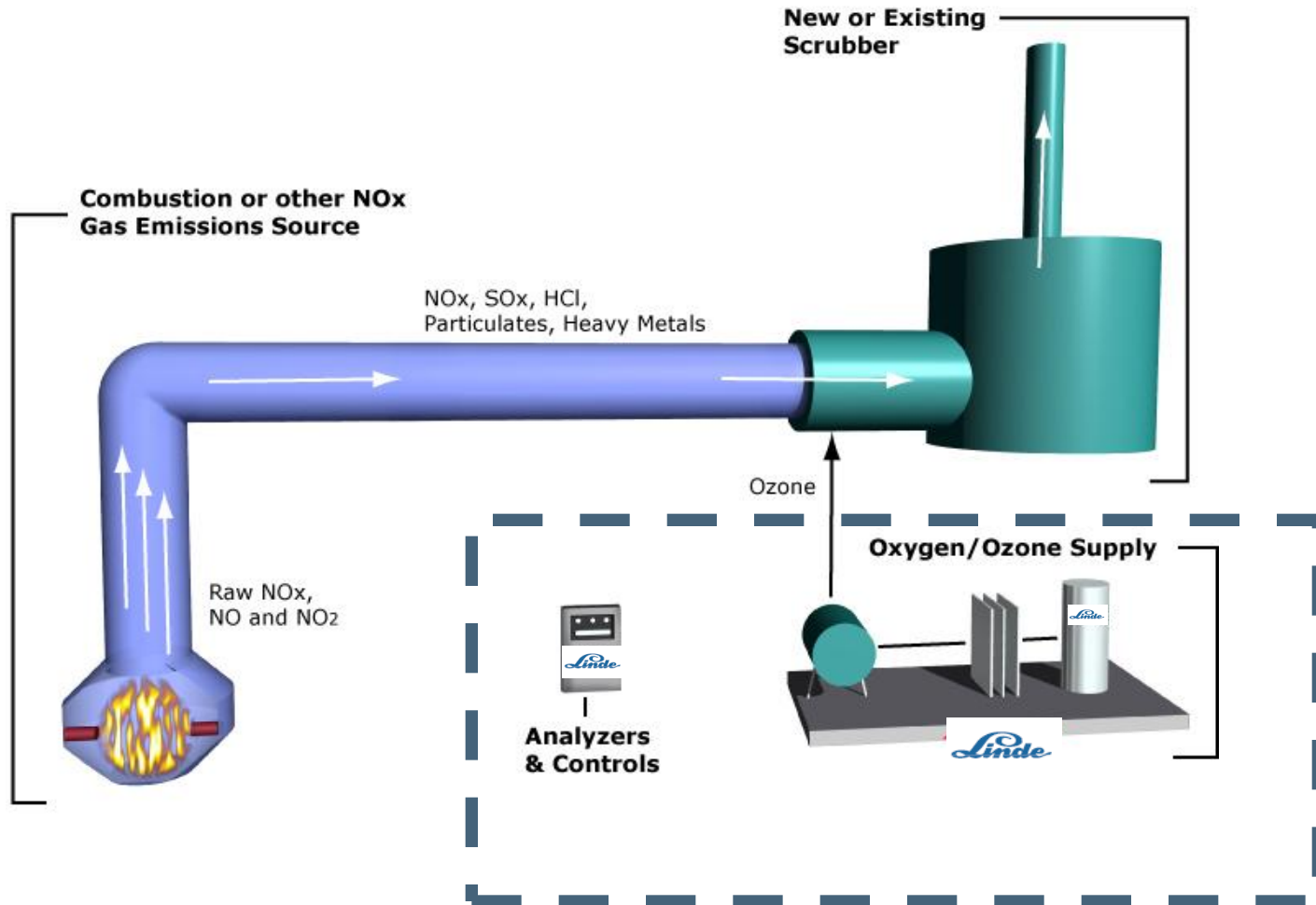


- Works on any “dirty” exhaust gas streams to oxidize and then capture NOx, Hg and other pollutants
- Needs oxygen supply for ozone generation
- Suitable when
  - NOx removal required is greater than 80% OR
  - Stack emissions must be below 20 ppmv
- Co-benefit Hg oxidation in 30-80 %
- Integrated easily with wet or dry (spray dryer) scrubber
- Commercial installation on 25 MW Coal fired
- Presently 25 FCC regenerator Off Gas is retrofitted with LoTOx for NOx control

# Typical stationary NOx source



# LoTOx process integrated



# LoTOx system process reactions

## Oxidation with O<sub>3</sub>

Converts insoluble NO<sub>x</sub> to highly soluble form



## Oxidizes Hg



## Very slow to oxidize CO and SO<sub>2</sub>



## Oxidized NO<sub>x</sub> is very soluble in aqueous media



# LoTOx™ - Medical College of Ohio

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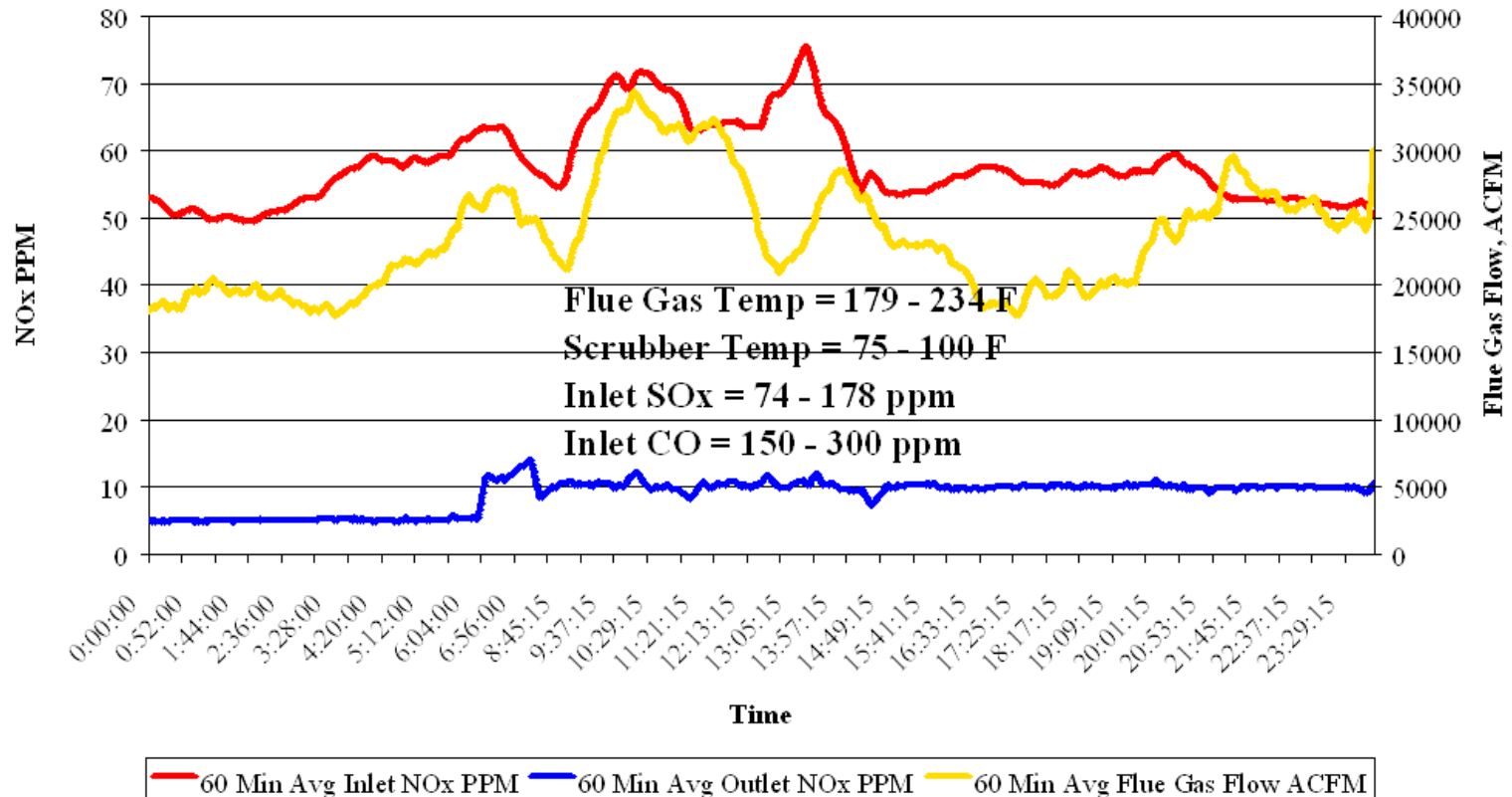
25 MW Coal-fired power plant - LoTOx™ reactor duct and scrubber

**Linde Confidential**

# LoTOx System results on 25 MW coal fired boiler



Performance of LoTOx System at MCO  
December 6, 2001  
Outlet NOx Setpoint = 5 PPM Changed to 10 PPM



## Commercial LoTOx installations

#	Application	Exhaust gas flow (Nm <sup>3</sup> hr <sup>-1</sup> )	NOx Inlet (mg/m <sup>3</sup> )	NOx Outlet (mg/m <sup>3</sup> )	Startup Date
1	400 HP NG fired boiler	6 300	55-130	4	1997-8
2	Stainless steel pickling	6 300	6 400	188	2000
3	25 MW coal fired boiler	142 000	375	19 – 38	2001
4	Lead recovery furnace	41 000	95-280	19	2002
5	1000 HP NG fired boiler	16 000	37.5-75	8	2001
<b>2003-2012</b>					
6-10	Five FCCs in US	60 000-410 000	130-225	15-38	2007
11-12	Sulfuric acid dual plants	2 x 26 500	170	19	2008
13-21	Six additional FCC + Three LoTOx ready installations in USA	20 000 – 485 000	130 – 470	19-35	2008-13
22-29	Seven FCC + 1st Refinery Boiler + One LoTOx ready installation in China	306 000-620 000	185 - 320	37 - 137	2012-15
30	1st FCC in Thailand	210 000	480	38	2014
31-42	12 Demos and feasibility studies	>315	vary	9	1999-2011