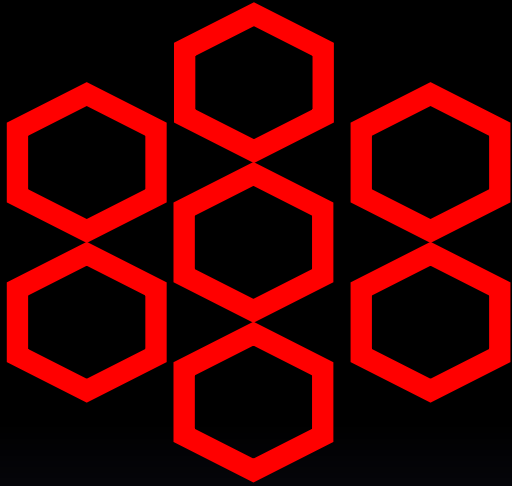




Lantec MicroNOxTM Combustion Technology





LANTEC: A Leader in Mass and Heat Transfer Media

- Almost 30 Years Experience at the Heart of Pollution Control
- Mass Transfer: Strippers, Scrubbers, Biological Treatment Systems, Cooling Towers, Oil-Water Separators, etc.
- Heat Transfer: Regenerative Thermal Oxidizers (RTO)

Dan St. Louis

- ❖ Chief Technology Officer, Lantec Products
- ❖ 16 current US patents, others pending
- ❖ Over 30 years mechanical engineering experience, including burners, combustion, and thermal oxidizers
- ❖ Developing Lantec's MicroNOxTM technologies since 2012

ASGE Objectives

**ASGE**
AMERICAN SOCIETY OF GAS ENGINEERS

bringing the Gas Appliance community together

home | join | contact us

Member No:

Password:

about usCGE programconferencesnewsletterlibrarymembership

Our Objectives

To promote the education and professionalism of its members and to make available to the public technical and scientific information and knowledge.

The objectives of the Society are accomplished by:

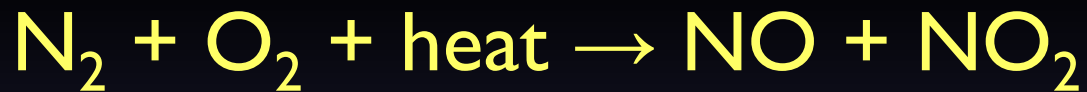
1. Advancing the theory and practices of gas engineering and the allied arts and sciences in the interest of the environment and conservation.
2. Promoting the safe, efficient and ecologically compatible utilization of gas.
3. Maintaining high standards of safety in the design of appliances and equipment and the utilization of gas technology.
4. Promoting a broader understanding of industry challenges and requirements.
5. Promoting standardization of terminology, techniques and laboratory testing methods.
6. Encouraging research and innovation in the gas industry.
7. Providing forums and media through which experiences and information of common interest and benefit to the Gas Industry may be reported, discussed and disseminated for the common good.
8. Offering recognition to encourage meritorious technological contributions to the industry and participation in the Society.
9. Encouraging students and young engineers to enter the Gas Industry.

About Menu

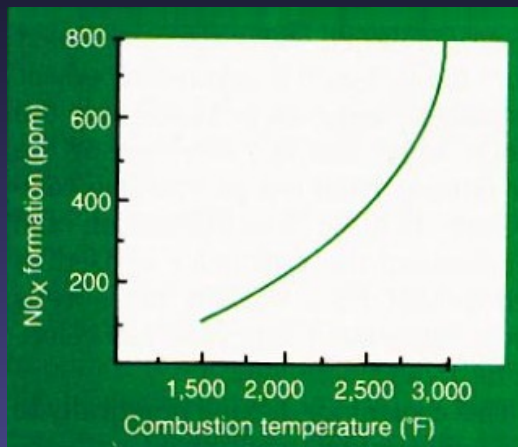
- History
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- Member Roster
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-  Membership Application
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Nitrous Oxides (NO_x)

Formed at high temperature ($\geq 1000^{\circ}\text{C}$) by burning fuel



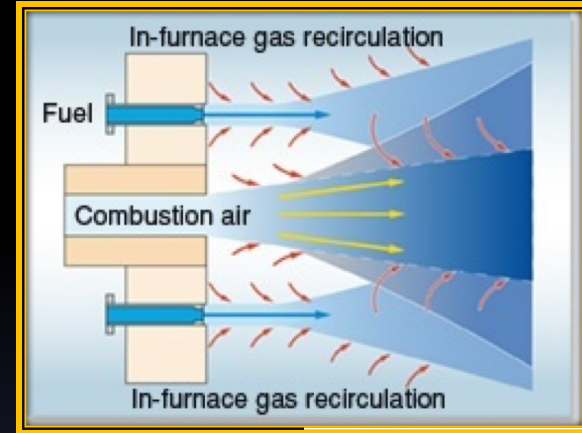
Higher flame temperature \rightarrow More NO_x



Low NOx Technologies

1st Gen

- Flame Quenching
- Air Staging
- Fuel Staging
- Flue Gas Recirculation



2nd Gen

- Surface Combustion
- Swirl Burner
- Other Flame Manipulation



Low NOx Technologies

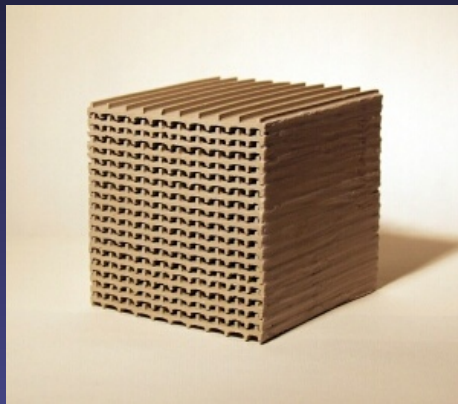
- ❖ **Central premise- Reduce flame hot spots**
- ❖ Complex- limits versatility
- ❖ Large burners/ large flames
- ❖ Expensive
- ❖ 'Low' NOx, 'Ultralow' NOx- cannot eliminate NOx
- ❖ **Commerciality Limitations**

Lantec MicroNOx Technology

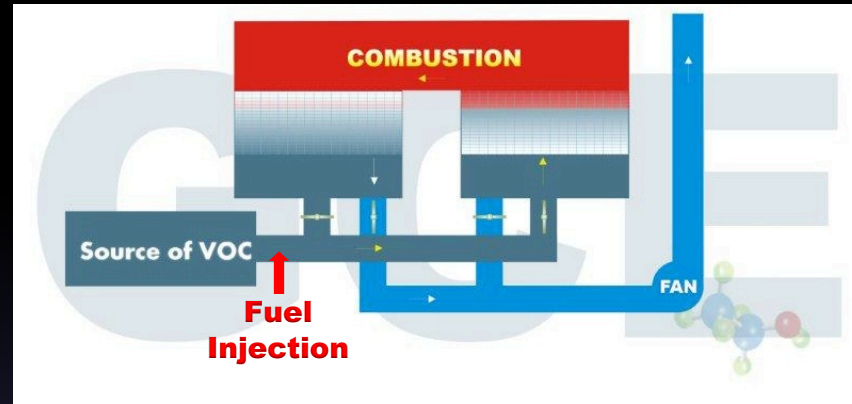
- ❖ Lantec Burner Temperature - $<1000^{\circ}\text{C}$
(as low as auto-ignition temperature)
- ❖ Below NOx formation temperature
- ❖ No flame manipulation necessary
- ❖ Capable of 100% elimination of NOx

Lantec RTO Background

- ❖ RTO: Regenerative Thermal Oxidizer
- ❖ Combustion and Burner Experience
- ❖ Materials Expertise
- ❖ Production Experience

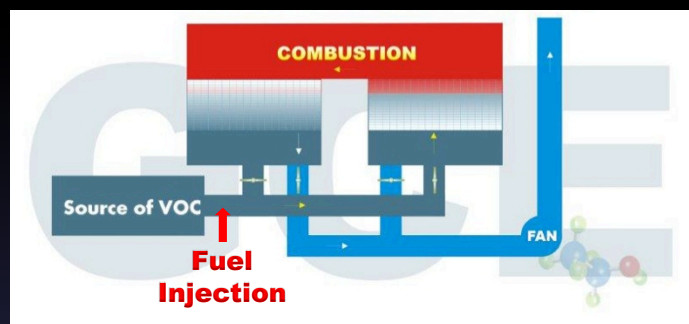


RTO w/ Fuel Injection



- ❖ Air/fuel preheat
- ❖ Homogenous air/fuel mixture and flux
- ❖ Temperature control
- ❖ Fuel Injection in RTO = No NO_x

Transforming an RTO into a burner



**Lantec Flameless Combustion =
Fuel Injection RTO = No NO_x!**

Lantec Flameless Burner Technology

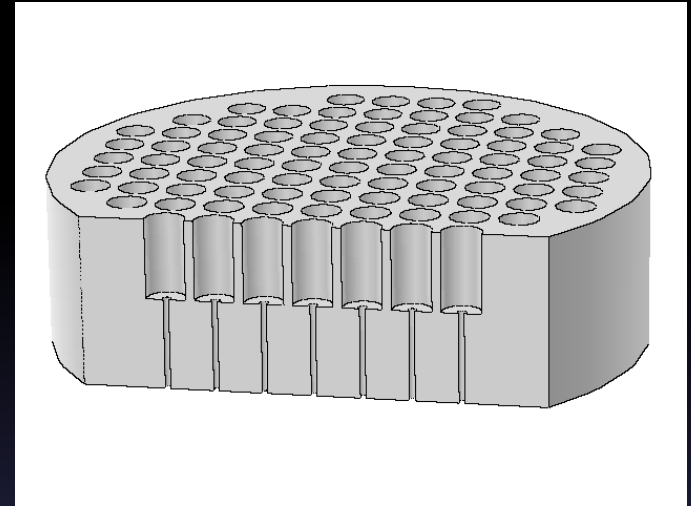
⬡ Extensive development history

⬡ Multiple burner versions

- Type 1
- Type 2
- Type 3
- Type 4

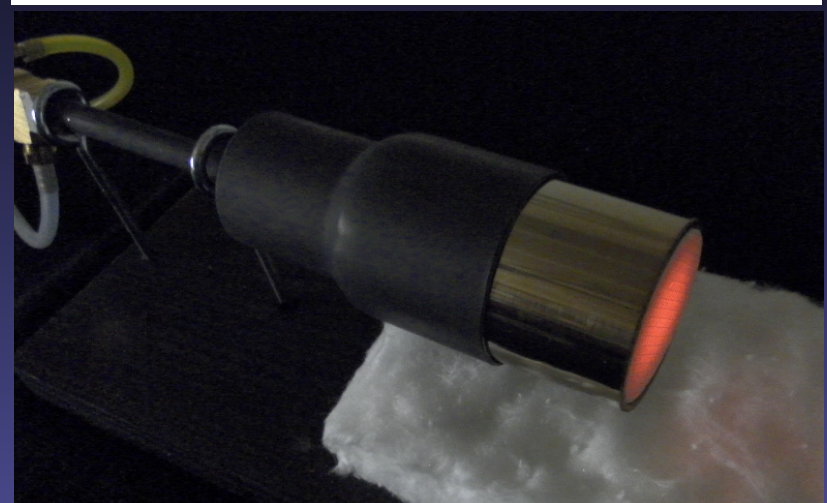
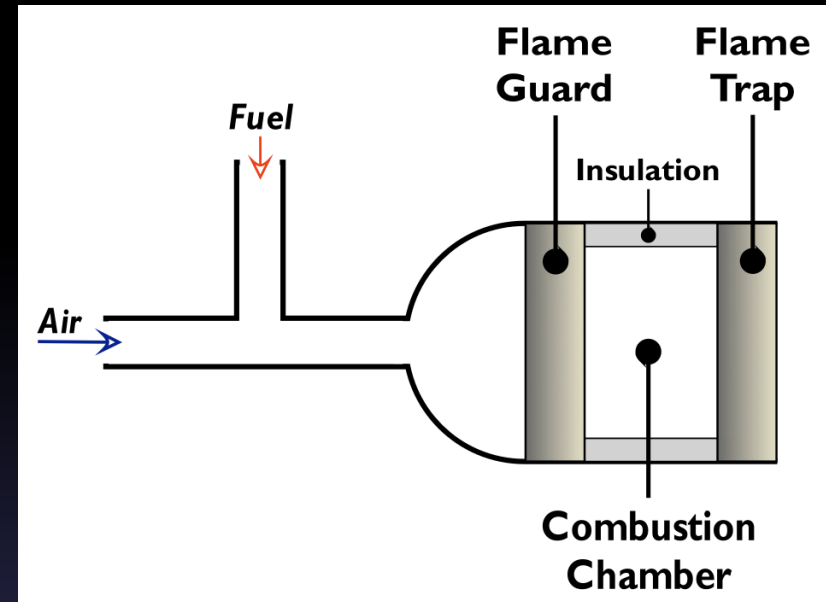
Type I Burner

- ❖ Honeycomb monolith
- ❖ 2 Sections
 - Flame Guard
 - Flame Trap
- ❖ Capable of 0 NO_x and 0 CO
- ❖ Low cost
- ❖ Suitable for low to moderate fuel loading
(up to 3,000 BTU/hr/in²)



Type 2 Burner

- ❖ Honeycomb monolith
- ❖ Three sections:
 - **Flame Guard**
 - **Combustion Chamber**
 - **Flame Trap**
- ❖ Improved performance
- ❖ Capable of zero NO_x and 0 CO
- ❖ Lower pressure drop, higher capacity than Type I
- ❖ Low cost



Type 2 burner

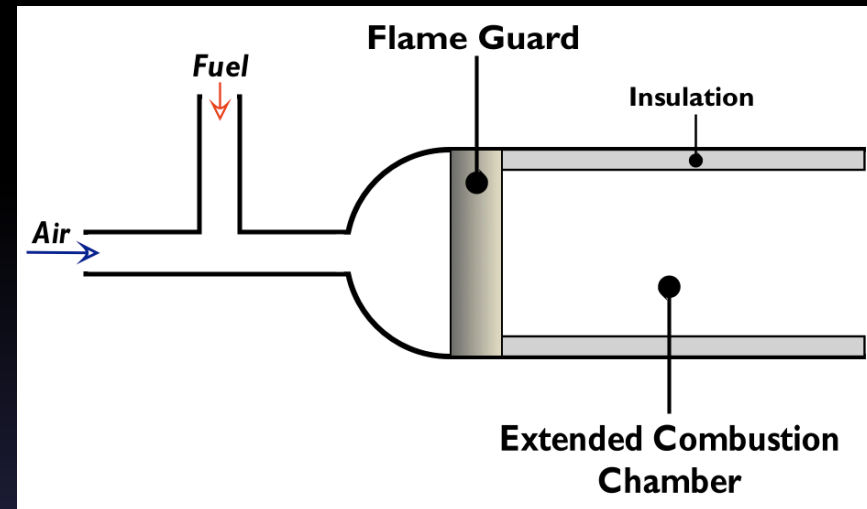


High Capacity Type 2 Burner



Type 3 Burner

- ❖ Integral Flame Guard/
Flame Trap
- ❖ Extended Combustion
Chamber
- ❖ High capacity
 - Over 40,000 BTU/hr/in²
- ❖ Capable of 0 NO_x and 0 CO
- ❖ Even lower pressure drop

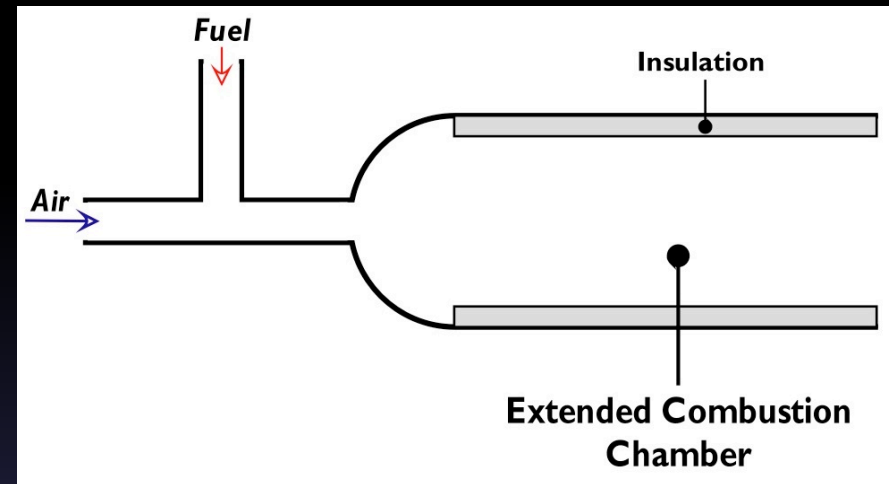


High Capacity Type 3 Burner



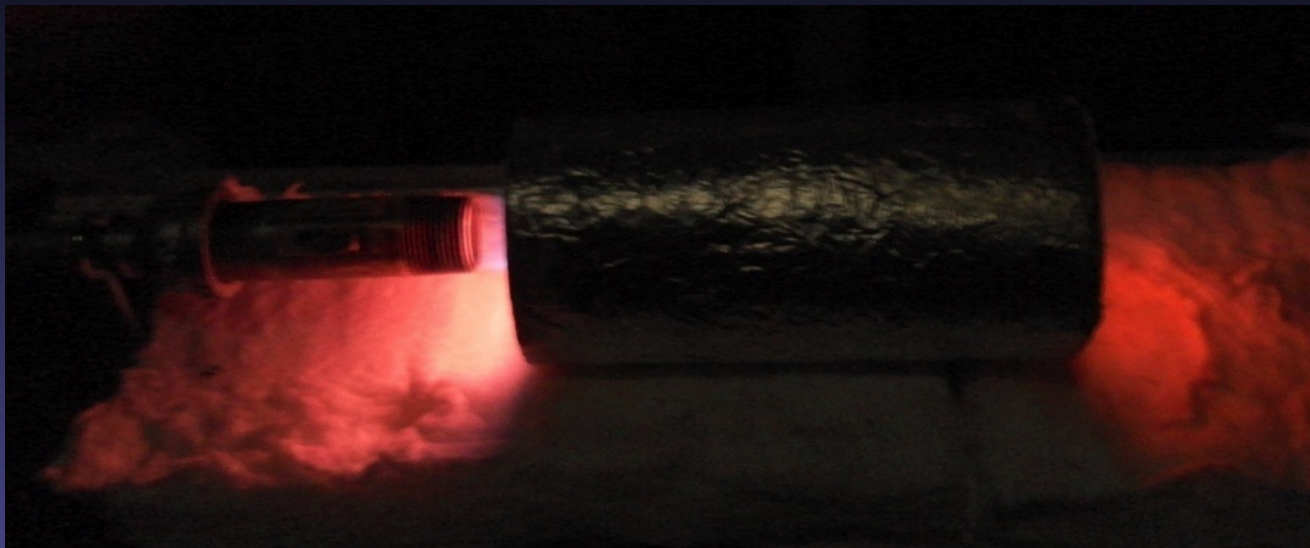
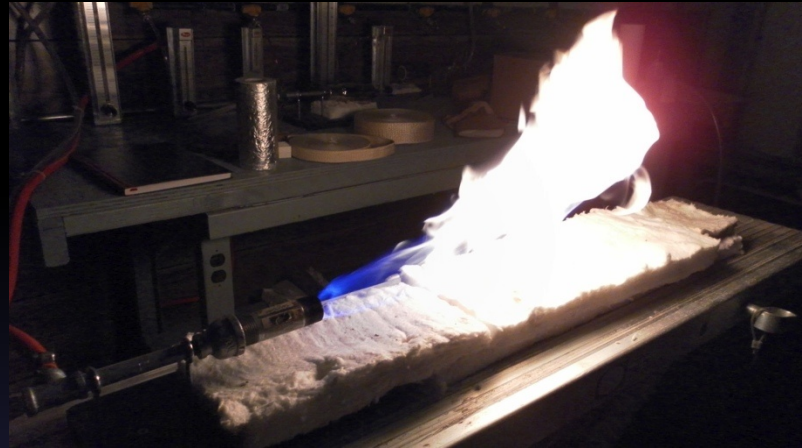
Type 4 Burner

- ❖ No Flame Guard/ Trap
- ❖ Extended Combustion Chamber
 - Single or multiple chambers
- ❖ High capacity
 - Over 40,000 BTU/hr/in²
- ❖ Capable of 0 NO_x and 0 CO
- ❖ Lowest pressure drop



Type 4 Burner

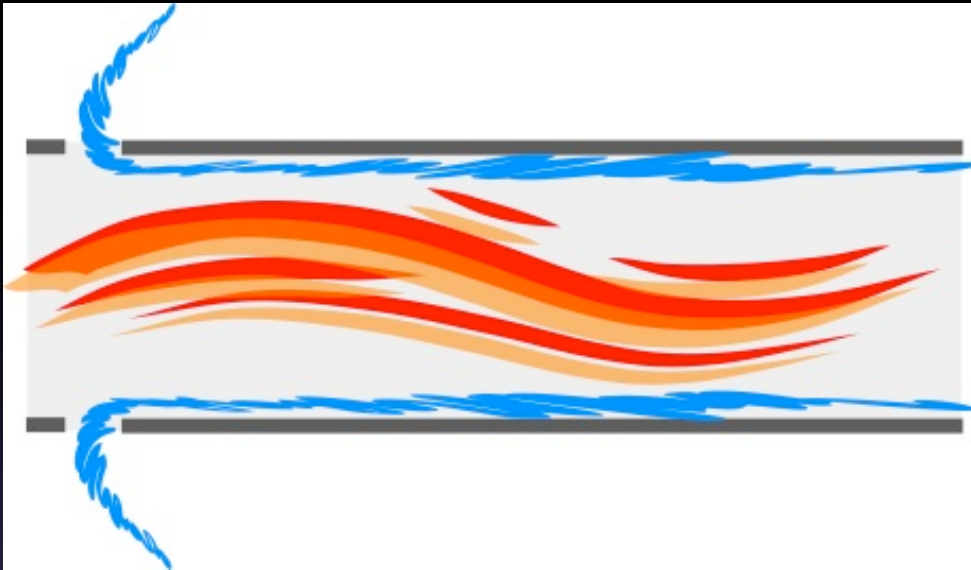
**Impact of Extended
Combustion
Chamber**



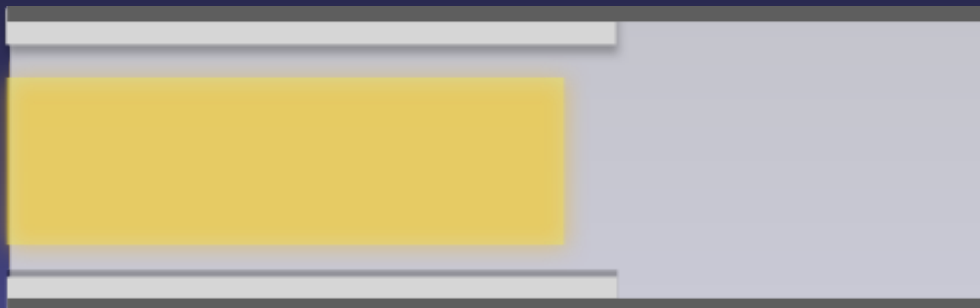
Type 4 Burner



A Tale of 2 Burners...



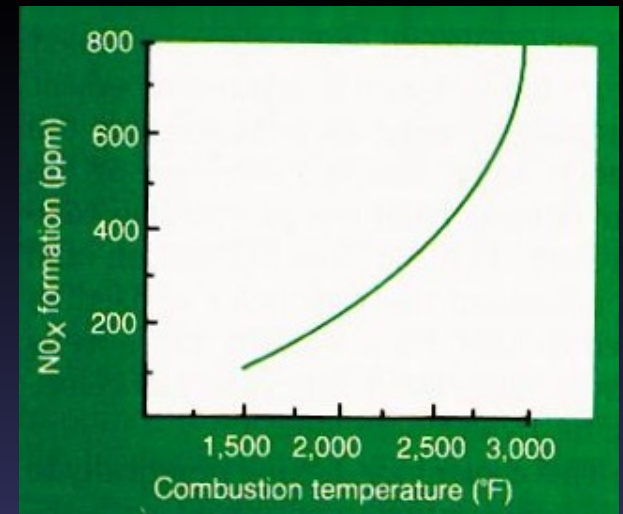
- Hot spots = NO_x
- Non-homogeneous
- Flame impingement
- Tertiary air for surface protection



- Even combustion
- Flameless
- Homogeneous
- No tertiary air

Next Leap in NOx Reduction

- ❖ Temperature feedback loop guarantees single digit NOx
- ❖ Adjusts for variation such as fuel value, elevation, flue blockage, etc.
- ❖ Increases safety
- ❖ **‘Dial a NOx’**



Safety

- ❏ Dial-a-NOx
- ❏ Avoid long flame phenomenon
- ❏ Avoid flame impingement
- ❏ Safer work environments in direct-fired occupied areas

Applications Under Development

- ❖ Residential forced air furnaces
- ❖ Space heaters, direct and indirect
- ❖ Radiant tube heaters
- ❖ Hot water heaters
- ❖ Kilns and ovens
- ❖ Boilers
- ❖ Metal Treating
- ❖ Line burners
- ❖ OvenPak burners
- ❖ Tubular immersion heaters

Cannon Burner



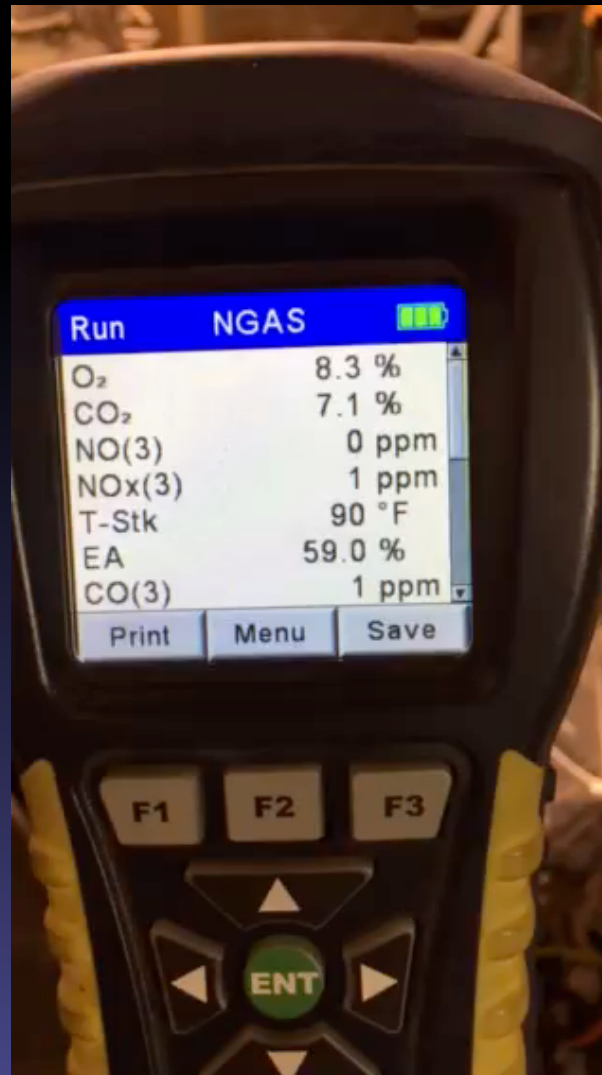
Line Burner



Line Burner



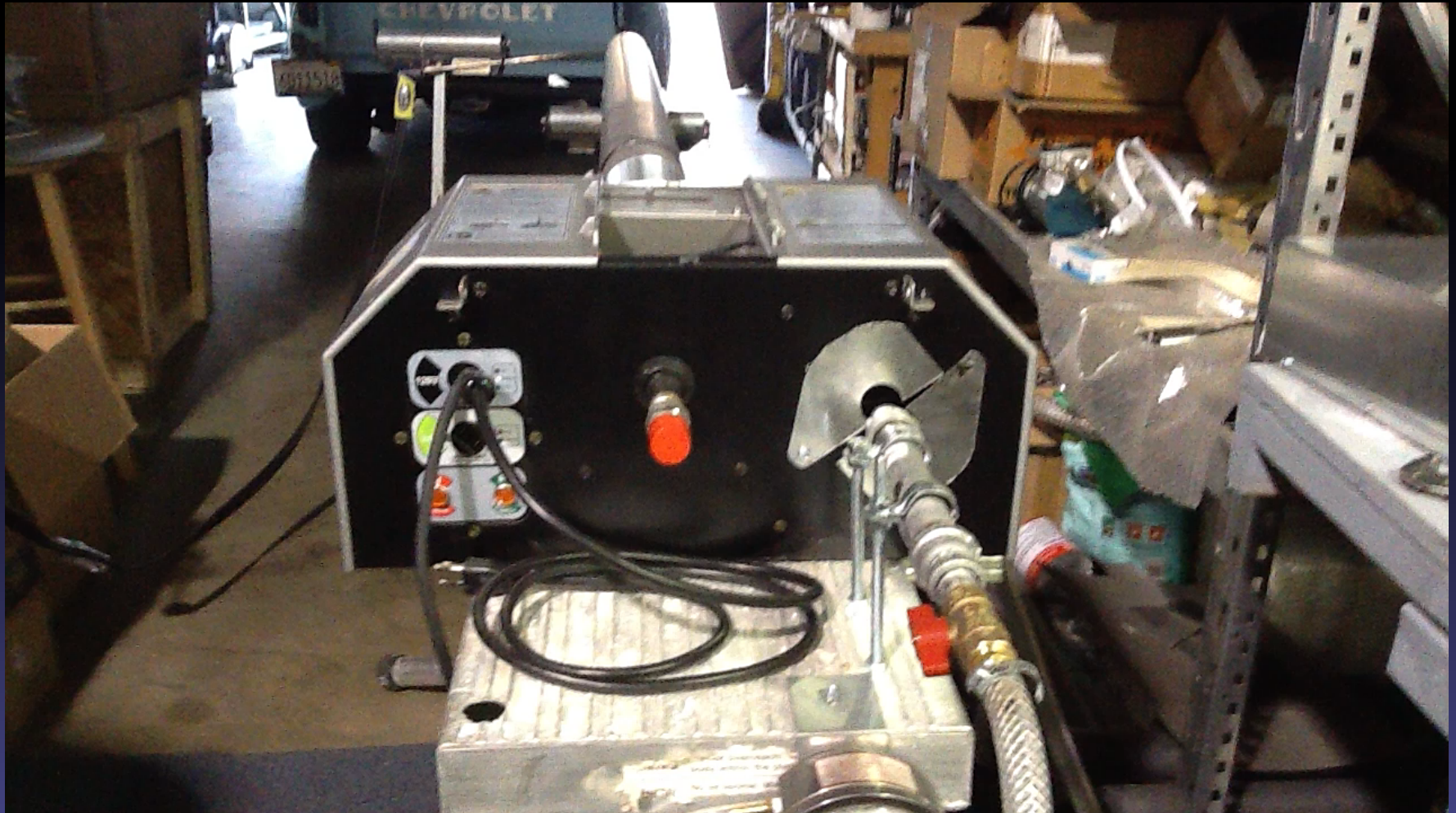
Domestic Furnace



Home Furnace Retrofit Operation

- ❖ Silent operation
- ❖ Stable combustion with wide window of operation
- ❖ Single speed ignition and steady-state ultralow NOx operation
- ❖ Suitable for non-condensing and condensing furnaces

Radiant Heater



Direct-Fired Heater



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**Absolutely the cleanest, most energy efficient,
least expensive NOx-eliminating burner in the
world.**