

GIDEON



Ultra Low NOx Burner

Advanced Combustion Technology Co.,Ltd.

<http://www.itmreps.com>

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State-Of-The-Art ACT-Gideon Ultra Low NOx Burner

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Worldwide concerns for the environment are presenting new challenge for industries. Governments, research organization, business and individuals have emphasized the need to change and develop new technologies to meet these environmental challenges. (1-4)

Five global environmental concerns present new challenges for burner manufacturers and the customers they support:

- climate change,
- acidification,
- eutrophication (atmospheric deposition),
- urban air quality, and
- tropospheric ozone.

Nitrogen Oxide (NOx) is one of the major contributing sources of pollution, and is a key ingredient in the formation of tropospheric ozone, acidification, and responsible for 70% of the global chemical destruction of stratospheric ozone.

The provisional emission reduction target for NOx, as given in the European Union acidification strategy, is six (6) millions tones by 2010, which means a reduction of 55% as compared to 1990. (1)

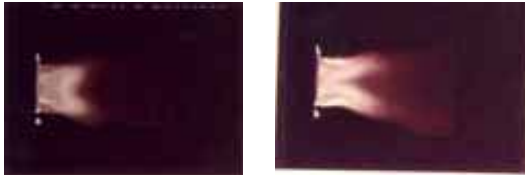
On March 10, 2005 , the United States Environmental Protection Agency (EPA) issued the clean Air Interstate Rule (CAIR) that will achieve the largest reduction in air pollution in more than a decade. CAIR will permanently cap emissions of NOx in the eastern United States. When fully implemented, CAIR will reduce NOx by over 60 percent compared to emissions in these states from 2003 levels. (4)

Fossil fuel combustion is one of the main sources for the global production of NOx. We need to find ways to burn today's fuels "Cleaner, Better, with Greater Efficiency and Less Pollution".

The **ACT-Gideon Ultra Low NOx Burner**, by Advanced Combustion Technology Co., Ltd, Taiwan is a state-of-the-art burner having the ability to meet these needs.



2-D LDV Flow Velocity Measurement



**Gideon Burner Swirling
Flow Visualization**

ACT-GIDEON ULTRA LOW NO_x BURNER

ACT-Gideon Ultra Low NO_x Burners is based on more than a decade of research conducted by Dr. Shyh-ching Yang. (5-10) Since 1991, Dr. Yang has been a leader and pioneer in the development of single digit (less than 9ppm NO_x emissions) burners.

The key to successful burner design is the ability to control the near-field burner aerodynamics of the combustion air producing a match between the flame reaction rates and the imposed velocities.

The ACT-Gideon Ultra Low NO_x burner applies a swirl to the combustion air stream creating a re-circulation zone in front of the burner. The patented swirler design produces a short, strong, and stable flame with Flue Gas Recirculation (FGR). FGR is added through the air fan. Air, FGR and fuel are linked proportionally to maintain proper combustion and the desired levels of O₂, NO_x, and CO. The swirl zone anchors the flame and creates inherent flame stability enabling a wide range of boiler loads. The burner has been demonstrated to operate at a turndown ratio of 10:1 for natural gas and 8:1 for oil firing. The re-circulating fluid zone generates regions of high turbulence in the shear layer between the forward and the reverse flow, causing faster mixing of combustion air with the injected fuel. The swirl profile, swirl level, diameter, and burner dimensions can affect the flow patterns and turbulence characteristics, which are developed by swirling zone.

The ACT Gideon Ultra Low NO_x Burner will meet the requirements and will comply with emission standards imposed on boiler manufacturers and operators, both today and in the future. Field tests of the ACT Gideon Ultra Low NO_x Natural Gas Burner have demonstrated that the burner can achieve:

- NO_x ≤ 6 ppm (d, 3% O₂)
- CO ≤ 10 ppm (d, 3% O₂)
- Excess Oxygen ≤ 1 % without the use of catalyst, re-burning, ammonia or urea injection.

NEW INSTALLATION AND RETROFIT APPLICATION

The Gideon is ideal for industrial and utility boilers, single pass steam generators, and heaters fro 1 to 250MMBtu/hour input. We offer full design, engineering and technical support.

The burner makes an easy retrofit to existing boilers and heaters using a forced draft fan. Its simple design and our ability to quickly custom design and manufacture necessary connection interface to an existing boiler achieve the versatility of the burner. We have current installation on both fire tube boilers and water tube boilers without causing major modifications or restrictions to the existing equipment. In most cases our custom fit is ideally compatible to the original boiler design and allows the operator to add a Low NO_x Burner without compromising room and access space around his existing equipment.

The ACT Gideon Ultra Low NO_x Burner is designed for the convenience of the operators of industrial and utility boilers. There are no moving parts in this burner. This simple design reduced maintenance to a minimum.



The ACT Gideon

Ultra Low NOx Burner

PERFORMANCE AND BENEFITS

The ACT Gideon Ultra Low NOx Burner operates with the lowest emissions and highest performance of available burners. The burner has the following performance characteristics offering benefits to boiler operators..

- Cost effective
- Operate at single digit NOx and CO emissions using FGR
- High turndown, 10:1 for natural and 8:1 for oil
- Adjusts quickly to load swings
- Operates at low excess oxygen ($\leq 1\%$ O₂), and maintains high efficiency
- Operates with air-pre-heat or high temperature air environment (up to 590°F) and maintains single digit NOx and CO emissions
- Exceeds current and will likely meet future air pollution and boiler emissions regulations
- Easily installed as a retrofit to existing furnaces, water tube, fire tube boilers, heaters, and utility power plants
- No moving parts and is very low maintenance
- Easy fuel change from natural gas, propane to waste gas without changing burner components
- Uses a single gas train
- Uses a single low temperature fan
- Simple design, construction, installation and operation.



19.9 MMBtu/hr, Natural Gas
NO_x(d,3%O₂):< 9 ppm;
CO (d,3% O₂):<10 ppm ;
Excess Oxygen:< 3% O₂;

Central Valley, CA, USA



5 MMBtu/hr, Natural Gas
NO_x(d,3%O₂):< 6 ppm;
CO (d,3% O₂):<10 ppm ;
Excess Oxygen:< 1% O₂;
USA

BURNER FOR INDUSTRIAL AND UTILITY BOILERS

The ACT Gideon Ultra Low NOx Burner is available for industrial furnaces, heaters, industrial and utility boilers in sizes from 1 MMBtu/hr to greater than 250 MMBtu/hr.

The ACT Gideon Ultra Low NOx Burner is manufactured with the highest standards component. Performance and standards of manufacturing are guaranteed.



100 MMBtu/hr Natural Gas
NO_x(d,3%O₂):< 9 ppm;
CO (d,3% O₂):<10 ppm ;
Excess Oxygen:< 3% O₂;
USA

GUARANTEE

The burner is guaranteed to be free of material and manufacturing defects for two

years after installation. Field tests of the ACT Gideon Ultra Low NO_x Natural Gas Burner have demonstrated that the burner can achieve:

- NO_x ≤ 6 ppm (d, 3% O₂)
- CO ≤ 10 ppm (d, 3% O₂);
- excess oxygen ≤ 1 % without the use of catalyst, reburning, ammonia or urea injection.

LOCAL REPRESENTATION AND SUPPORT

Local representation and support is provided through *Advanced Combustion & Process Controls*, Bakersfield, CA. Leaders in Data Acquisition and Control Systems technology. We engineer, design, program and build control systems in a modern UL approved Bakersfield facility.

Field technicians can assist with start-up and commissioning and our sister Electrical Contractor firm can assist with installation and other support.

PATENTS

The burner design is covered and protected by 18 worldwide patents.

References

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