

ClearSign Announces Novel 'Duplex(TM)' Short-Flame Burner Design Brand New Approach Is a Potential Breakthrough, Enabling a New Level of Simultaneous Control Over Both Flame Shape and Flame Length Without Compromising NOx Control

SEATTLE, WA -- (MARKETWIRE) -- 02/14/13 -- ClearSign Combustion Corporation (NASDAQ: CLIR) today announced that it has developed and successfully demonstrated a novel two-tiered burner design. Unlike conventional burners that anchor the flame at a fixed location, the ClearSign design has two user-selectable locations at which the flame can alternately be anchored, with one positioned directly above the other. This allows a flame to be transferred from a lower flame holder to an upper level flame holder virtually instantaneously. When the control is cycled, the flame transitions from one stage to the other and is highly stable in either position.

When the flame is moved to the upper position it is cooled to inhibit NOx formation by the increased volume of flue gas that is now mixed with the fuel prior to ignition. The flame is also dramatically shortened because oxygen diffuses more rapidly as a result of this enhanced pre-ignition mixing.

The movement of the flame from one level to the next is controlled through the application of the company's Electrodynamic Combustion Control (ECC™) technology so that no mechanical parts or valves are required to effect the transition, and control of the burner can be easily integrated into virtually any digital control suite. ECC also helps to ensure flame stability in both positions.

According to the company this represents a significant innovation that promises to offer system operators an unprecedented level of control over flame shape and flame length -- while maintaining low NOx emissions.

The company said that preliminary results showed flame length could be reduced by as much as 80%.

"Having a short flame and low NOx at the same time is highly desirable, but is virtually impossible to achieve using conventional design techniques," said ClearSign CEO, Rick Rutkowski. "In fact, burners of this type are usually designed to elongate the flame to reduce NOx by exposing more surface area in order to lower flame temperature. While this flame-stretching technique is effective at reducing NOx, tall flames create a whole new set of problems."

"This has been a challenge that industry has wrestled with since the introduction of low NOx burners," said Joe Colannino, ClearSign's CTO. "A longer flame may mean lower NOx emissions, but it also imposes some costly penalties. The first one is simply that when you stretch the same heat energy out over a longer distance, you reduce the Btus per square foot of furnace volume, effectively de-rating the heater capacity."

"This innovation has the potential to remove the constraints that have previously defined the tradeoffs between environmental performance and process throughput operating range or fuel efficiency," Colannino added.

According to the company, the American Petroleum Institute has established guidelines which stipulate that flame length must not exceed 2/3 the height of the furnace. "Given the tradeoff between flame height and process capacity," Rutkowski adds, "adhering to these guidelines entails an enormous sacrifice."

Colannino points out other problems that arise with tall flames when flames merge and coalesce, creating undesirable flame patterns or "fire clouds" that compromise heat transfer efficiency and uniformity and further constrain process throughput. Large heaters typically use arrays of multiple burners compounding the problem of long flames interfering with one another.

"Improvements in flame shape in refinery process heaters," says Rutkowski, "can make a difference of tens of millions of dollars a year in increased process throughput and improved energy efficiency at a single site and there are more than 800 refineries worldwide. A single installation can comprise thousands of individual burners among the various refinery heaters."

Unlike conventional low NO_x burners, ClearSign's design uses a different and proprietary mechanism to keep NO_x at bay. Rather than stretching the flame to cool it, ClearSign's Duplex burner lifts the flame and re-stabilizes it in an elevated position. The volume of flue gas entrained in the fuel stream is dramatically increased so that the flame is simultaneously both cooled and shortened.

ClearSign's Duplex burner features a circular array of fuel nozzles around its base, and is specifically designed to resemble commercial burners commonly used in process heaters such as refinery heaters or ethylene cracking heaters.

The upper tier of the burner is a flat disc that contains a central aperture ringed by a band that is perforated with a series of small diameter cylindrical vertical cavities. The vertical position of the upper tier can be adjusted depending upon the desired amount of flue gas entrainment, but this upper tier flame holder can be positioned as much as two to three times the distance the fuel nozzle as compared to the primary, lower tier, flame holder.

Rutkowski continued, "We were asked by a very large potential customer to investigate whether we could shorten a momentum-dominated flame, such as those used in refinery heater burners by 30% to 40%. It turns out that we can. We were in fact able to reduce flame length by as much as 80% or 90% using this new Duplex burner design.

"We believe this is a major innovation. Not only has no-one ever built a burner like this using electrical fields, but so far we cannot find evidence that anyone has ever conceived of such a two-tiered burner of any kind. If that's the case, the breadth of the available intellectual property protection may prove to be significant. We believe this may represent a powerful extension of our patent portfolio. It has already inspired a considerable number of new inventions."

The company believes that refinery and petrochemical systems such as process heaters, ethylene cracking furnaces, and high-pressure flares are early candidate applications for ECC™ and the Duplex burner technology. The company also believes that this architecture could be well suited to package boilers.

For more information on the ClearSign flat-flame burner design and market implications, please visit www.clearsign.com/applications

About ClearSign Combustion Corporation

ClearSign Combustion Corporation designs and develops technologies that aim to improve key performance characteristics of combustion systems including energy efficiency, emissions control, fuel flexibility and overall cost effectiveness. Our Electrodynamic Combustion Control™ (ECC™) platform technology improves control of flame shape and heat transfer and optimizes the complex chemical reactions that occur during combustion in order to minimize harmful emissions. For more information about the Company, please visit www.clearsign.com

Cautionary note on forward-looking statements

This press release includes forward-looking information and statements within the meaning of the Private Securities Litigation Reform Act of 1995 and the provisions of Section 27A of the Securities Act of 1933, as amended, and Section 21E of the Securities Exchange Act of 1934, as amended. Except for historical

information contained in this release, statements in this release may constitute forward-looking statements regarding our assumptions, projections, expectations, targets, intentions or beliefs about future events that are based on management's belief, as well as assumptions made by, and information currently available to, management. While we believe that our expectations are based upon reasonable assumptions, there can be no assurances that our goals and strategy will be realized. Numerous factors, including risks and uncertainties, may affect our actual results and may cause results to differ materially from those expressed in forward-looking statements made by us or on our behalf. Some of these factors include the acceptance of existing and future products, the impact of competitive products and pricing, general business and economic conditions, and other factors detailed in our Quarterly Report on Form 10-Q and other periodic reports filed with the SEC. We specifically disclaim any obligation to update or revise any forward-looking statement whether as a result of new information, future developments or otherwise.

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Released February 14, 2013

 [**ClearSign Announces Novel 'Duplex\(TM\)' Short-Flame Burner Design**](#)
(37 KB)

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