

USGasTech Inc

Providing gas-related technologies to the American Gas Industry

Digital Combustion Regulator

*SIMPLIFIES AND IMPROVES
NATURAL GAS COMBUSTION CONTROLS*

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➤ Objective

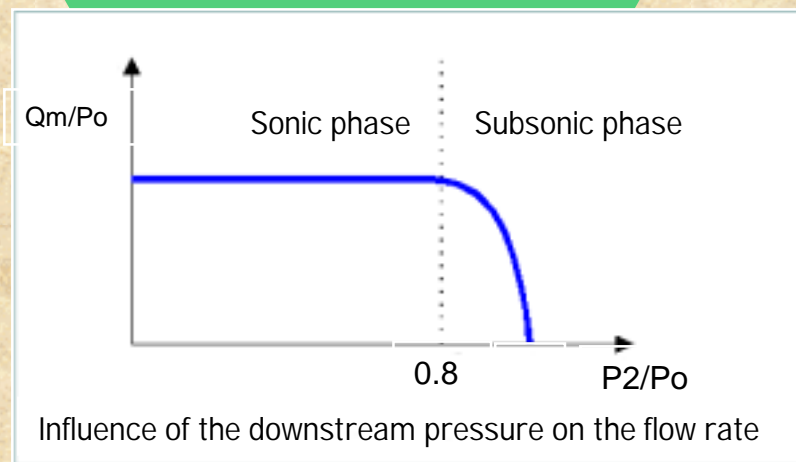


Studies conducted by the research division of a major European gas company, with the support of thermal equipment professionals, to improve the compactness and performance of air-gas pipes for industrial burners, have resulted in the development of a new actuator combining gas flow rate expansion, metering, and combustion control functions.

This apparatus is based on a technology: **the variable-section throat sonic nozzle**, which is brought to the USA by USGasTech.

➤ Principle

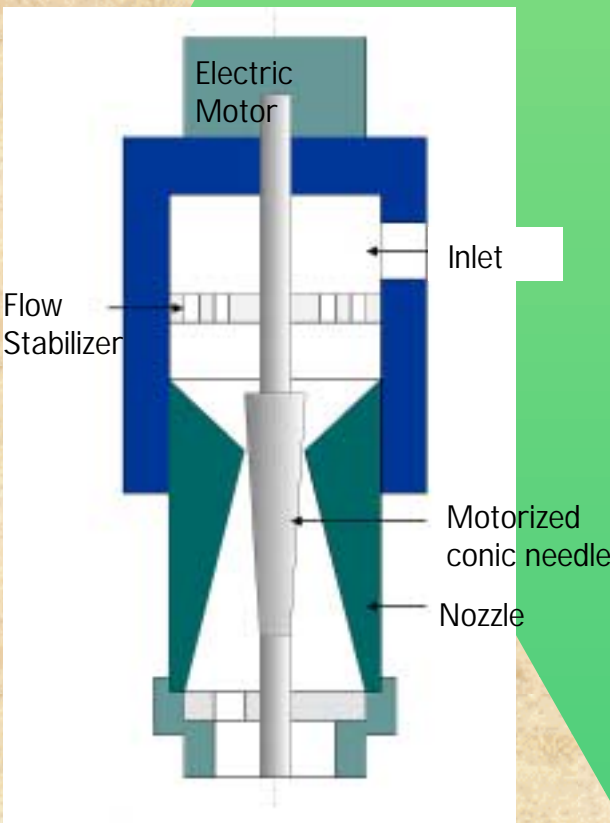
In an Industrial burner, the quality of the air/gas line governs safety and efficiency of the thermal process.



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The idea is to have the nozzle operating under sonic conditions. For this to happen, when the upstream pressure is P_0 , the downstream pressure P_2 must be lower than a given value P_2' , the P_2'/P_0 ratio being the starting point of the nozzle critical operation.



MECHANICAL SCHEME OF THE SONIC NOZZLE

The mass flow rate Q_m then depends only on the pressure P_0 and the density ρ_0 of the fluid upstream of the nozzle, and on the section of the throat.

Controlling the flow rate flowing through the nozzle makes it necessary to have an actuator available capable of modifying the only changeable variable: the fluid flow section at nozzle throat. This is the intended use of the conic needle.

According to this principle, it is therefore possible to ensure metering, pressure reducing and flow regulation with the aid of a single appliance.

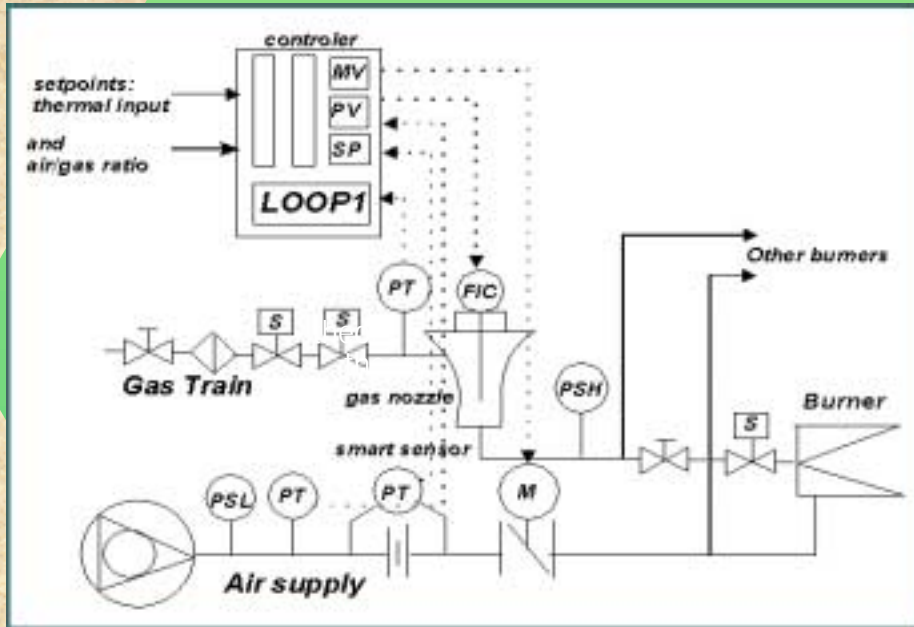
➤ Experimental Study

An experimental study was achieved to confirm the theoretical approach

Description of the bench test:

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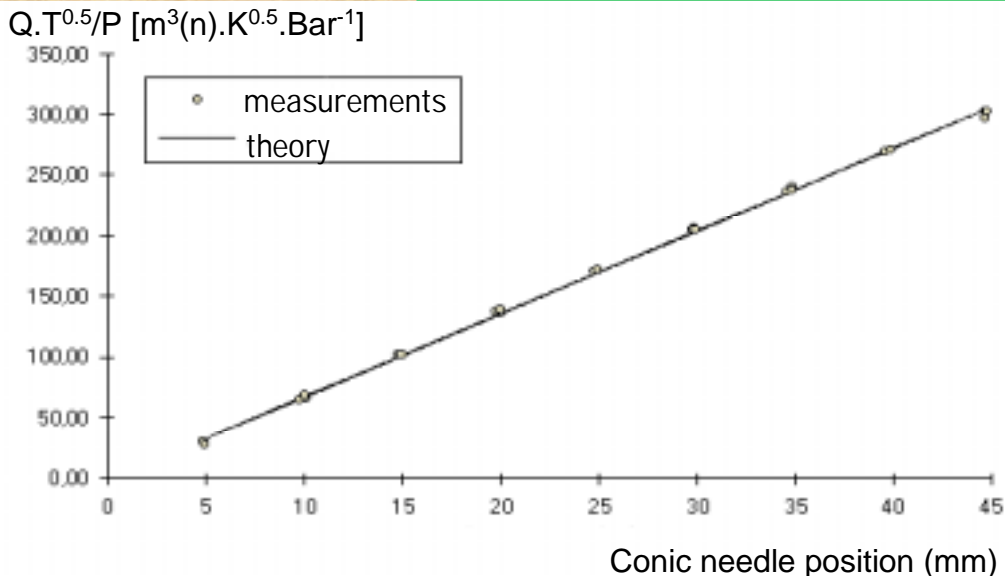
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Typical diagram of an air-gas pipe with a sonic nozzle

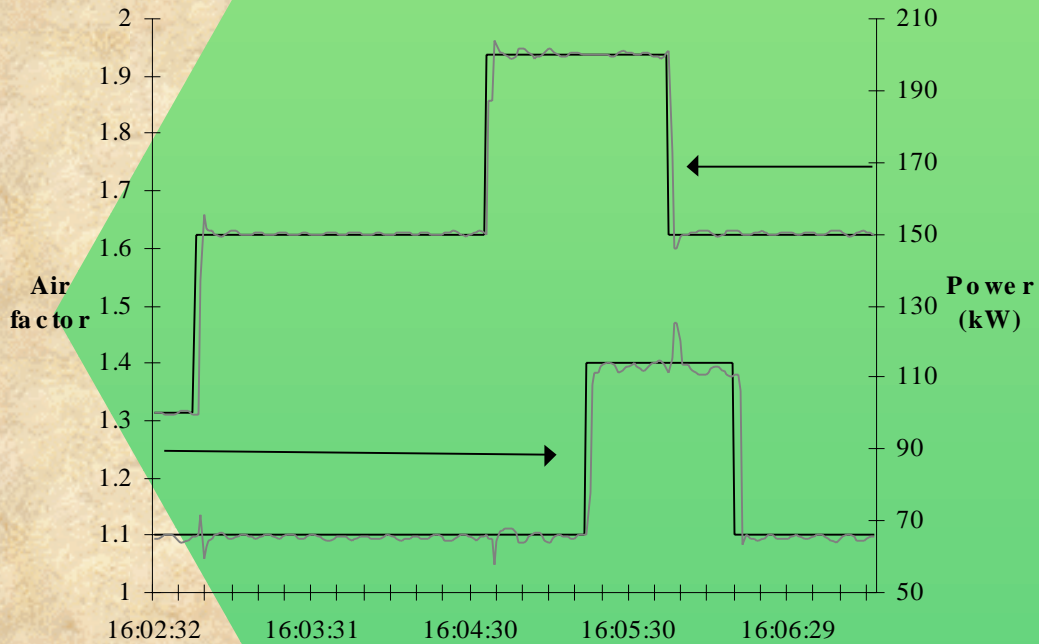
Test Results

The results were extraordinary close to what was predicted in theory, as you can see on the enclosed graphics.



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➤ An industrial innovation

This apparatus contributes to modernizing industrial thermal equipment and should privilege gas solutions in industry. The three models proposed (DN 25 to DN 100) cover the needs of burners in the **1,05 MMBtu** to **52,5 MMBtu** power range.

By design, the apparatus is particularly suitable for installation in large furnaces used in the metal, glass, lime or ceramics industries, but it should also find its place on the steam boiler equipment market.

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➤ Validation in service : Pilot operation at Ascometal in France

The device thus developed has already found room on first thermal equipment at the Ascometal (Dunkerque, France) plant and the targeted market is the high powers furnaces operated at high temperatures.



Ingot bar reheating furnace in a rolling plant of Ascometal



New gas pipe

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➤ Conclusion

New technical solutions are necessary to allow, for certain applications, the compactness and performances of regulation devices mounted on the air/gas lines to be improved at no extra-cost.

The most promising solution is the one that was presented to you: a combustion regulator combined with a variable throat sonic nozzle. This technique initially developed by a European gas company for other applications, in fact, allows the pressure reducing, metering and flow control function to be ensured by one device.

The first experimental study carried out under real operating conditions proves how the process proposed is appropriate, allowing a control of the power and ventilation rate of an industrial burner with an accuracy of about 1% in a dynamics exceeding 10.