# YOUR EXPERTS FOR BURNERS AND COMBUSTORS

CS COMBUSTION SOLUTIONS

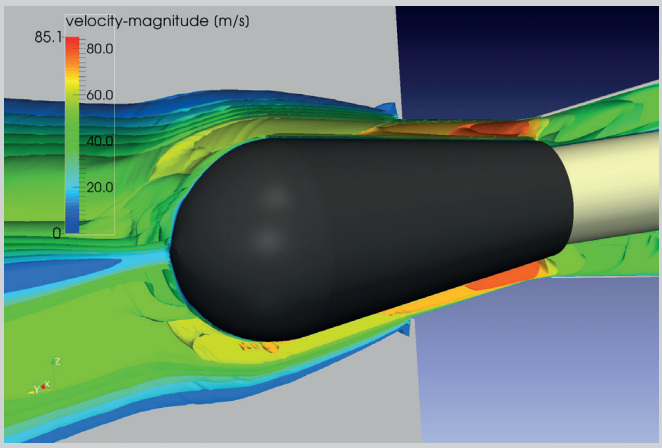
## OPERATING COST OPTIMISATION THROUGH PRODUCT INNOVATION

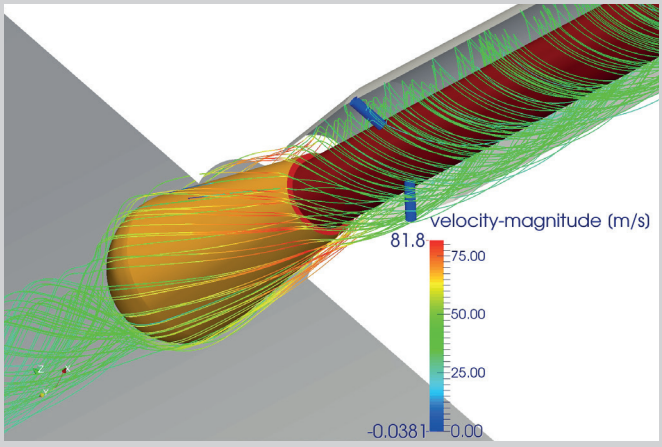
**Across Europe, the idea of handling energy – one of our most important and precious goods – efficiently and economically is now noticeably gaining ground in the operation of industrial incineration plants. Well known companies in the chemical and pharmaceutical sectors are now setting themselves the objective of lowering the energy requirements of their operations and plants as far as possible through optimisation measures.**


CS Combustion Solutions offers solutions for this by further developing proven technologies for incineration processes. They have developed innovative approaches to reducing the demand for auxiliary media such as nitrogen, for example by employing VARIEX automatically regulated gas injection.

Conventional gas lance systems – especially for the injection of explosive exhaust gases – have until now been limited by a narrow adjustment range of max. 1:5. Where there is the need of a higher control range, an auxiliary medium such as nitrogen or air needs to be added to ensure a minimum throughput or minimum discharge velocity.

The VARIEX gas lance is automatically regulated during operation, so that even with a low primary pressure this adjustment range can be extended to at least 1:40, meaning the fluctuations involved in the process can be compensated without further addition of operating and auxiliary media. The result is a partial or complete reduction of the required auxiliary medium, which is necessary for maintaining the minimum required exhaust velocity of such gases prescribed by the technical rule for operating safety TRBS 2152. Elimination of the auxiliary medium also means reduction of support fuels such as natural gas, because if the auxiliary medium has been eliminated it no longer needs to be heated up to the process temperature. Subsequently, the total flow rate of the exhaust gas is reduced.




The design was optimised in several steps through a CFD flow analysis. An integrated swirler ensures an even flow to the regulating cone. The high momentum of the swirled gas stream means a very homogeneous distribution can be achieved in the combustion chamber ensuring that even the smallest amounts of hydrocarbons and combustible components are completely oxidised.

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## CASE STUDY

**Comparison table**

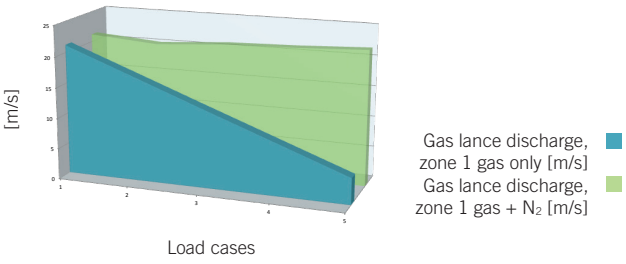
| | Standard Gas Injection | VARIEX |
|---|---|---|
| Process gas | Zone 1 gas (+ $N_2$ in lower adjustment range) | Pure zone 1 gas $H_u$ = 4,48 MJ/Nm³ |
| Adjustment range | 1:5 | 1:40 |
| Throughput | 240 - 1,200 Nm³/h | 30 - 1,200 Nm³/h |
| $N_2$ | 200 - 900 Nm³/h | Not required |
| Combustionchamber temperature | ~ 1,140 °C | ~ 1,140 °C |
| Support fuel | Natural gas | Natural gas |

| Load case 3 (2,600 h/a) | Conventional Gas Lance | VARIEX |
|---|---|---|
| Zone 1 gas | 750 Nm³/h @ 21 m/s | 750 Nm³/h @ 25 m/s regulated |
| $N_2$ | 450 Nm³/h @ 21 m/s | - |
| CC temperature required | 1,140 °C | 1,140 °C |
| Natural gas supply | 220 Nm³/h | 95 Nm³/h |

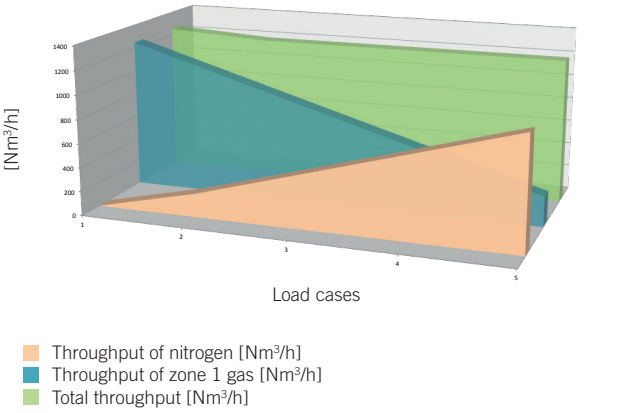
| VARIEX | Reduction / h | Reduction / 2,600 h [1] |
|---|---|---|
| $N_2$ | 450 Nm³ | 1,170,000 Nm³ |
| Natural gas | 125 Nm³ | 325,000 Nm³ |
| $CO_2$ | 698 t/a direct or 807 t/a including upstream chain [2] (corresponding to a reforestation of approx. 32,000 m² forest) | |

[1] Based on 2,600 operating hours / year
[2] Calculation and data basis GEMIS 4.94

**Flow Rate-Related Discharge Velocity for Static Gas Lance**




**Flow Rates for Ensuring Min. 20 m/s Discharge Velocity**




If you are interested, we would be happy to work with you in analysing the possible potential for reduction in your application and offer a complete tailor-made solution for implementation. You can reach us at any time by using the following contact details.

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**your experts for burners and combustors**