

A service offer in combustion control of gas-fired industrial thermal processes :

- applications in the glass industry (melting furnaces and feeders)

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A service offer in combustion control for gas-fired thermal processes

The combustion control in industry :

- definition and main issues
- sources of disturbances and « sensitive » processes

Development of a service offer in combustion control

- new appliances for measuring and controlling the Wobbe index
- the service offer : from the diagnosis to the maintenance

Applications in the glass industry :

- using WOBBELIS or POCCILIS for gas-fired melting furnaces
- using INDELIS for feeders

The combustion control in industry

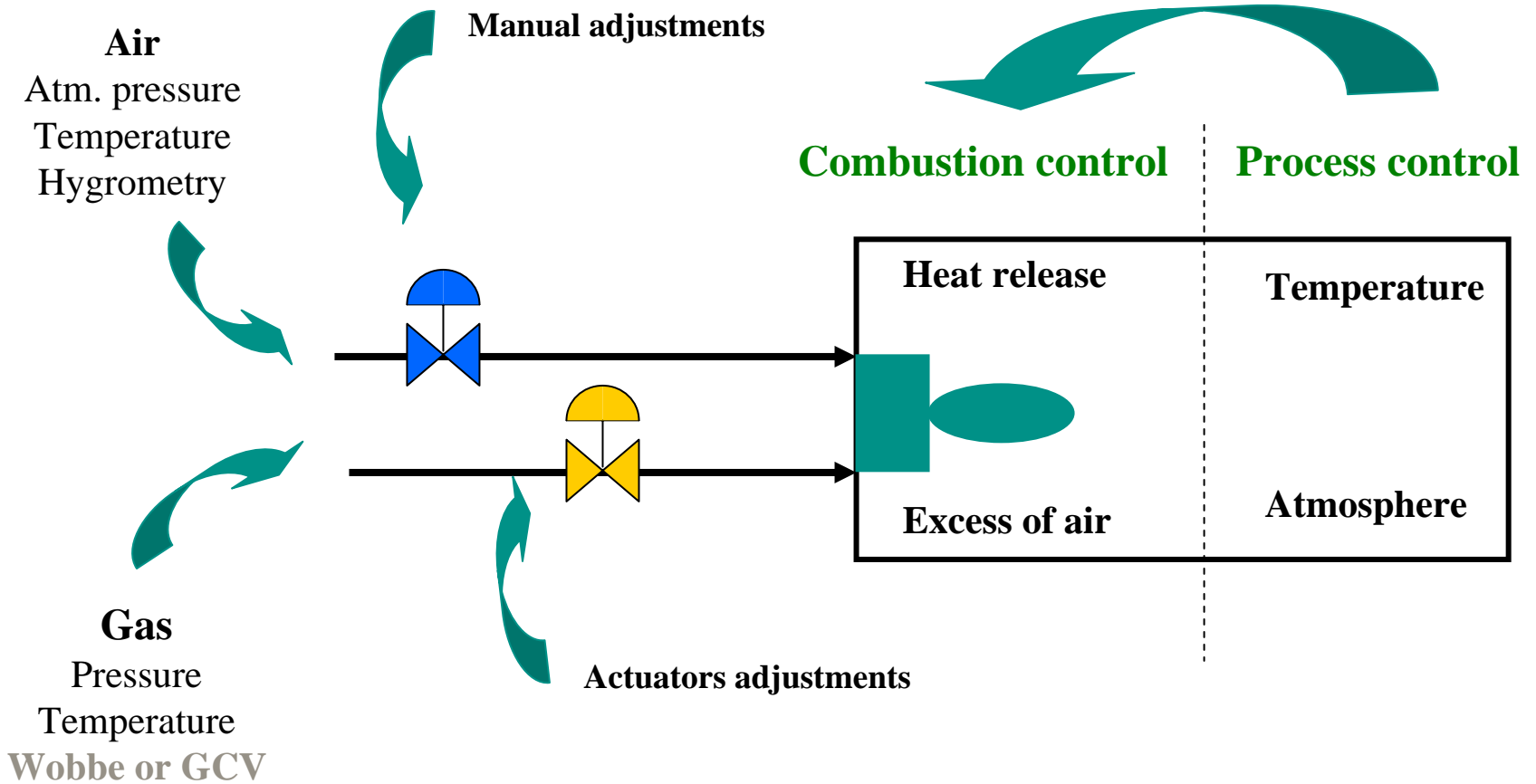
Definition : control of the combustion characteristics of a burner

- Heat release (depending on gas flow rate and gas calorific value)
- Excess of combustion air (or O₂) (related to a/g ratio and V_a)

The quality of this control has an impact on :

- Safety (ex : to avoid uncontrolled CO emission)
- Environment (NO_x depends generally on the excess of air)
- Performance (combustion efficiency)
- Products quality (respect of the temperature or atmospheric set values inside the furnace)

Sources of disturbance of the combustion



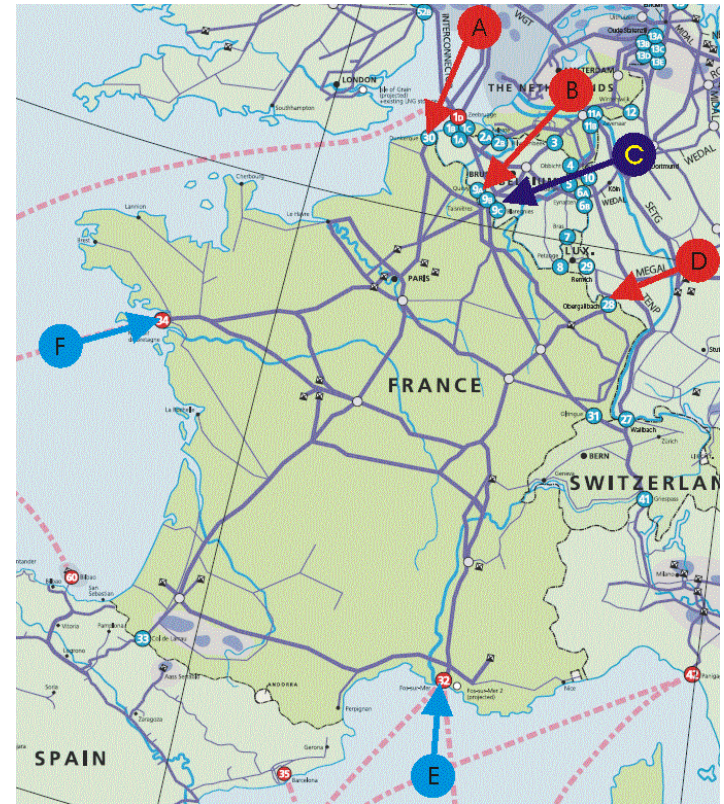
Gas variations in Europe are trending to increase !

A consequence of the increase of the natural gas demand in Europe :

- Diversification of gas sources with more and more LNG
- Improvement of the European interconnected network

EASEE-gas CBP on gas quality

- Wobbe spec. : $47 < W < 54$ MJ (+/-7%)
- $0,55 < rd < 0,7$ (no specification for GCV)

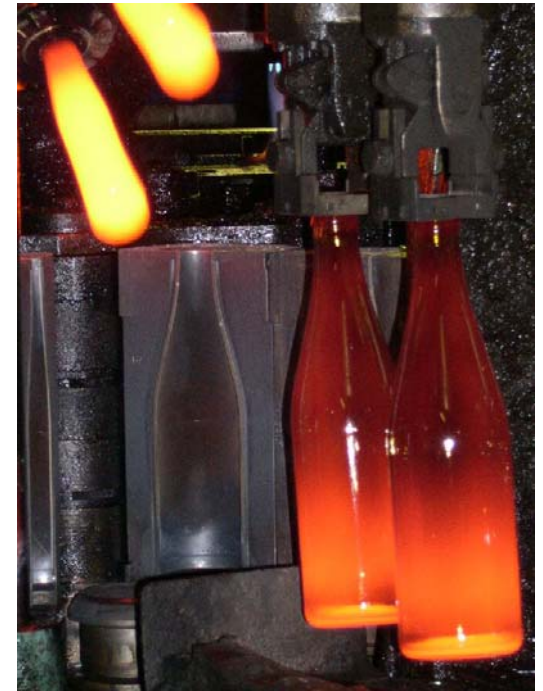


French specifications :
 $43,7 < WI < 53,5$ MJ

“Sensitive” thermal processes

In industry, some processes are more sensitive to gas variations :

- where the flame is used as a tool (e.g. flame work in glassware industry),
- where process temperatures are very high (e.g. melting glass furnaces or glass feeders),
- where combustion products are used in the processing (e.g. direct contact firing and thermal treatment, in ceramics or metallurgy),
- where combustion sparks off a chemical reaction (e.g. lime production).



Development of a service offer in combustion control by GDF Suez

A packaged service offer proposed for customers adversely affected by gas variations and including :

- a diagnosis on site (process sensitivity assessment, estimation of the potential profitability of a corrective system),
- study of the technical solution,
- installation on the industrial site of the required equipment,
- commissioning of the appliance or system,
- training the personnel in the use and standard maintenance,
- maintenance throughout the contract duration.

A service offer including the renting of new appliances for measuring gas quality (WI, GCV)

WOBBELIS ®, POCCILIS ® (developed in partnership with ARELCO):

- measurement by patented correlations with physical properties (nor combustion neither compounds analysis)
- accuracy to 1%, for all natural gases supplied in Europe,
- 9 kg, WxHxD : 300x600x150 mm
- cabinet with protection IP55,
- self CH4 calibration and automatic restart,
- monitoring and display with touch screen,
- output : 4-20 mA (Modbus in option),
- complying with EMC European standards.

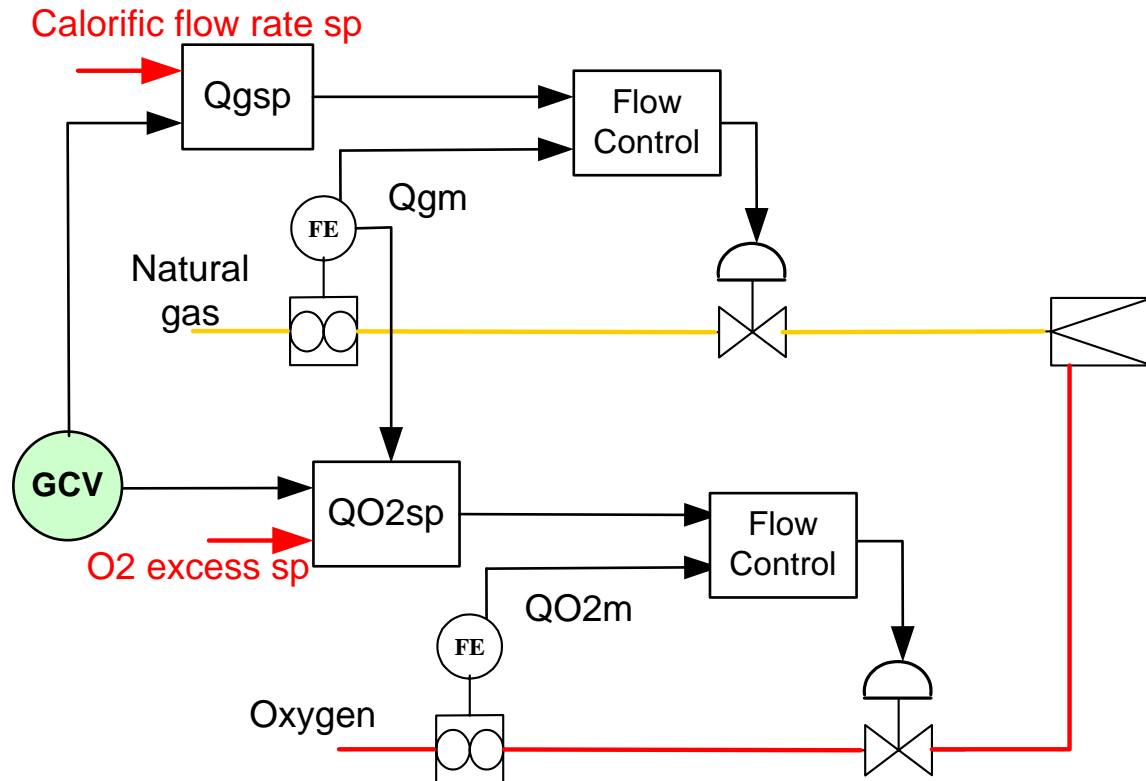


Corrective systems for glass melting furnaces

Modulating flow rates with WI or GCV measurement

-Adjusting the set points of flow controllers with a gas value measurement :

- If gas flow measured within diaphragm or venturi, then use Wobbe index
- If gas flow measured within volumetric meter, then use GCV
- For the air or O₂ flow control, the proportionality between GCV and stoichiometric volume is used



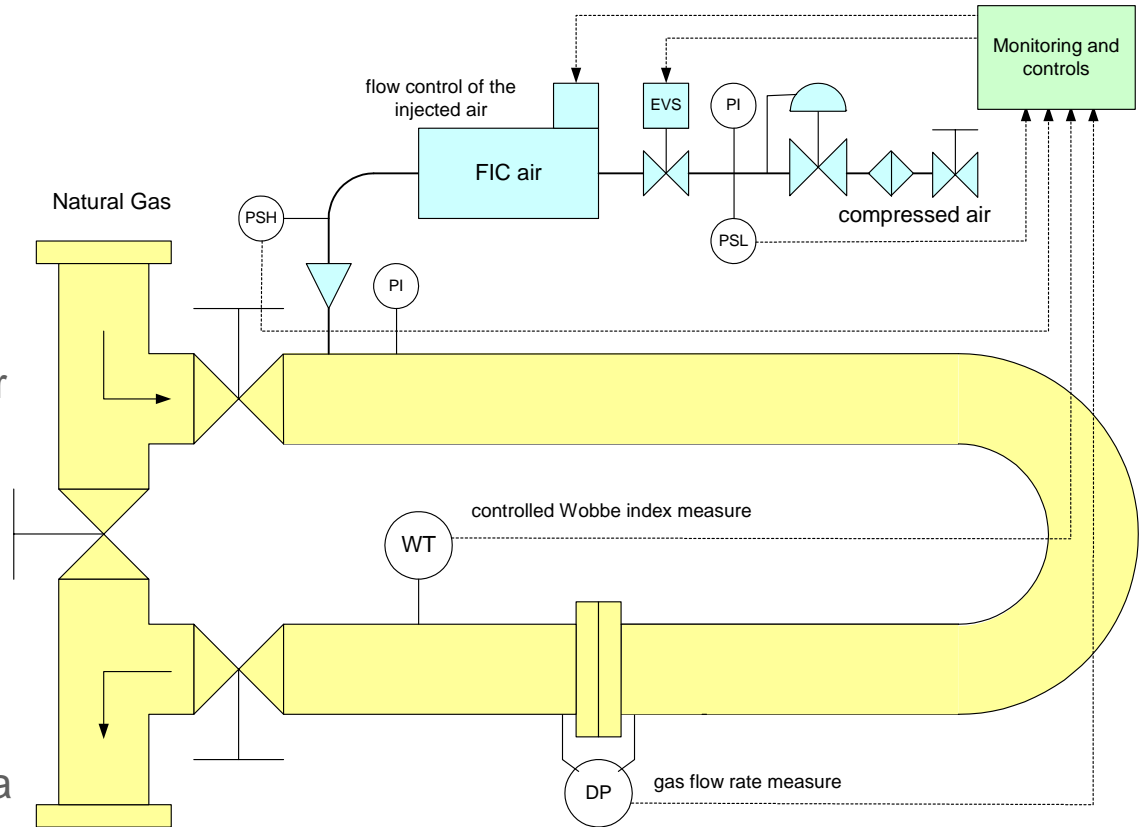
Example of a corrective system for oxy-gas burners

Corrective systems for glass feeders

Regulating the Wobbe Index with INDELIS ®

INDELIS ®: a Wobbe index regulation station developed by GDF SUEZ

- Controlled injection of a small quantity of air into the gas
- Accuracy of the WI control better than 1%,
- Commissioning with very few disturbances in production
- Capacity : up to 1000 Sm³/h of natural gas
- Turndown: from 8% to 100% of a nominal gas flow rate



Corrective systems in the glass industry

Assessment of first results

With this GDF SUEZ service :

- No investment for the appliance or system
- Reliability + maintenance : corrective function always available

Stated benefits :

- Improvement in the process stability (crown and glass temperatures)
- Improvement of the quality in production,
- Decrease of the number of burners adjustments (feeders),
- Energy (and oxygen) savings



Example of INDELIS installed in glass industry for supplying feeders

Increase of the European natural gas demand
→ increase of variations in gas quality (GCV, WI)

Glass thermal processes are sensitive to these variations, but :

- The issue is well-known, efficient technical solutions exist
- Based on 30 years of experience in the field, GDF SUEZ proposed a package service offer for helping their customers to deal with the issue
- Service including : design, installation, commissioning, renting and maintenance of adapted measurement or control systems

First returns of experience :

- Systems reliable and well suited to industrial needs
- Stated improvements in process stability, service costs covered by energy savings



POCCILIS installed at a bottles manufacturer