European Committee of Industrial Furnace and Heating Equipment Associations

Member associations:

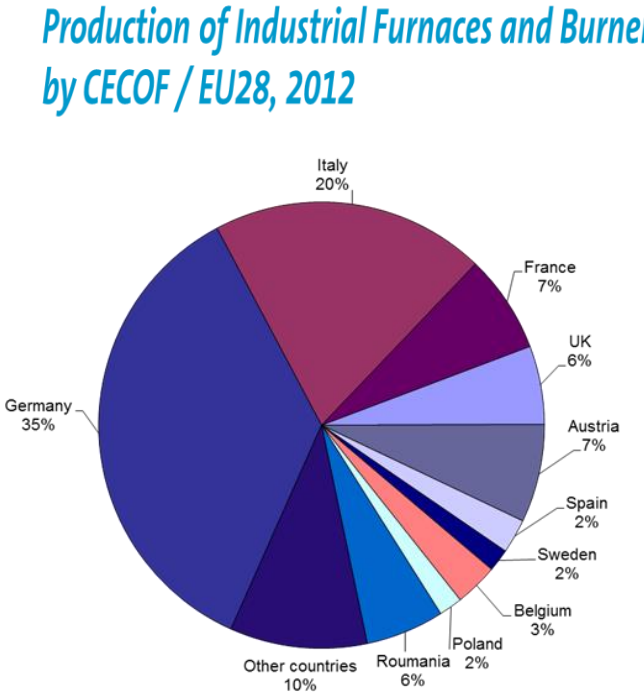
- Austria (FMS)
- Belgium (Agoria)
- France (CISMA)
- Germany (TPT Association of VDMA)
- Great Britain (BIFCA)
- Italy (CICOF)
- Sweden (SHTE)

Individual member companies in:

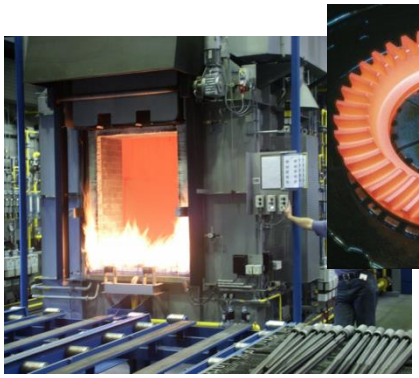
- Poland, Romania, Swiss

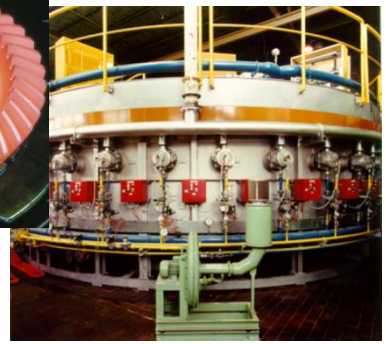
Associate members:

- IHEA (USA), JIFMA (Japan)



Some Furnaces
or
What does a typical furnace look like ?





Characteristics of Furnaces

- Industrial furnaces are used for different materials and different **thermal processes**.

- Industrial and laboratory furnaces are **product and process dependent** (from small to huge, e.g. breadth 400 m or height more than 100 m).

Industrial furnaces are (mainly) customer-built for single item production for a special application.

=> One solution which covers all types of furnaces is not possible for fluctuating gas qualities

How does an industrial thermo-processing equipment (ITPE) is designed

constant
calorific value

Steps to design a furnace:

- how much energy is used “to heat” up a product and under which “reactive” conditions in the ITPE?
- how big are the energy losses of the ITPE?
- ask the gas supplier for the **calorific value** of the natural gas H
- calculate the required gas volume by caloric value and needed energy in the ITPE
- define the burner system
- define the air/gas ratio (λ)

Assumption:

- calorific value of gas to the ITPE is constant
- minor changes of the caloric value are allowed in dependency of the process in the ITPE

Gas/air ratio λ

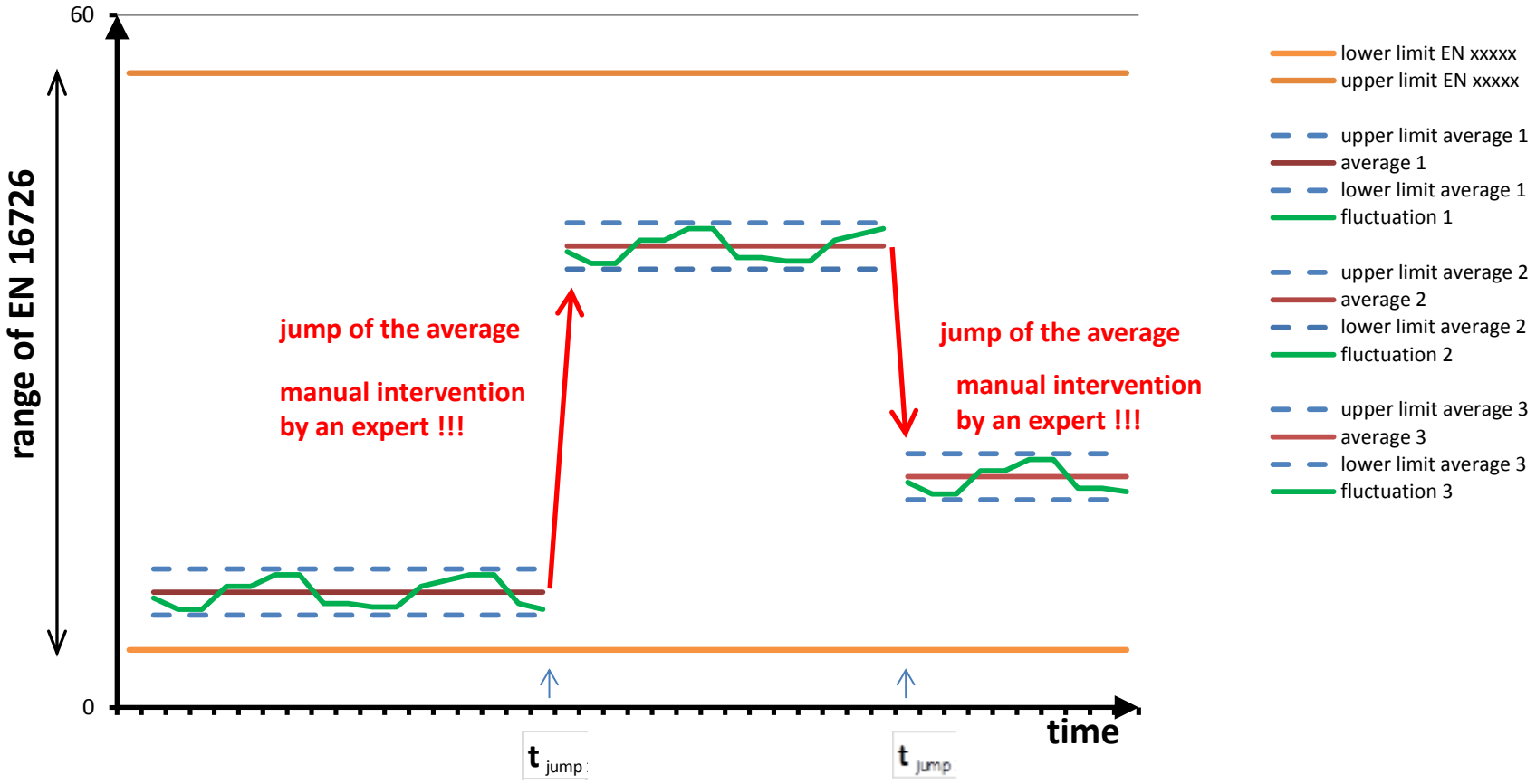
- In all thermoprocessing equipment, λ is set by the manufacturer on the basis of
  - **Process requirements**
  - **Energy requirements**
  - **Safety requirements**

- The ratio λ can only be set on the basis of information on the gas quality / gas composition at the inlet to the equipment (ball valve).

- Today, it has **not** been necessary to carry out a continuous analysis of gas quality and gas composition as the gas quality on site either remains constant or only fluctuates within a very narrow range.

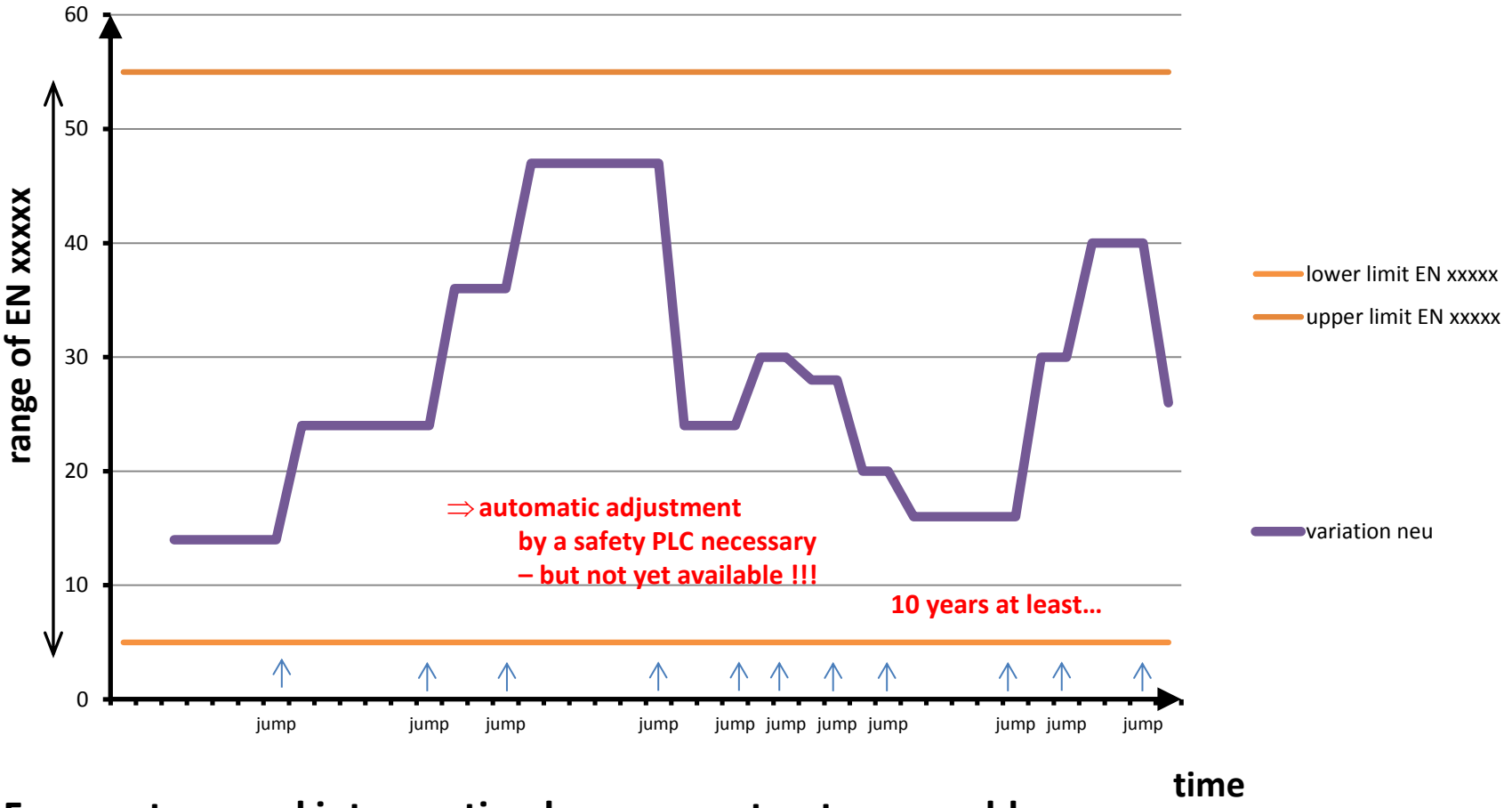
- Major changes in gas quality lead to
  - Quality problems with the goods produced where process requirements apply (ceramics industry, process gas generation,…)
  - Higher or lower cost (possibly with penalties) where energy efficiency requirements apply
  - Uncontrolled Variable emissions (IED)
  - Uncontrolled exhaust gas compositions (CO , NOx, ..) where safety requirements apply

Actual Situation for Thermoprocessing Equipment



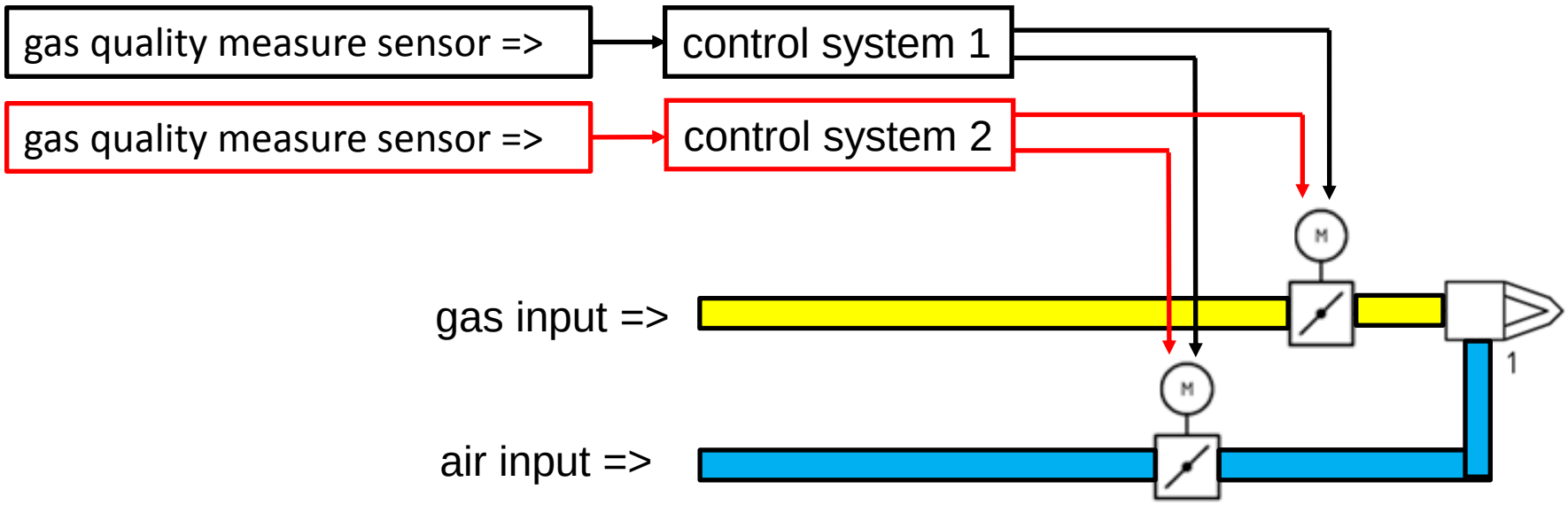
Date of the average jump is given by the gas suppliers in advance

New Situation for Thermoprocessing Equipment



Frequent manual intervention by an expert not reasonable

Ideal solution for fluctuating gas qualities



- Online controlling of the gas quality (calorific value) => safety and energy efficiency optimised
- Two independent gas quality measure system necessary, based on Machinery Directive (EN 746-2)

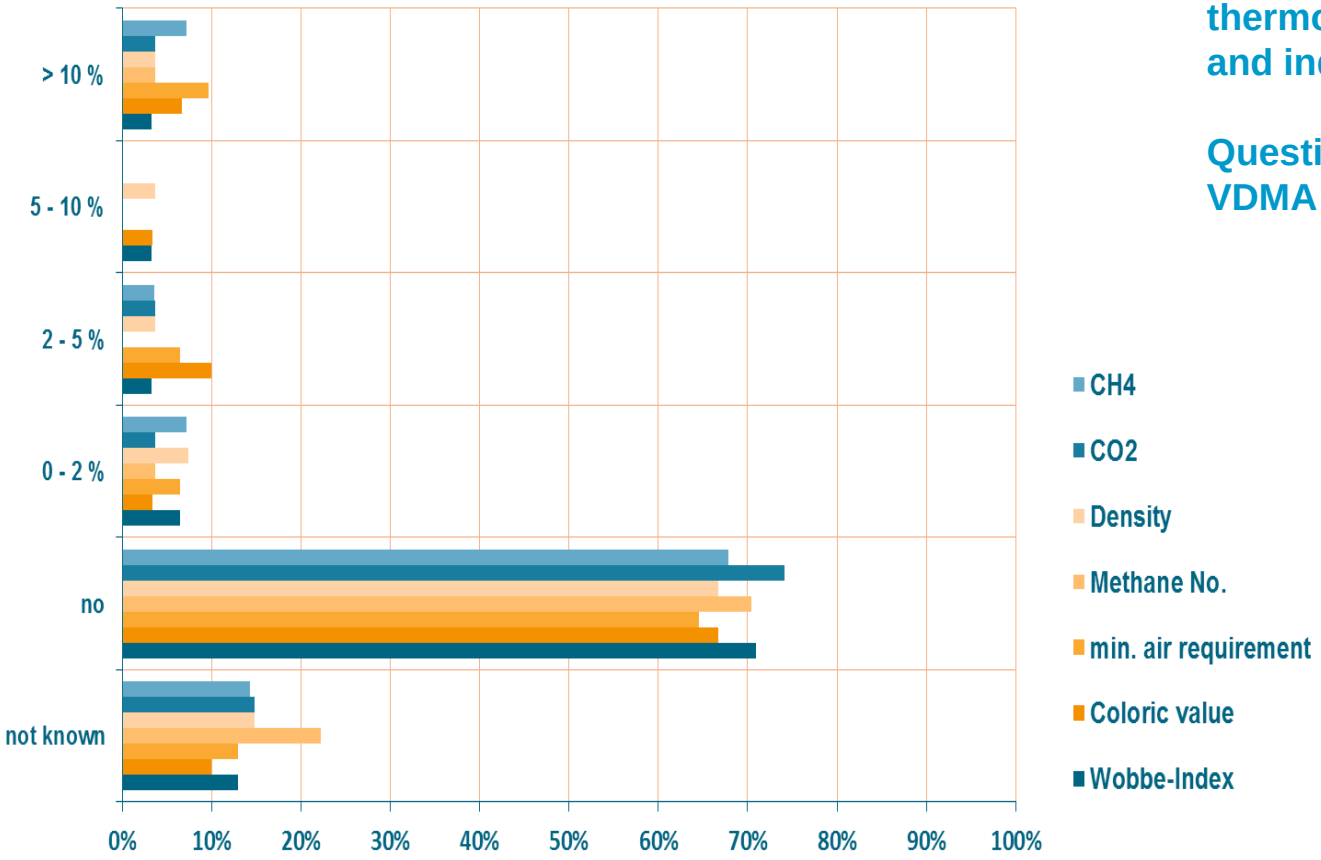
BUT:

- Online safe gas quality measure system are not existing
- A gas chromatograph does not measure continuously, costs more than 50.000€ => not to finance for single burner ITPE or for small industrial units
- The manufacturers of measure devices are on the way to develop a cheap (?) gas quality measure system, **but it need time (more than 10 years possible ??)**
- Still required an “intelligence” to trim safety both the air and the gas in coherence with the input signal coming out from the “double liability” system (COSTS!)

Examples – to be clarified!!

- Thermoprocessing equipment are optimized with reference to process requirements and energy aspects.
  - Example 1: furnace atmosphere parameters defined for processing reasons (ceramics industry, metals industry, controlled atmosphere generation, pyrolisis ….)
  - Example 2: energy consumption is defined in a contract (measured in terms of the gas volume flow rate and constant caloric value)
  - Example 3: maximum energy consumption is laid down in European legislation (ErP Directive for industrial furnaces)
  - Example 4: in the case of plants requiring official permits, the exhaust gas composition must be in accordance with national and European legislation (IED, MCP, BREFS, and national rules e.g Germany: TA – Luft, BIschV, …..)

Which GasQuality fluctuation is automaticly ajusted by your furnace control equipment?



Answers from manufactures of thermo processing equipment and industrial burners

Questionnaire:
VDMA in April 2016