

# Influence of the oxygen probe location in the furnace on the measured oxygen rate

EGOLF TC<sub>2</sub>

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# Reminder

- EGOLF TC2 N633 rev1 (Oct. 2011 – Helpdesk)

The UK Chiltern Lab reports furnace gassing phenomenon :

« During some fire resistance tests on largely non-combustible specimens, a flame is observed escaping from around points of leakage of the specimen for more than 10 seconds. Such flaming may be caused by unburned furnace gasses flaming on the unexposed face as a result of the higher oxygen content outside the furnace. This would therefore be regarded as an integrity failure. »



# Reminder

- EGOLF TC2 N657 (Mar. 2012 – After Braunschweig meeting)
  - EN1363-1 (5.3 Furnace atmosphere)
    - « The fuel/air ratio to the burners and the introduction of any secondary air shall be set to give a minimum oxygen content of furnace atmosphere of 4% when testing specimens with no combustible content. »
  - What causes that flames to occur can not change the time of failure
  - The problem of unburned gassing can occur if the oxygen content in the furnace is too low
  - It can be very difficult to determine what is feeding the flames because even non combustible elements can contain combustible material known or unknown to the test lab and to the manufacturer



# Reminder

- EGOLF TC2 N663 (Apr. 2012 – After Espoo meeting)
  - More data is required to demonstrate that there is a problem
  - During the round robin on partition wall (2009), the same non combustible test specimen was tested in 32 different labs. Measures of oxygen were collected in 32 different furnaces.
  - A template (N661) was sent to these labs to collect data about their furnace
  - The aim is to evaluate the influence of the oxygen probe location in the furnace on the measured oxygen rate



# Reminder

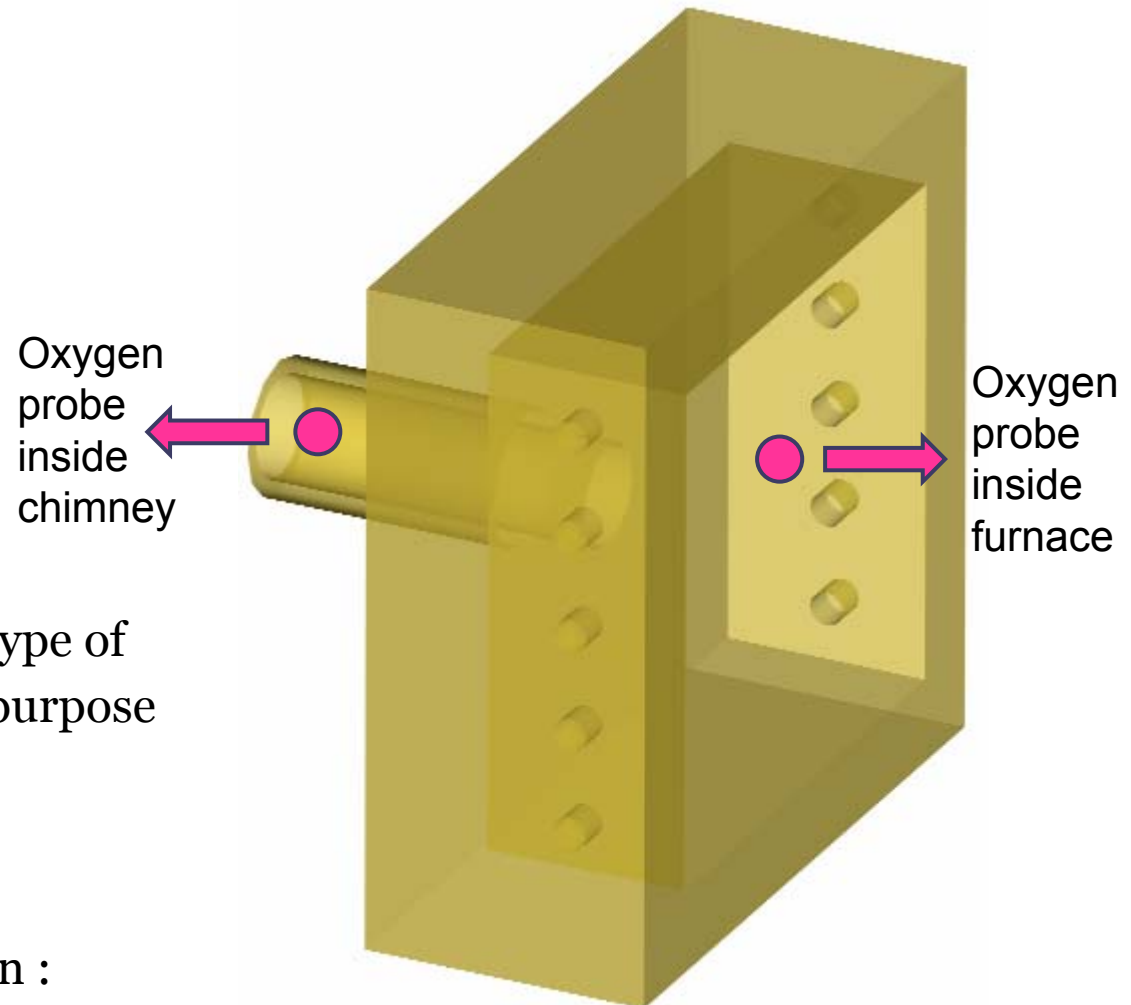
- ENV 1363-3

## 9.3 Oxygen content

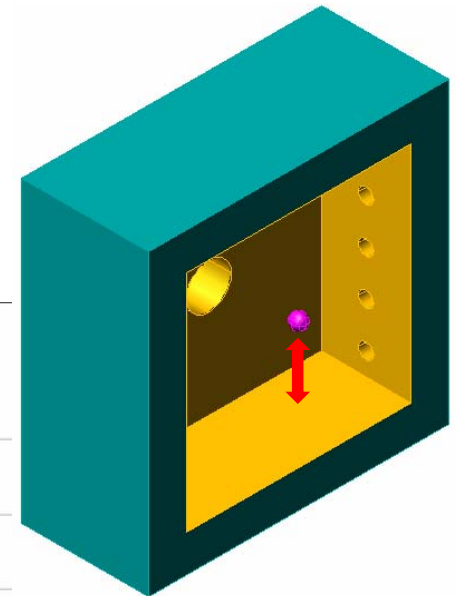
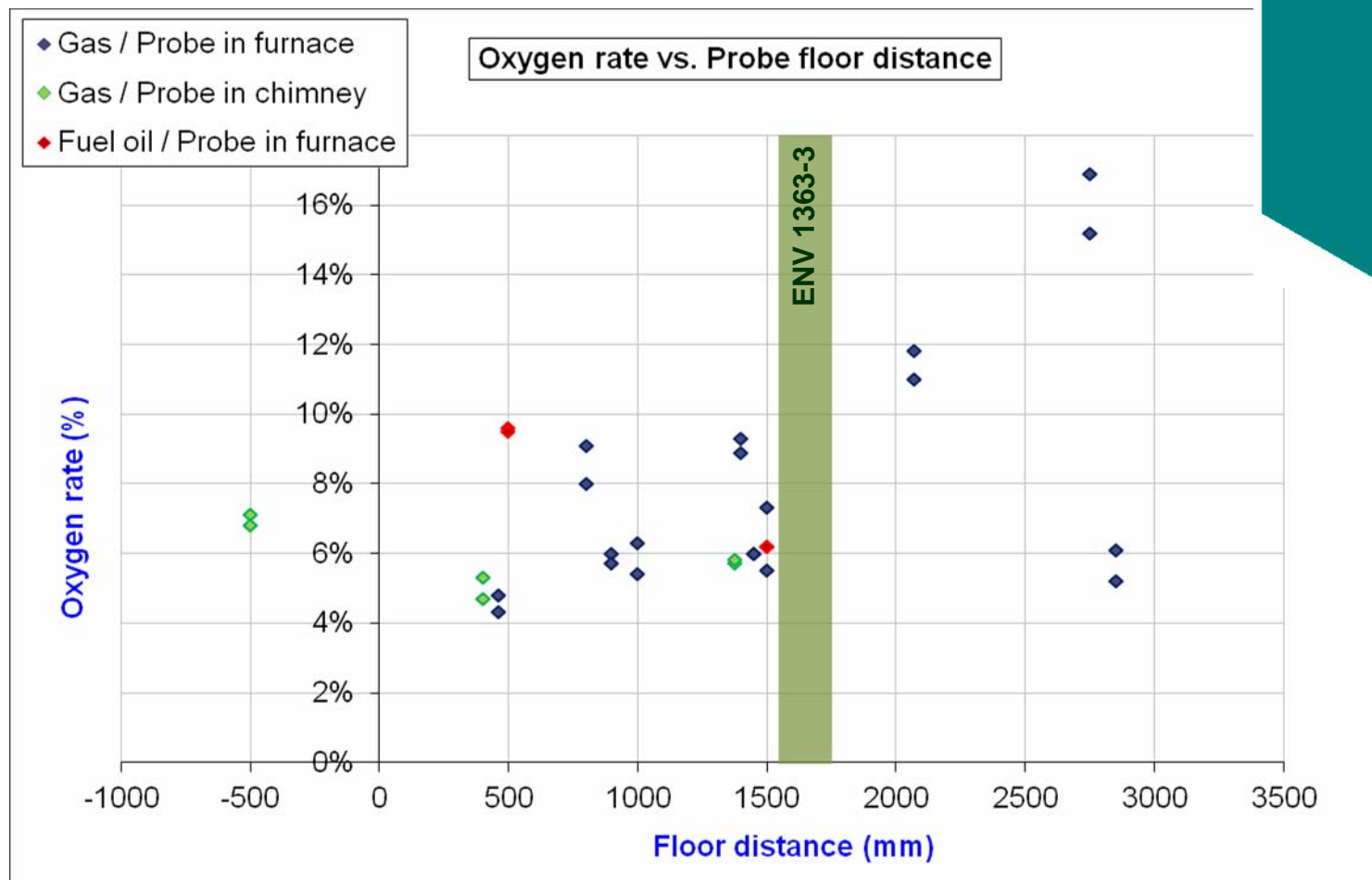
« The furnace shall be provided with a gas sampling probe inserted at a location where the gas composition is representative for the furnace environment. For vertical furnaces the probe shall be located at midheight ( $100\pm 50$ ) mm from the exposed face of the test construction. For all furnaces, taking measurements directly within the combustion zone of the burners, near secondary air inlets, adjacent to the measuring elements or close to the flue outlet shall be avoided. »

# Inquiry N661

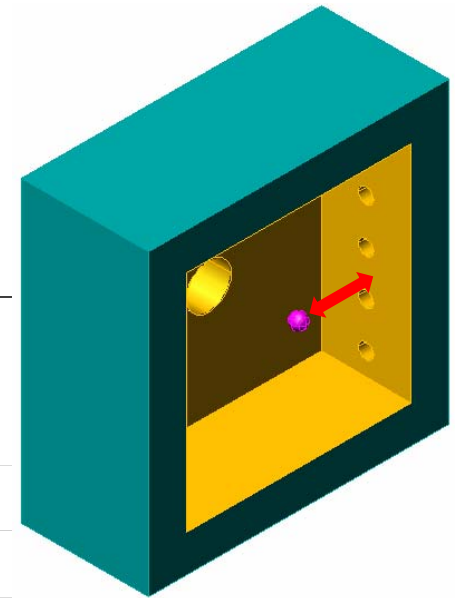
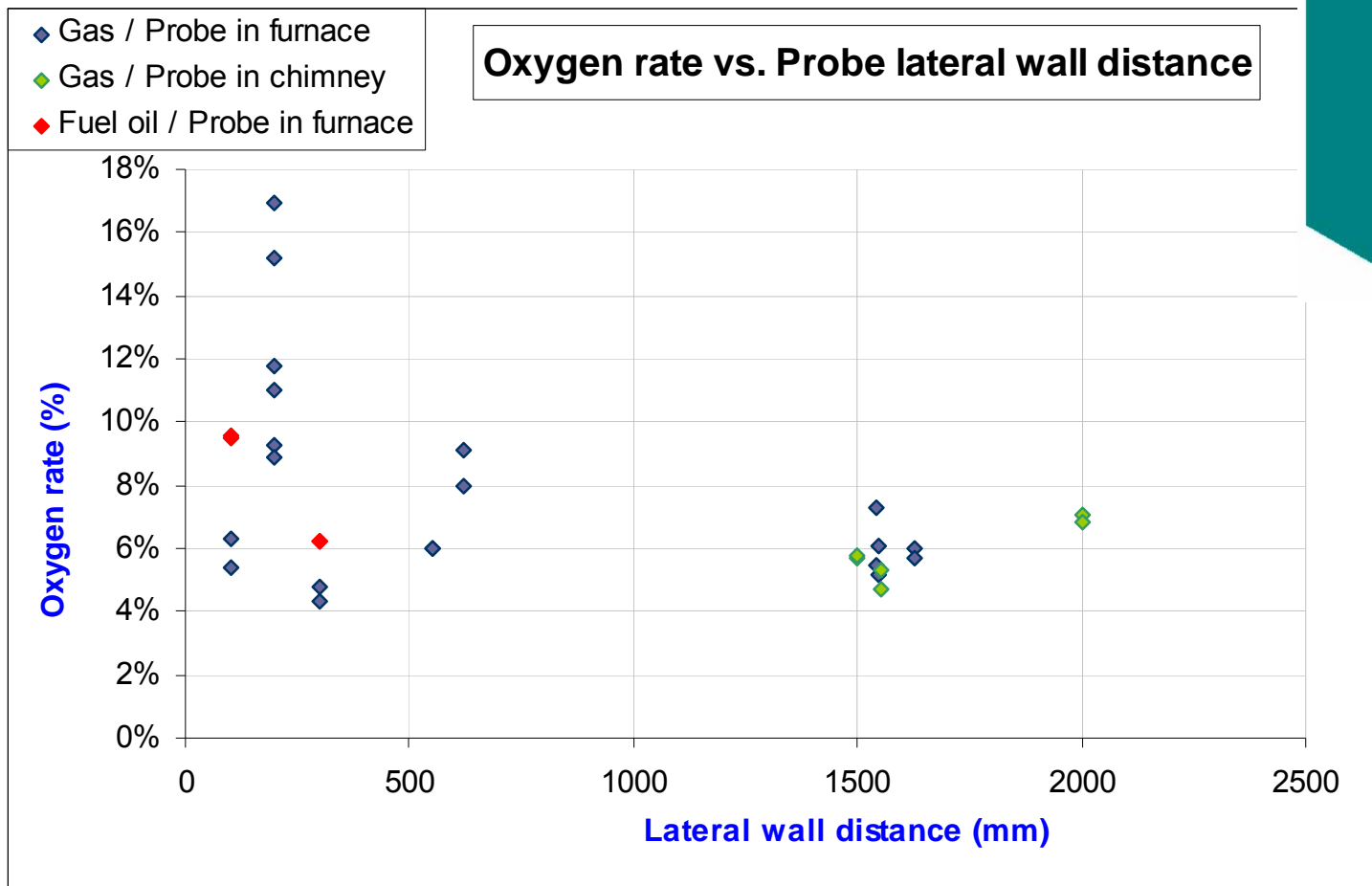
- 15 answers
- Burner combustible type of furnace used for the purpose of the round robin :
  - 13 gas
  - 2 fuel
- Oxygen probe location :
  - 12 inside furnace
  - 3 inside chimney



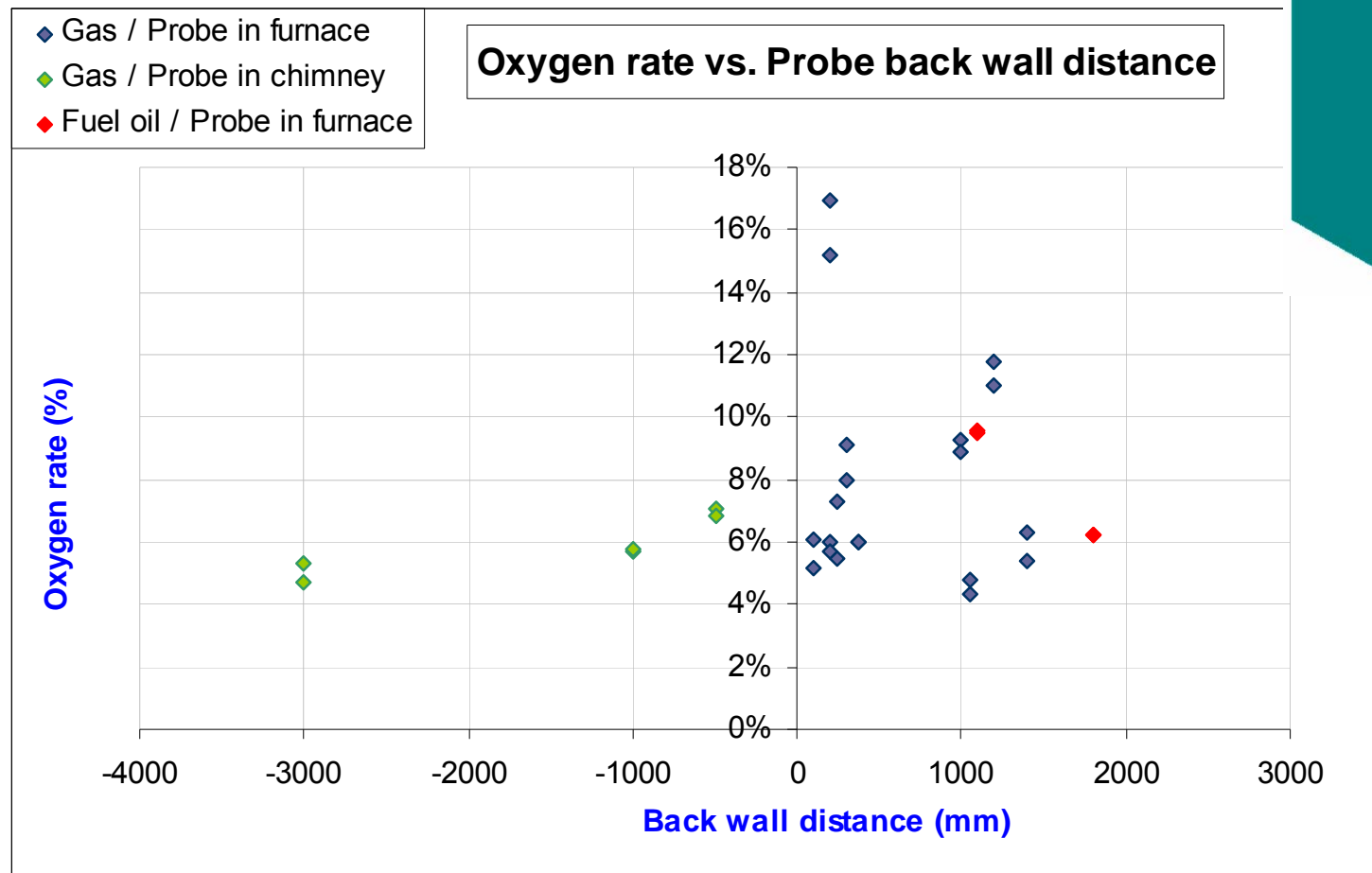
# Influence of oxygen probe location



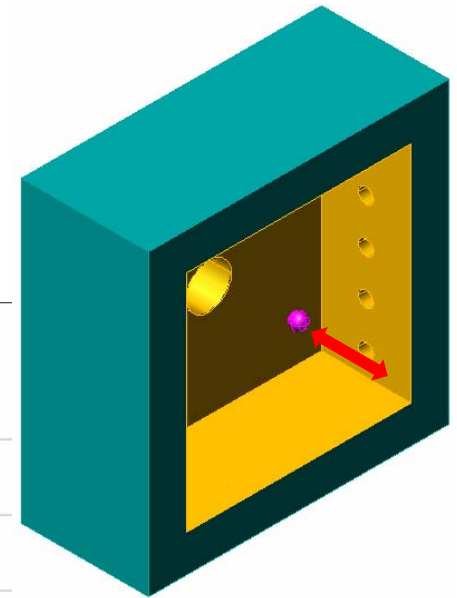
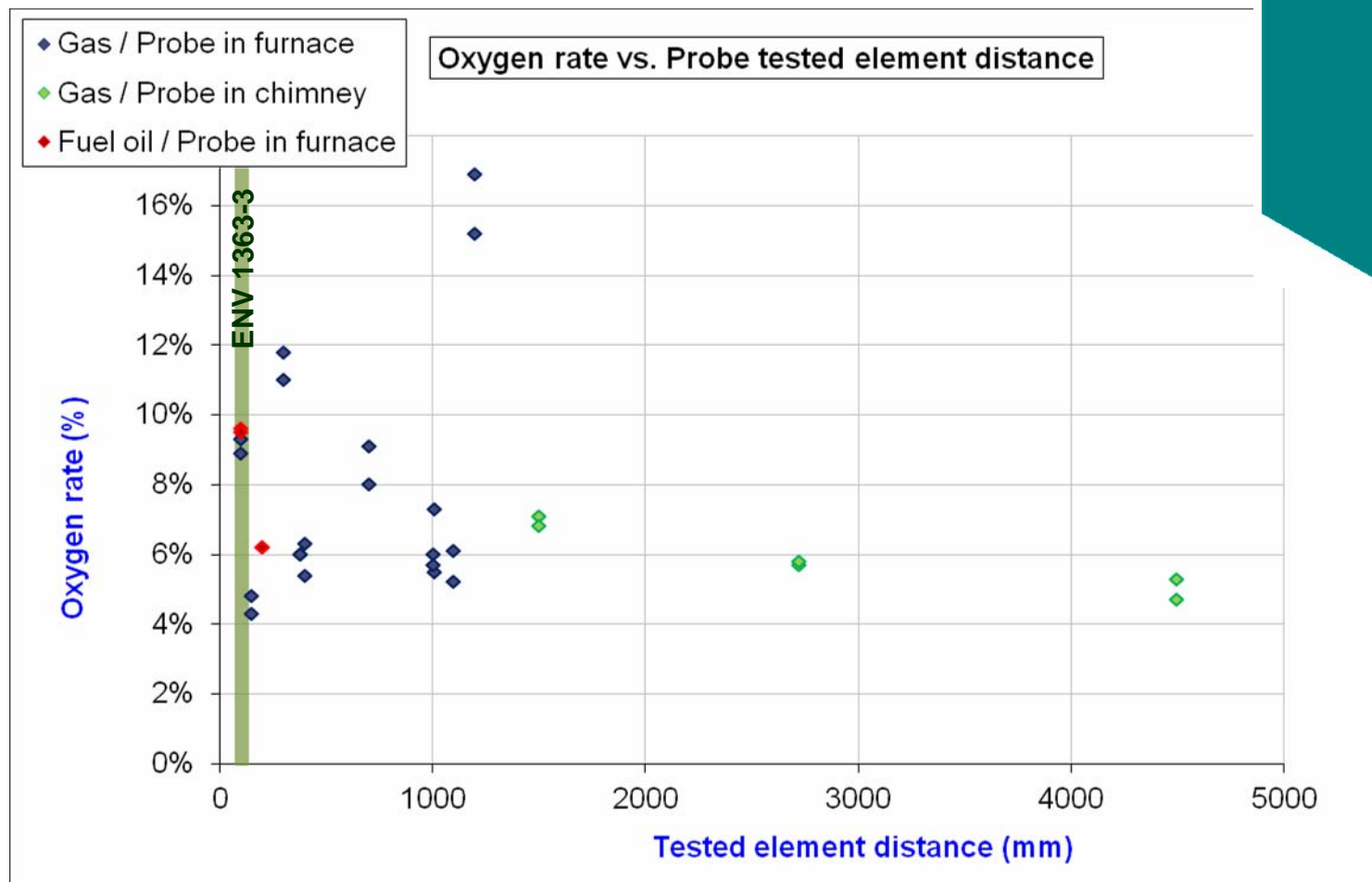
# Influence of oxygen probe location



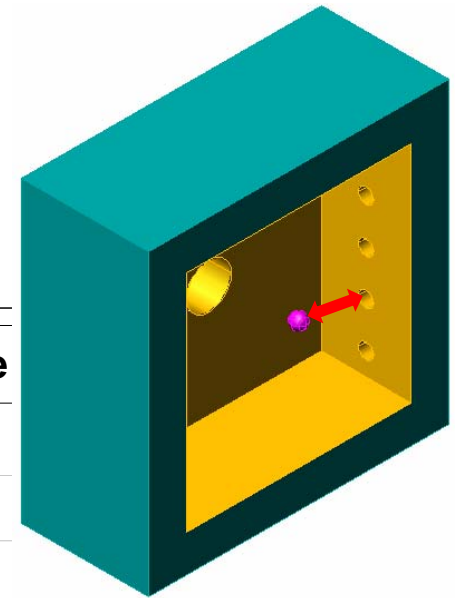
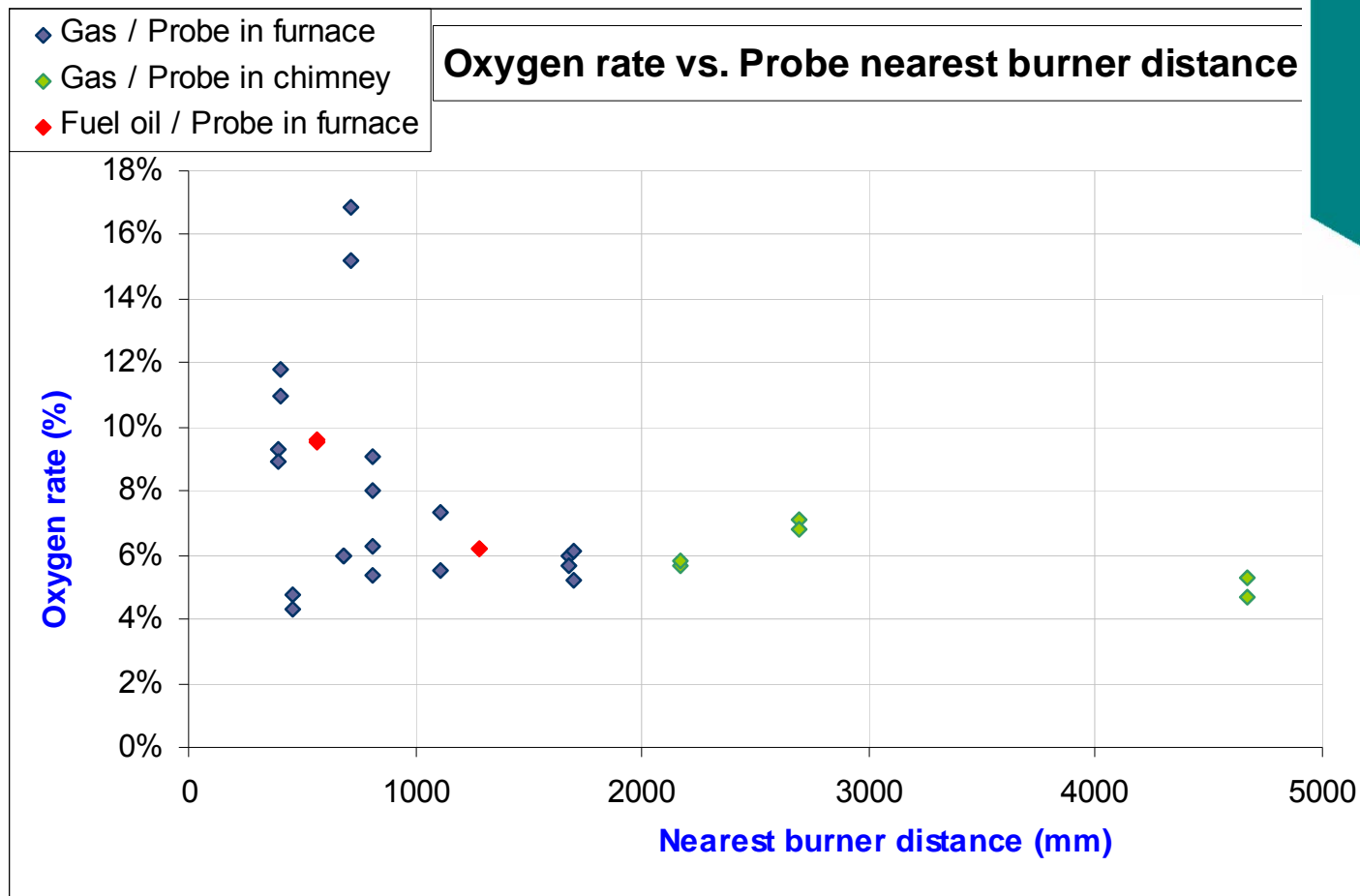




# Influence of oxygen probe location



# Influence of oxygen probe location



# Conclusions

- Probe position proposed in ENV 1363-3 is largely not adopted
- Present situation : the great variability of oxygen probe location from one lab to another involves a great variability in oxygen measured values  
→ These values don't represent the same reality and cannot be compared
- To avoid variability in measurements between labs, the recommendation could be to locate the oxygen probe :
  - at least at 1 m of burners
  - in the lower half of the furnace

→ Where do we want to measure oxygen ?

→ Why do we want to measure it ?

