Extreme fire scenario at the lab scale

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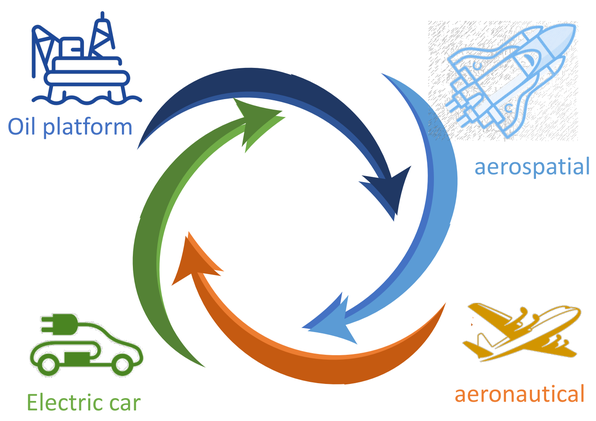
Extreme fire scenario



Context

Regulation & certification

ISO 22899-1:2007
(jet fire test efectis®)

UL 2596
UL.com

Extreme fire scenario

Hydrogen fire

No standardization (yet)

Extremely hot temperature

Development of new products

Objectives

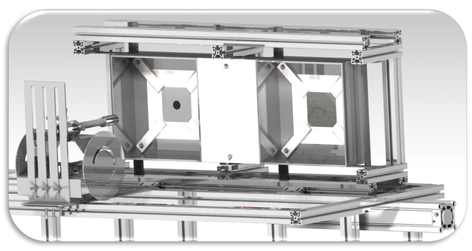
Development of small-scale test benches that can mimic a specific extreme fire scenario to help the development of new products

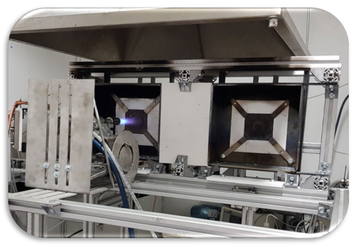
Outlook

New concept for innovative materials.

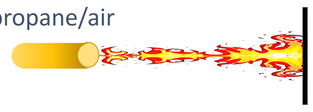
Bench scale test jet-fire
According to ISO 22899-1:2007

Bench scale test





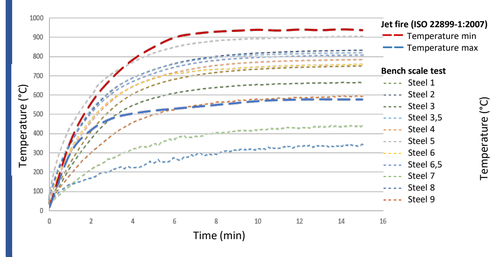
Mix propane/air



Heat flux : 150kw/m² to > 400kW/m²
Flame temperature around 1450°C

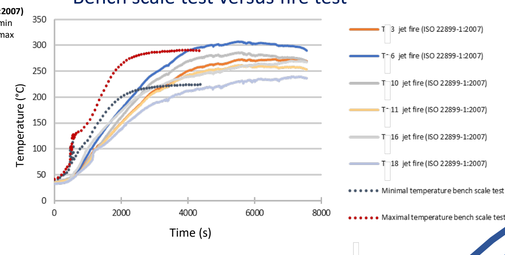
According to ISO 22899-1:2007

Fire scenario



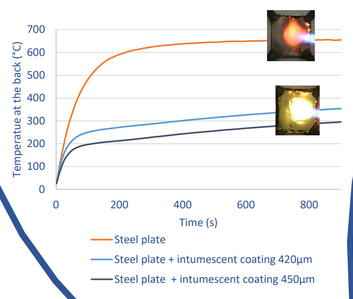
Results

Bench scale test versus fire test



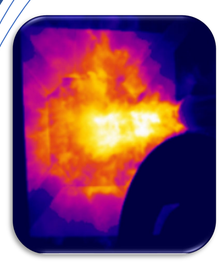
Outlook

Development of new concepts

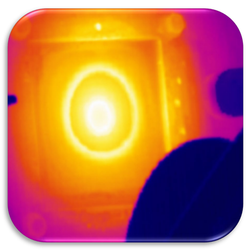


Instrumentation

Infrared camera

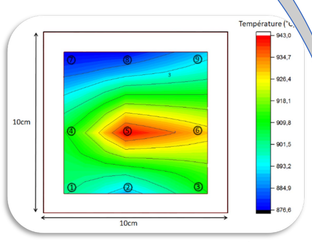


flame contour



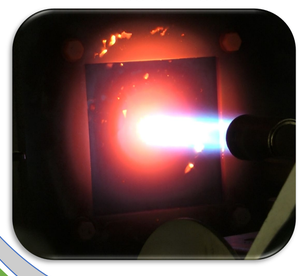
Through the flame

Thermocouples / pyrometer

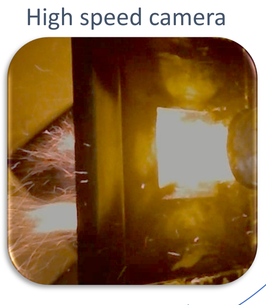


Temperature cartography

Video camera



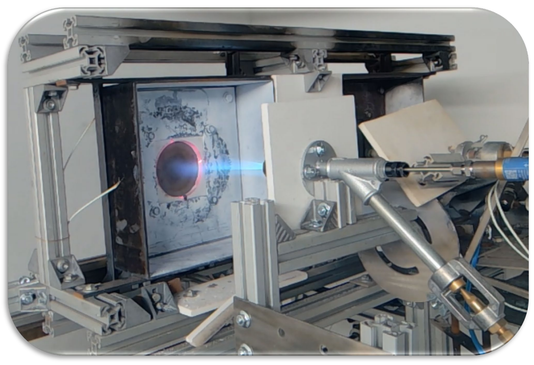
High speed camera



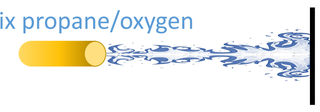
Comprehension

Bench scale test to extreme fire scenario with oxy-combustion
no standardization (yet)

Bench scale test



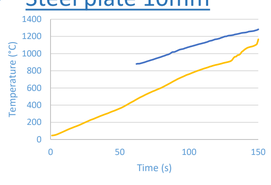
Mix propane/oxygen



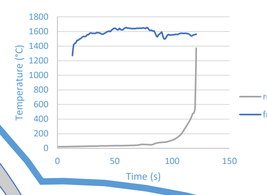
Heat flux > 500kW/m²
Flame temperature > 1700°C

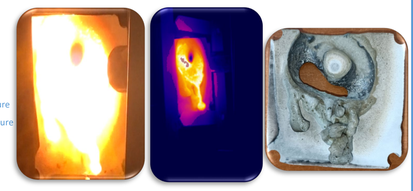
Fire scenario

Steel plate 10mm



Calcium silicate plate 20mm (D1000)

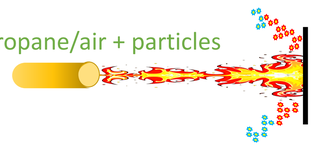




Bench scale test extreme fire scenario with particle
burner according UL 2596

Bench scale test

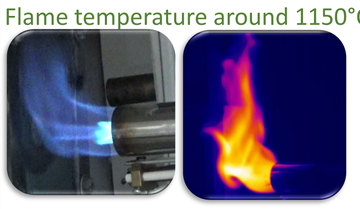
Mix propane/air + particles



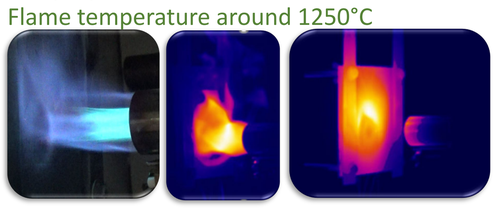
Heat flux : 100kw/m² to > 250kW/m²
Flame temperature around 1200°C

Fire scenario

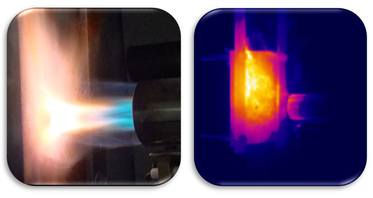
Propane flame
Flame temperature around 1150°C



Mix propane/air flame :
Flame temperature around 1250°C



Mix propane/air flame with particles :
Flame temperature around 1250°C



Development of new protocol of test

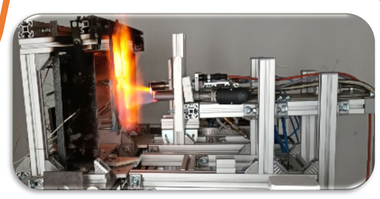
Nature and size of particles

Aluminum
Aluminium oxyde
Iron
Copper
...

size of particles
5µm to 210µm

Bench scale test extreme fire scenario with hydrogen
no standardization (yet)

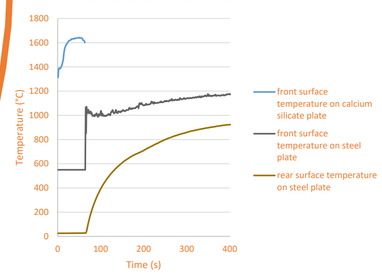
Bench scale test



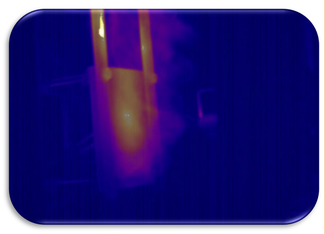
Hydrogen

Heat flux : 400kw/m² to > 500kW/m²
Flame temperature around 1700°C

Fire scenario



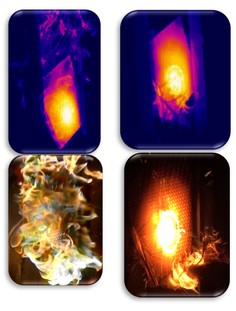
flame visualisation



flame contour

Results

Carbon epoxy composite



Intumescent coating