



MARINE SYSTEMS TECHNOLOGY

CNE 2024 **Providing advanced passive fire protection to platforms**

Including Live Demo

Dr Ralph Rizk, Managing Director
22nd May 2024 – Future Surface Fleet, Theatre B (11h45)

Introduction

Jered LLC & Marine Systems Technology Ltd, PaR Systems Companies

1946
Jered Equipment Company
Founded in Michigan as an engineering design company for vehicle drive systems



1961
Programmed And Remote Systems
PaR Systems was created as a spin-off of General Mills with focus on remote manipulators and nuclear fuel handling



2001
Marine Systems Technology Ltd founded
MST started as a family Engineering business, having developed a passive fire protection compound: COMFIRE®, answering the demand for a fire rated well-deck partition panels on the UK T45 Destroyers.



On Every US Navy Surface Combatant Class Ship Since World War II











Side view of door retrofit with COMFIRE®





Addressing the challenges (1/3)

Safety, Health, **Fire protection**, Sustainability, Weight, The Environment, ...

- New technologies:
Added equipment sensitivity and risks, notably **Fires** (e.g. Li Batteries ...)
- Health & Safety of the operators:
Materials **toxicity**, notably in enclosed/confined spaces (e.g. Submarines/Sub-sea applications)
- Environmental consideration:
Sustainability, waste, emissions, etc...



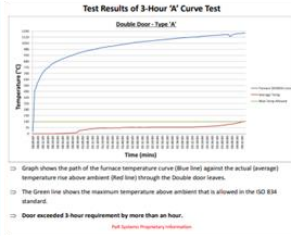
COMFIRE®

From bottle banks to Naval Platforms: a sustainable journey!...



COMFIRE®

From bottle banks to Naval Platforms: a sustainable journey!...



COMFIRE®: A Superior Fireproof Material

- ✓ Non-combustible
- ✓ No smoke or toxicity
- ✓ Non-carcinogenic
- ✓ Not affected by water (dimensionally stable)
- ✓ Excellent acoustic attenuation
- ✓ Excellent insulation properties

COMPLIES WITH THE FOLLOWING TEST REQUIREMENTS

- Oxygen Index: ISO 4589-2
- Temperature Index: ISO 4589-3
- Smoke Index: NES 711
- Toxicity Index: NES 713
- Non-Combustibility: BS 476 part 4
- ISO 1182-1990 (E): test for the determination of the combustibility performance –IMO Resolution
- MSC.61(67): Smoke & Toxicity Test

CHEMICAL OF CORE COMPOSITION:

Chemical	SiO ₂	Na ₂ O	Al ₂ O ₃	CaO	K ₂ O	MgO
Mass %	72	14	2	9	1	2

COMFIRE® density: 330-660 kg/m³
 Particleboard density: 650-700 Kg/m³.
 MDF density: 750-800 Kg/m³.
 Plaster/Cement based sheet products: > 1000 kg/m³

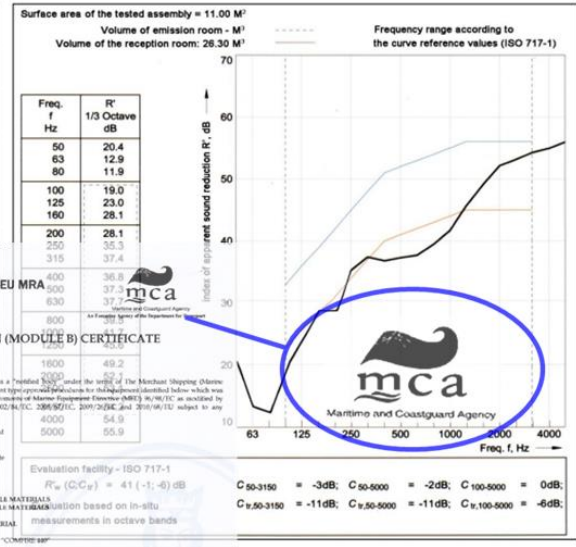
TEST	Number of specimens required	NES 705 Target Acceptance Data	COMFIRE Results
OXYGEN INDEX	20 test pieces	>30%	>80%
ISO 4589 - 2	150 x 10 x 4mm		
TEMP INDEX			Test suspended at 400°C – out of range of equipment
ISO 4589 - 3			
SMOKE INDEX	3 test pieces	<50	0.1
NES 711	75 x 75 x 4mm		
TOXICITY INDEX	30g	<5	1.56 / 100g
NES 713		no halogens	Negative
Non Combustibility Test (BS 476 part 4)			
	Furnace mean temp. rise	10°C	6.2°C
	Centre specimen mean temp. rise	10°C	8.0°C
ISO 1182 – 1990 (E)	Surface mean temp. rise	10°C	8.0°C
	Surface specimen temp. rise	10°C	8.0°C
IMO Resolution	Smoke suspension	10 steps	50%
MSC.61(67)	Smoke	50%	

Lloyd's Register
 Smoke and Toxicity Test Graph Display

USCG-EU MRA

EC TYPE EXAMINATION (MODULE B) CERTIFICATE

APPEARANCE: Grey/light grey board
 ODOR: None
 VAPOR PRESSURE: n/a
 VAPOR DENSITY: n/a
 DENSITY: 330-660 kg/m³



SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Evaporation Rate: not available
 pH (IN WATER): not available
 BOILING POINT: n/a
 FREEZING POINT: >1000°C
 VISCOSITY: n/a
 SOLUBILITY IN WATER: None

SECTION 10. STABILITY AND REACTIVITY

Stability: Stable
 Incompatibility: None
 Hazardous Decomposition: None

SECTION 11 AND 12. TOXICOLOGICAL AND ECOLOGICAL INFORMATION

Toxicity: Non-toxic
 Biodegradability: Does not decompose biologically

SECTION 14. TRANSPORT INFORMATION

ADR: Not Applicable
 CDG: Not Applicable
 IMDG Code: Not Applicable
 ICAO-TI: Not Applicable

SECTION 15. REGULATORY INFORMATION

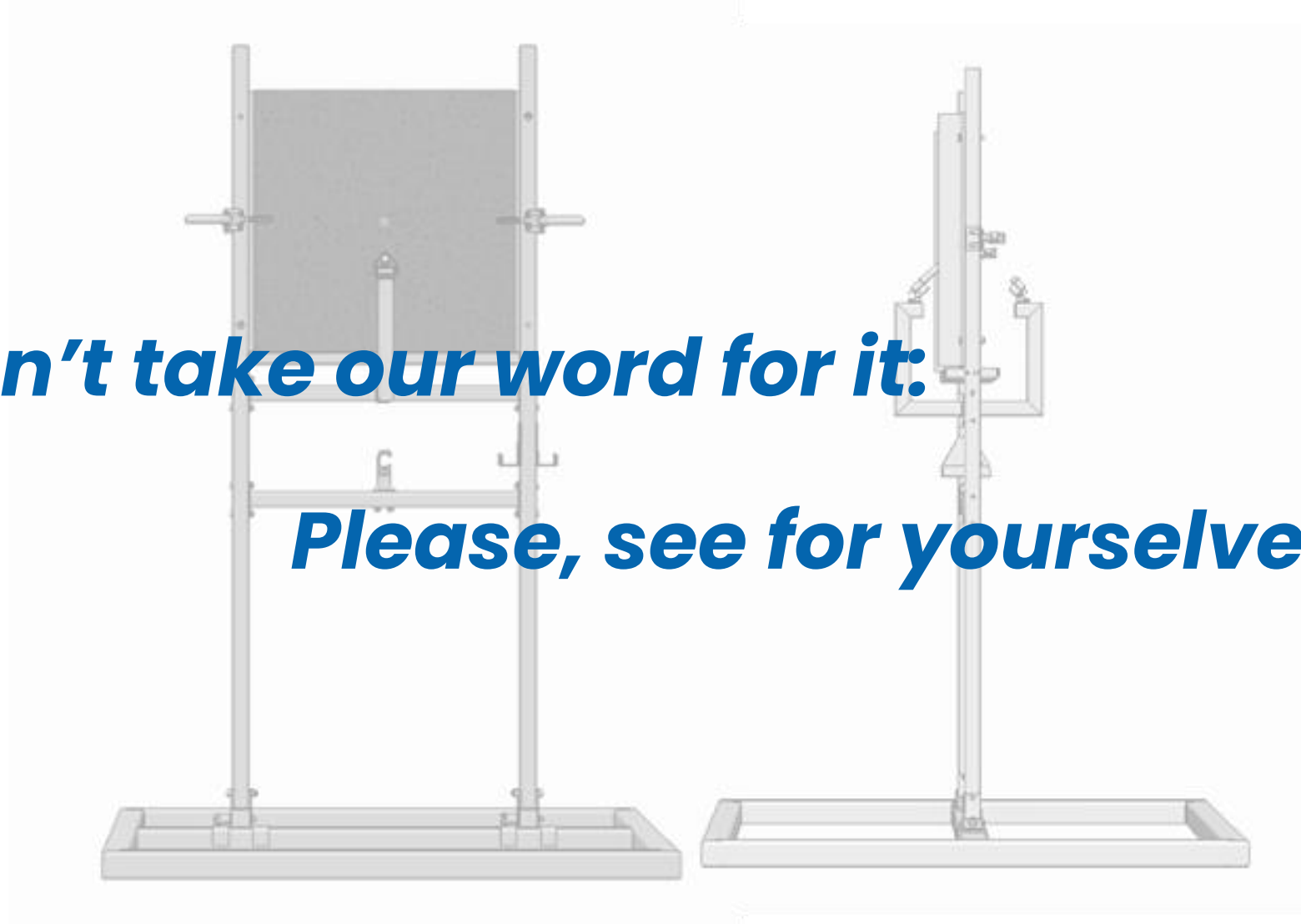
European Regulations: Not a dangerous material according to EC Reg 67/548/EWG and 1999/45/EG.



COMFIRE® Demo

Live Demonstration

***Don't take our word for it:
Please, see for yourselves..***



Past COMFIRE® applications

Passive protection: Naval Closures, Li Batteries Storage & Charging, Furniture, Partitions...

Installations

Type 45 Destroyers

B30 'style' Door Systems—
Sliding / Hinged
Stand Alone B30 'style' Bulkhead System
Door Frame Systems
Wet Area Paneling Total System
Integrated Fire Locker Systems
Acoustic Room Enclosures
Furniture



CVF Aircraft Carriers

Total Door Systems—
Water Tight / Quick Acting
Fire Boundary
Sliding, Zero Sill, Electric
A0 Non Water Tight Double Doors
Lithium-ion Battery Lockers
Furniture



Type 26 Frigates

Water Tight, Gas Tight and
Weather Tight Doors
including A0 and A60 Fire
Integrity
Double Doors with Level Access System
XL Water Tight Doors with Removable Sill
A60 Fire Integrity and Ballistic Protection
External W/T Passenger Access Door
Gas Tight and Water Tight Deck Hatches with A0
and A60 Fire Integrity
Escape Scuttles with A0 and A60 Fire Integrity



COMFIRE® Standards Achieved

•Non Combustibility Certification

- USCG - Solas
- Lloyds - DNV
- MCA

•Individual Certifications

- B15 - N30
- B30 - Def-Stan 07-247
- A60
- Royal Navy A1 Classification

Excerpt from UK Institute of Naval Medicine
to Ministry of Defense DPA re COMFIRE®
Material Suitability Verification . . .

*"3. Providing that Comfire is applied in
accordance with the manufacturer's
recommendations, INM has no objections on
grounds of health and safety to its
introduction into the Type 45 destroyer.
Indeed, its properties make it suitable for
use throughout the RN surface and
submarine fleets."*

Escape Scuttle Systems Underwater Watertight Hatches



Naval Flush & Raised Hatches Shock Qualified — In conjunction with Mafo Naval Closures BV



Li-Ion Battery Charging & Storage System



Queen Elizabeth Class Aircraft Carrier
Flying Control Room Desks utilizing COMFIRE®



MST COMFIRE®

Lightweight, Fire-Proof Composite Material for Marine Environments

- B30 Door Systems
- Stand alone B30 Bulkhead system
- Door Frame Systems
- Wet Area paneling system
- Integrated Fire Locker Systems
- Acoustic Room Systems
- Water Tight, Quick Acting
- Fire Boundary
- Sliding, Zero Sill, Electric

Our proprietary technology delivers
unique improvements in marine safety

COMFIRE® - Designed to be as versatile as possible and
suitable for a host of applications whether fit-out,
retro-fit or stand-alone.



MST A60 Double Door System—In conjunction with Mafo Naval Closures BV.



Deck insert plate incorporated for level
access all applications.

Blast Door System Available With or Without Fire Protection and Ballistic Protection



Watertight Gasket Watertight Door allows for radius
stress relieved bulkhead
corners Internal Passageway B15 w/kickout Acoustic Cabin Door



Addressing the challenges (2/3)

Safety, Health, Fire protection, Sustainability, **Weight**, The Environment, ...

- Environmental sustainability: waste, **carbon footprint**..

“...According to the [International Maritime Organization \(IMO\)](#), the shipping industry accounts for about **2.5% of global greenhouse gas emissions**...”

- **Weight**: impact of fuel consumption and emissions..

- 1 extra MT (weight) ~ adds up to 600kg* Fuel consumption p.a. (*: rough estimate.)
- Vessel CO2 emissions are calculated from the carbon content of the fuel consumed. Marine heavy fuel oil is circa 86% carbon, which implies about **3.15 tonnes of CO2 per tonne of fuel consumed**.

Illustration 1:

Fully Electric Aircraft Carriers' Elevators - Direct Electric Systems are now the preferred package for weight and space savings and environmental preservation over legacy hydraulic systems.

Elimination of high-pressure hydraulics removes the hydraulic engine and foundation systems, storage tanks and interconnecting piping providing an approx. **30% weight reduction**...

Tanker Ship Type	Ship Size	Fuel Consumption per Day (metric tons)
Product tanker / General Purpose tanker	10,000 - 24,999 DWT	5-30 mt/day
Medium Range tanker / Panamax	25,000-44,999 DWT	25-40 mt/day
LR1 (Long Range 1) / Aframax	45,000-79,999 DWT	30-50 mt/day
LR2 (Long Range 2) / Suezmax	80,000-159,999 DWT	45-60 mt/day
VLCC (Very Large Crude Carrier)	160,000-319,999 DWT	60-100 mt/day
ULCC (Ultra Large Crude Carrier)	320,000-549,999 DWT	100-150 mt/day

Table of oil tanker fuel consumption estimates. Actual daily rates vary depending on the type of engine, speed, and laden condition.

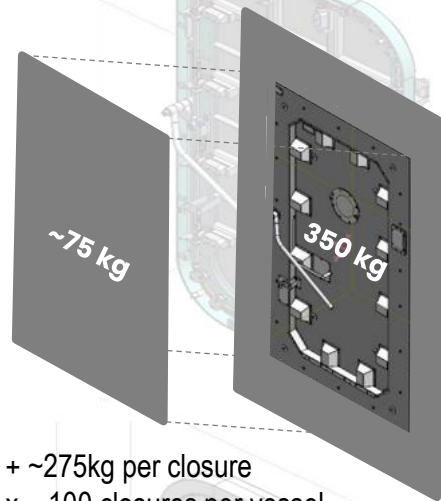


The Jered electric systems are now the standard on the latest US NAVY carriers

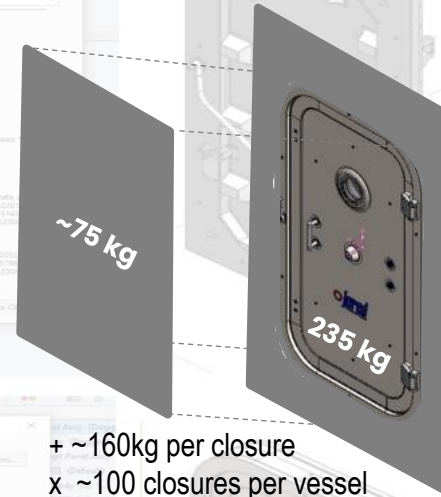
Addressing the challenges (3/3)

Safety, Health, **Fire protection**, Sustainability, **Weight**, The Environment, ...

Illustration 2: Lightweight Naval Closures incorporating COMFIRE®
Combining **non-toxic, non-carcinogenic passive fire protection** into **lightweight** solutions.



+ ~275kg per closure
x ~100 closures per vessel
= **+27.5 tonnes**

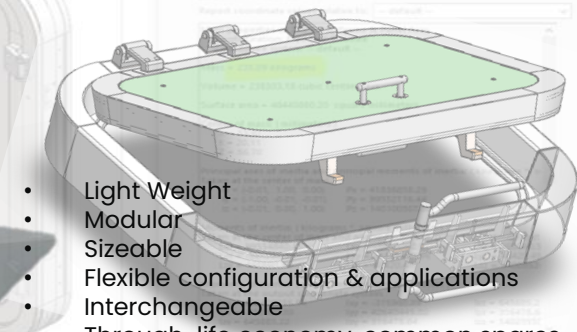


+ ~160kg per closure
x ~100 closures per vessel
= **+16 tonnes**

Relative weight saving:
Circa 11/12 tonnes
(~40%)

Hunter Class Frigates (Australia)

Working with BAESMA on an anticipated first application of the newly developed modular Lightweight Closures.



- Light Weight
- Modular
- Sizeable
- Flexible configuration & applications
- Interchangeable
- Through-life economy, common spares...

Mass comparison excl. Comfire (Supplier = 219.5 kg vs Jered/MST = 150.5 kg, yielding saving of 69 kg or 31.4%)

Mass comparison incl. Comfire (Supplier = 346.5 kg vs Jered/MST = 235 kg, yielding saving of 111.5 kg or 32.2%)



COMFIRE[®] Demo

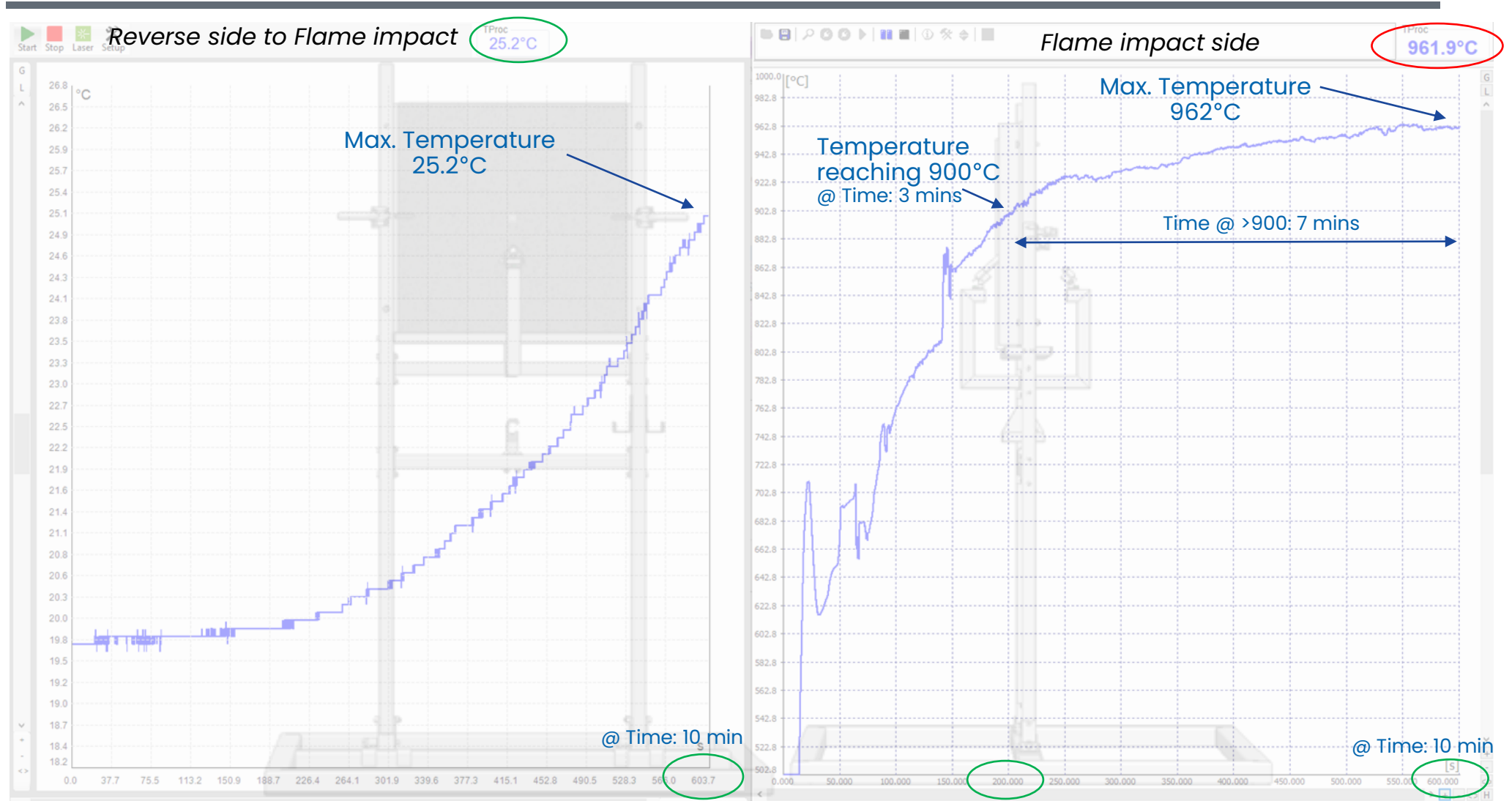
Live Demonstration



Let's see how the test is doing?...

COMFIRE® Demo

Live Demonstration: result after a 10 minute exposure to a direct flame of COMFIRE® C49 test piece



Summary & Closing Notes

Recap:

- **Versatile solutions:**
Retro-fit or Bespoke
- **Modular Lightweight solutions:**
Interchangeable, reducing NRE, Config. Ctrl., Certs., Parts/Spares, through-life costs ...
- **Environmental Considerations:**
Sustainability, low impact, recyclable, non-toxic, contribute to low emissions,...



So, where can we take it from here?...

(Please feel free to drop by Stand D16)

Thank you! and Q&A?

