Development of a self-extinguishing epoxy infused sandwich

E-Lass, 09-11-2016

Over me

- Thomas Thon
- 18 years with Rhebergen Composites (Amsterdam)
- Mainly lightweight sandwich components for Megayachts

Over me

- Since 2014 working as a consultant
- Supporting composite companies and shipyards

Start

- 2014

Objective

- To develop a sandwich panel to comply with IMO FTP code
- To fulfill the cosmetic demands of megayachts

Target

- Deck furniture/landscapes on Mega-yachts

Consortium

- Summer 2014
- Builder
- Epoxy supplier
- Paint manufacturer

Kick-Off

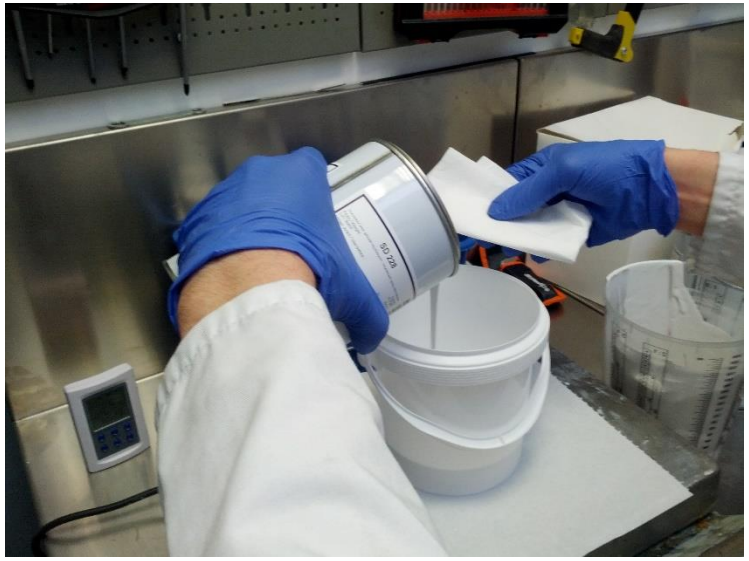
- Main components found:

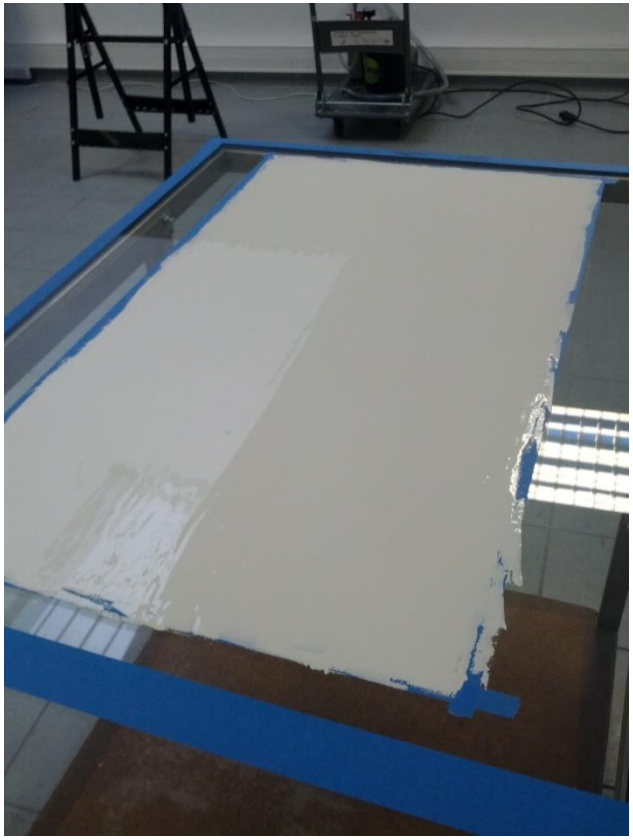
  Paint+Resin

- Cooperation agreed

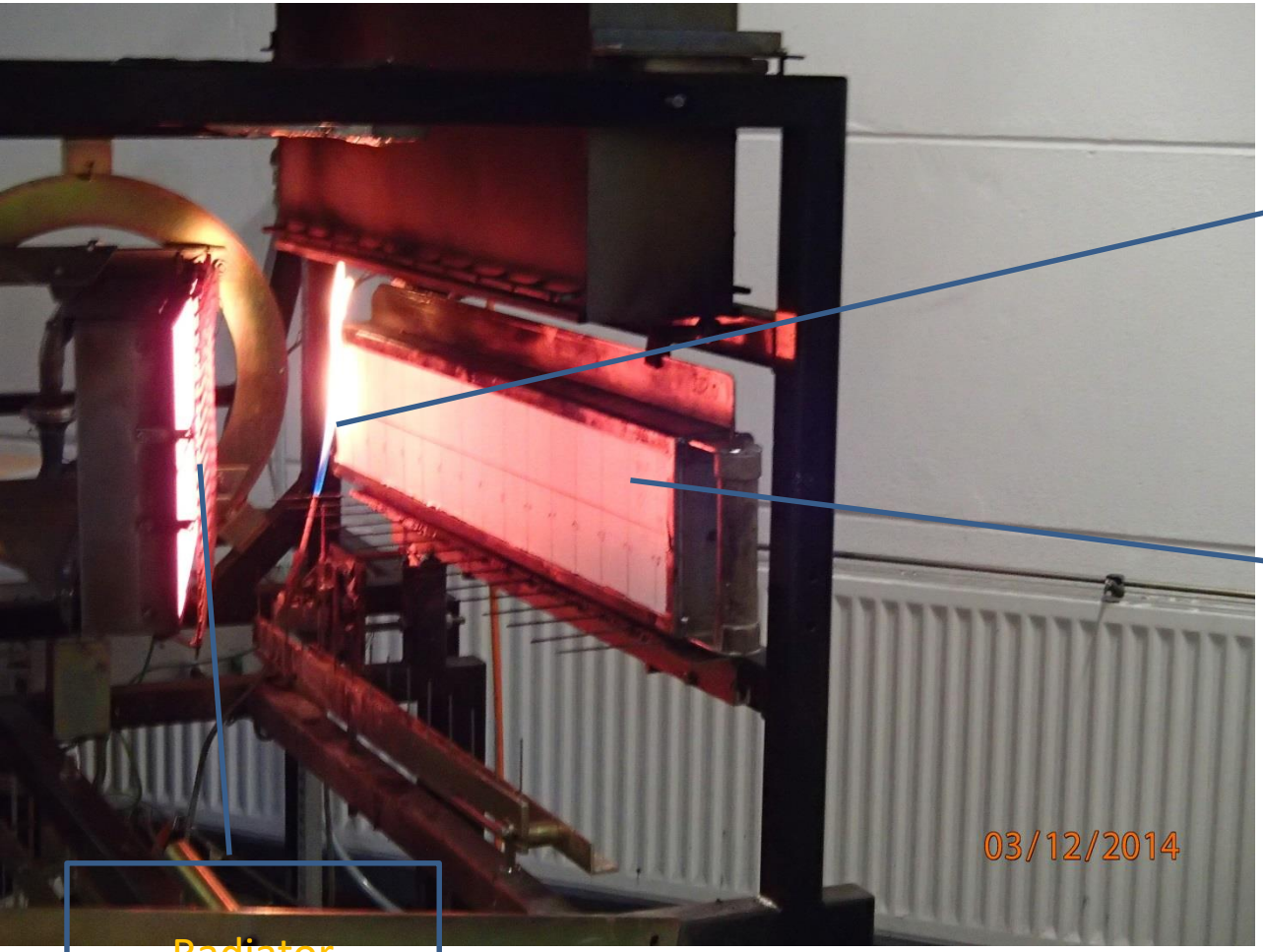
Panel

- Approx 3 mm solid glass
- Epoxy infusion





Test Set Up (part 5)



Pilot flame

Specimen 153 x 798 mm

Radiator

Measured:

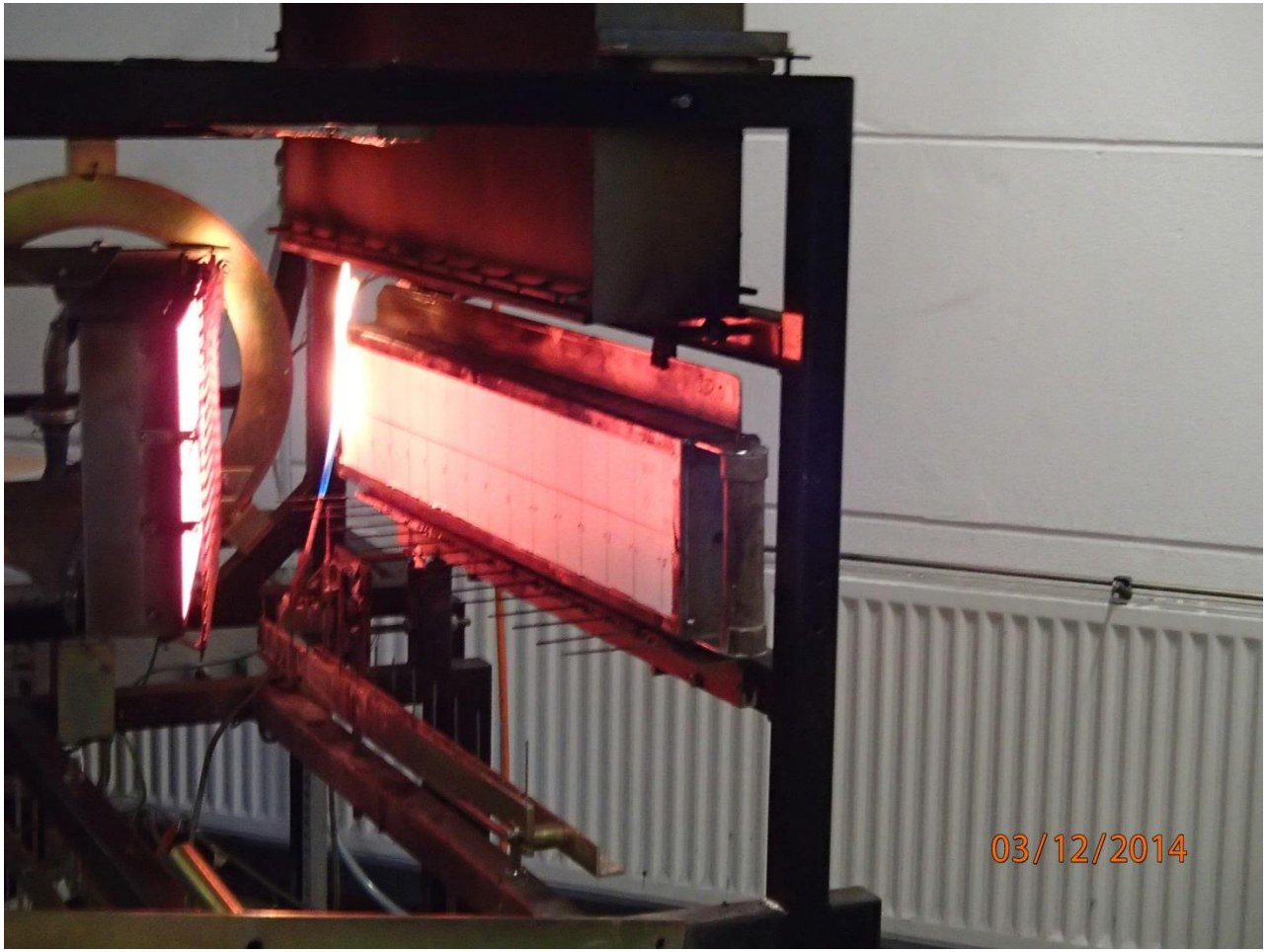
- CFE (Critical Flux at extinguishment), kw/m2
- QSB (Average heat for sustained burning),MJ/m2
- Peak Heat Release, KW
- Total Heat Release, MJ

Measured:

- Green: Pass
- Red: Fail
- Orange: In the limits but smoke and toxicity need to be passed additionally (part 2)

	CFE (kw/m2)		Qsb (MJ/m2)		Qp (KW)		Qt (MJ)	
	Measured	Limit	Measured	Limit	Measured	Limit	Measured	Limit
Example"	20,5	≥20,0	3	≥1,5	6	≤4,0	0,446	≤0,7
If either Qt is >0,2MJ or Qp is>1,0KW Part 2 needs to be fulfilled additionally								

Panel “M”



Panel “M”:

- Solid laminate, approx. 3 mm
- Infused with epoxy
- Outside layer Gelcoat, 1000g/m2

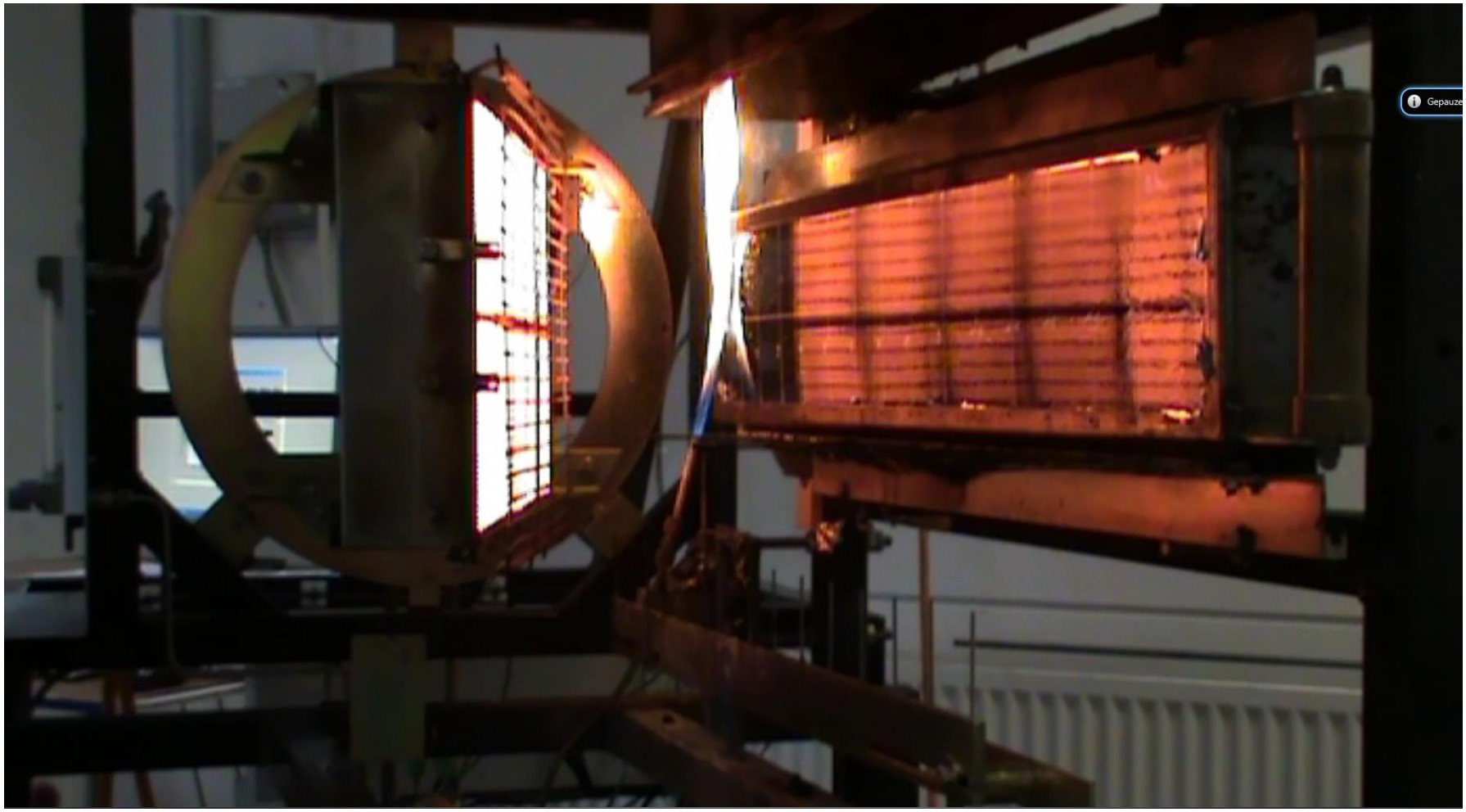
	CFE (kw/m2)		Qsb (MJ/m2)		Qp (KW)		Qt (MJ)	
	Measured	Limit	Measured	Limit	Measured	Limit	Measured	Limit
M	26,4	≥20,0	2,7	≥1,5	0,7	≤4,0	0,18	≤0,7

Test the paint:

- Exterior paint:

  Primer, Topcoat and Clearcoat applied on steel sheet

Panel”STN”:



Panel “STN”:

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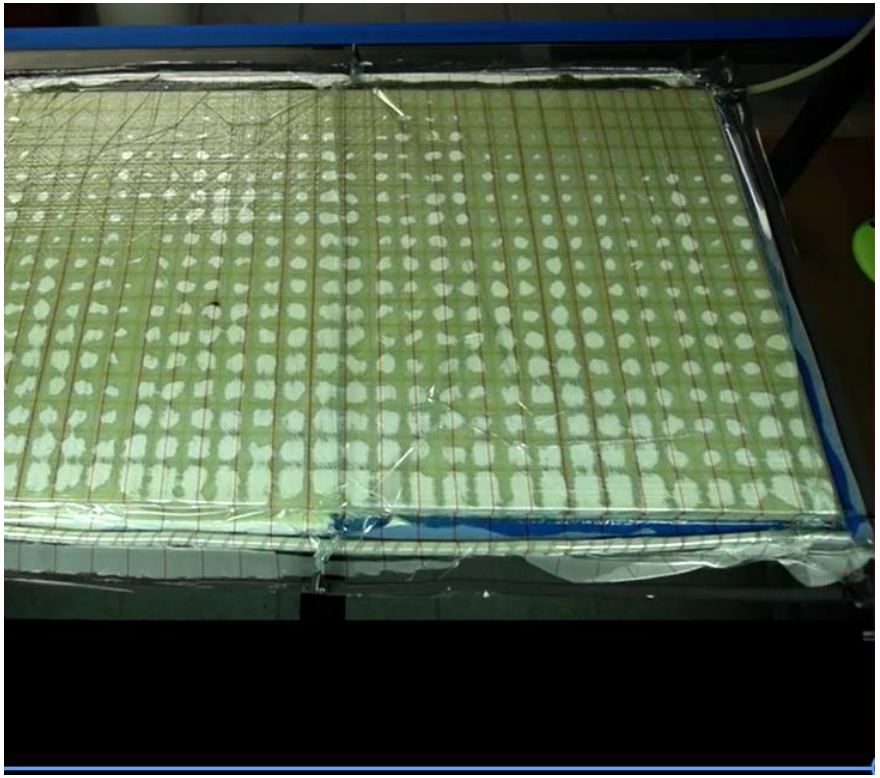
	CFE (kw/m2)		Qsb (MJ/m2)		Qp (KW)		Qt (MJ)	
	Measured	Limit	Measured	Limit	Measured	Limit	Measured	Limit
STN	42,1	≥20,0	2,226	≥1,5	0	≤4,0	0	≤0,7
If either Qt is >0,2MJ or Qp is>1,0KW Part 2 needs to be fulfilled additionally								


Optimism

Panel “S10”:

- Outside layer Gelcoat, 1000g/m2
- SR1125 on 20 mm foam
- Laminate 2 x BiAx 600g (glass), both sides



Panel “S10”

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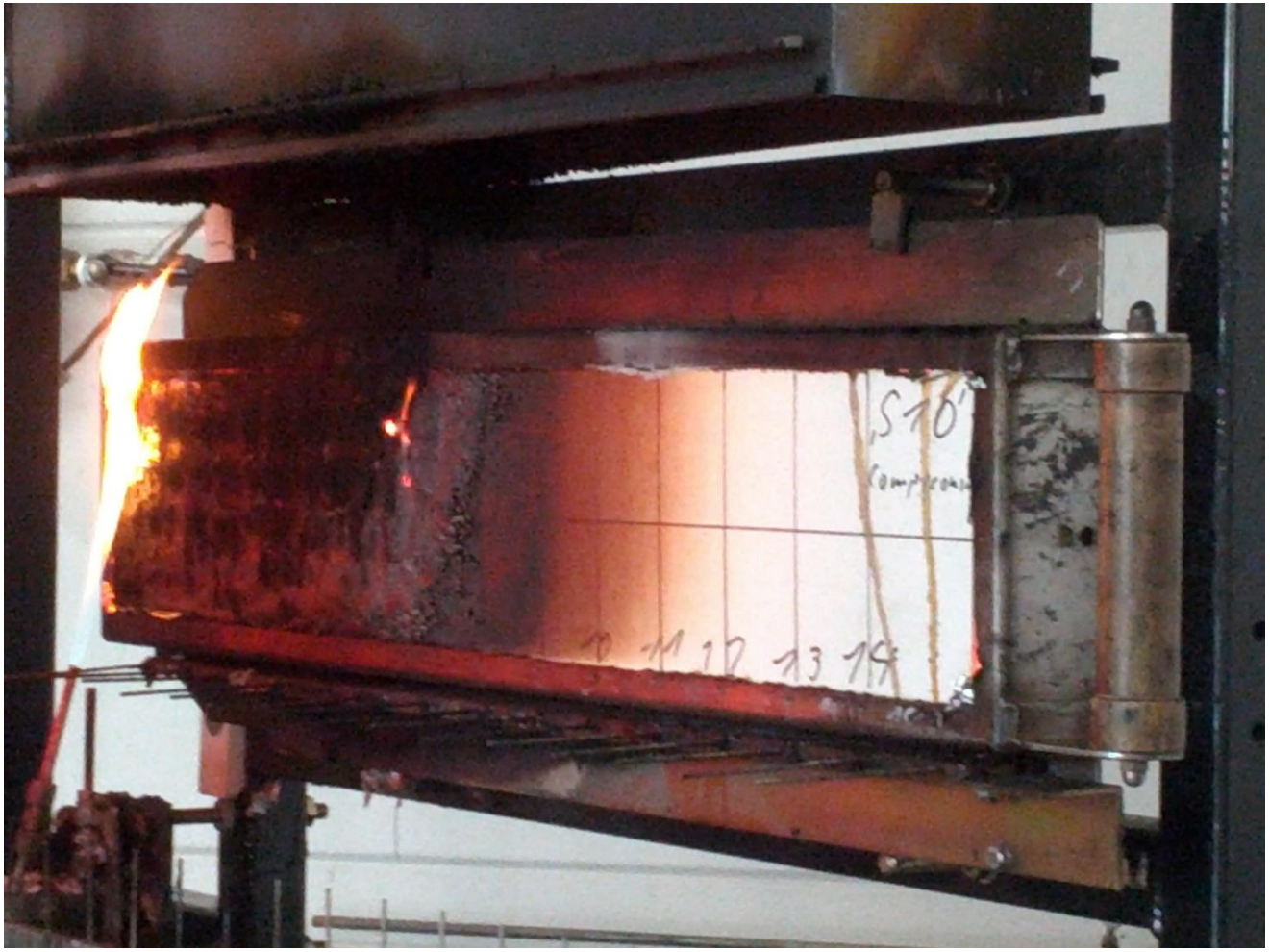
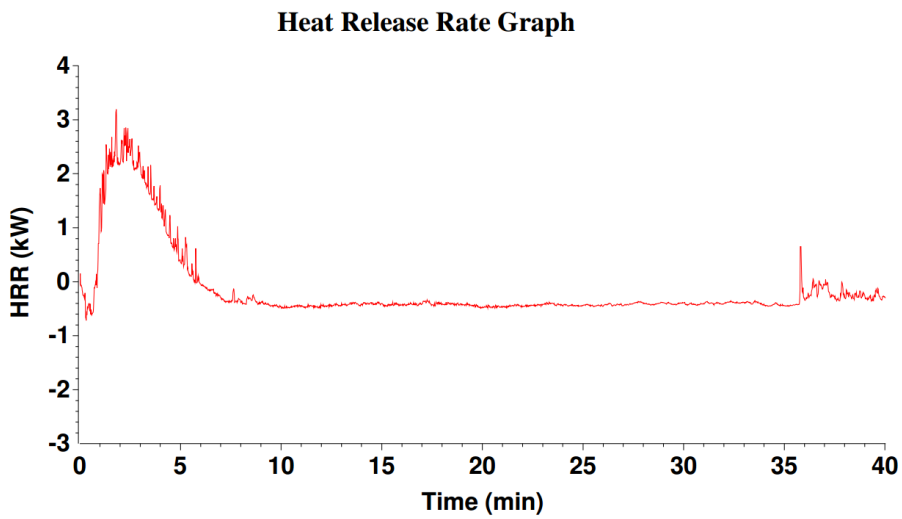


Panel “S10”

	CFE (kw/m2)		Qsb (MJ/m2)		Qp (KW)		Qt (MJ)	
	Measured	Limit	Measured	Limit	Measured	Limit	Measured	Limit
"S10"	22,6	≥20,0	2,97	≥1,5	3,19	≤4,0	0,446	≤0,7

If either Qt is >0,2MJ or Qp is>1,0KW Part 2 needs to be fullfilled additionally

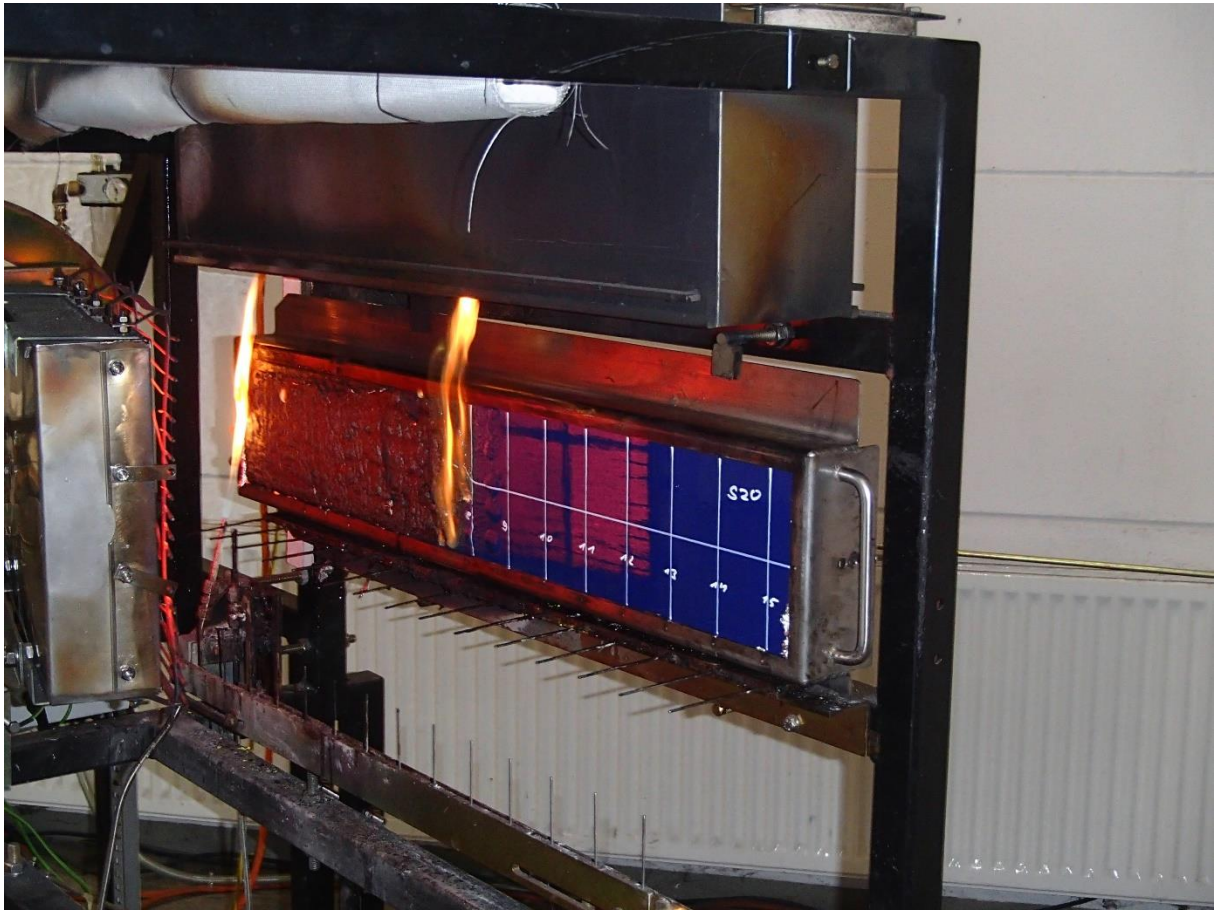


1+1=2

Panel “S20”:

- Based on results of “S10”and “STN” the next panel has been designed:
- Sandwich panel with paint

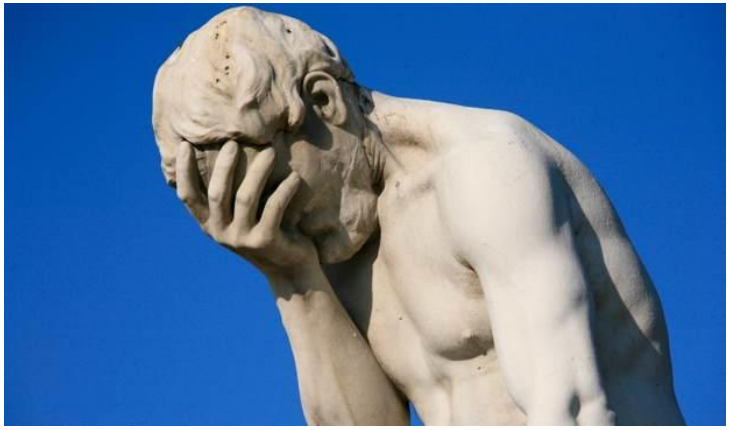
Panel “S20”



Panel “S20”

Panel “S20”

	CFE (kw/m2)		Qsb (MJ/m2)		Qp (KW)		Qt (MJ)	
	Measured	Limit	Measured	Limit	Measured	Limit	Measured	Limit
"S20"	6,78	≥20,0	0,854	≥1,5	2,52	≤4,0	0,288	≤0,7



Conclusion

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- Different mass…
- Different temperatures…
- Different composition….
- …different results

New mind-set:

More specimens

- With the same basic materials
- Variation in application and film thickness
- Some additives
- 8 iterations

Status

	CFE (kw/m2)		Qsb (MJ/m2)		Qp (KW)		Qt (MJ)	
	Measured	Limit	Measured	Limit	Measured	Limit	Measured	Limit
"S73"	20,38	≥20,0	0,883	≥1,5	0,82	≤4,0	0,088	≤0,7
If either Qt is >0,2MJ or Qp is>1,0KW Part 2 needs to be fulfilled additionally								

Caused by remaining solvents?
More patience required!

To be continued…..!!!

Questions/suggestions?

For questions/proposals/projects do not hesitate to contact:

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