

Report



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Report No : PeBa2017-02-16

Order:

Determination of the temperature resistance of PESTEC FPB
1100/60/300 fire protection blanket under simulated cable
installation condition in simulated hydrocarbon fire test

Date:

16.02.2017

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Total number of pages incl front page :

6

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1.1 Test scope, target, requirements and documents

Flame resistance test of PESTEC FPB 1100/60/300 fire protection blankets under simulated cable installation conditions including inner post-tensioning strand bundle and outer HDPE cover pipe.

Under direct flame impingement of 2 x propane-butane flames in a test oven leaning a 1100°C (2012°F) hydrocarbon fire curve. The direct flame area should include a joint of two blankets as the expected weakest area of the product system.

1.2 Target

Temperature protection of strand bundle representing a strand stay cable system. The temperature of the outer strands of the full strand bundle should remain below following values under 1100°C (+/- 5%) hydro carbon fire.

- < 200°C (+max 5%tolerance) of minimum 30 minutes
- < 250°C (+max 5%tolerance) of minimum 45 minutes
- < 300°C (+max 5%tolerance) of minimum 60 minutes

1.3 Requirements, documents, norms

Requirements by PESTEC – Holger Jung. No referable documents or norms.

System components:

15,7 mm post tensioning strands with HDPE coating

FPB 1100/60/300 blankets

Steel straps

HDPE cover pipe

1.4 Speciman set up

21 single number of PT- strands size 15,7 mm in length of 1200mm supplied from PESTEC have been fixed in circular shape by using a pipe support



Pic 1



Pic 2

1.5 Sensors

6 numbers of NiCr-Ni Sensors were fixed mid length on the strand surfaces of outer layer, mid layer and center layer (see picture) and lead through the bundle ends. The sensors off the strand bundle were located in full direction of the flame (No 3).



Pic 3

1.6 Fire protection Blanket

Pestec supplied the multi-layer fabric blankets in wall thickness of approx 15 mm including fixed velcros for connection of two blankets.

1.7 Joint

Two blankets around the strand bundle were jointed in the middle of the bundle length by overlapping using the velcros. Additional metal straps (part of the system) were fixed in distance of approx 150 mm around the blankets



Pic 4

The whole bundle package was placed inside a HDPE pipe PE 100 size 200 x 6,2 mm of same length 1200 mm.

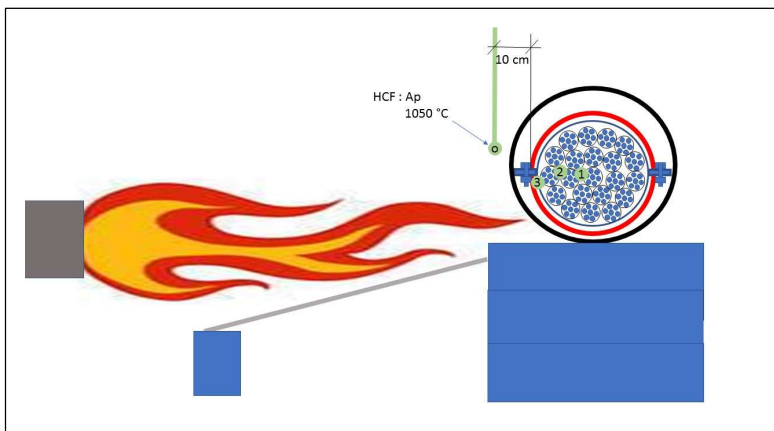
The full specimen was placed in the oven by placing the longitudinal velcro fixing to the rear side of the flame, representing the PESTEC proposed 12 o'clock installation location (opposite an expected fire from the bridge deck) in a cable application.



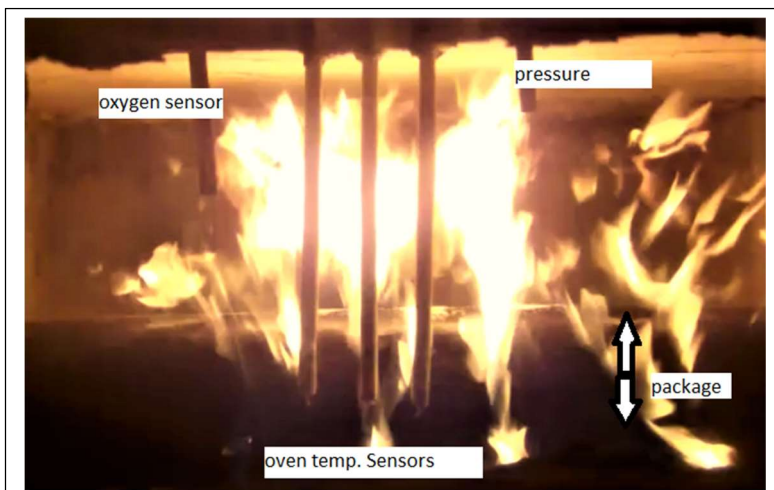
Pic 5

The gas torches were placed so the flame blue cap (hottest part of the flame) get in direct contact to the HDPE pipe (see sketch). To simulate a worst case scenario and to avoid possible gas turbulences which may happen in an oven, the two flames were additionally directed to the bundle by using a steel sheet (see picture)

The 3 flame temperature sensors (oven) were placed 10 cm in front of the area where the flame blue cap contacted the specimen (see sketch).



Pic 6



Pic 7

2 Flame impingement

Starting the flame impingement the measured temperature increased very slowly. The HDPE pipe material started to drop and the pipe was completely burned off after 8 minutes. After 14 minutes a section of the blanket top layer opened but did not cause significant temperature increase.

After 30 minutes the outer layer sensor reached 171,27°C

After 45 minutes the outer layer sensor reached 236,69°C

After 60 minutes the outer layer sensor reached 308,42°C

After approx. 95 minutes the bundle started to gas out by burning the inner gases on both ends.

After the center layer reaching 300°C after 100 minutes the test was stopped.

No further dismanteling of the fire protection blanket was observed. The steel straps kept in Place. The blanket system (without HDPE pipe) kept in form.

3 Conclusion

3.1 Temperature

The PESTEC FPB 1100/60/300 fire protection blanket resisted the 1100°C hydrocarbon fire by limiting the temperatures of the outer layer of the post tensioning strand bundle to the targets.

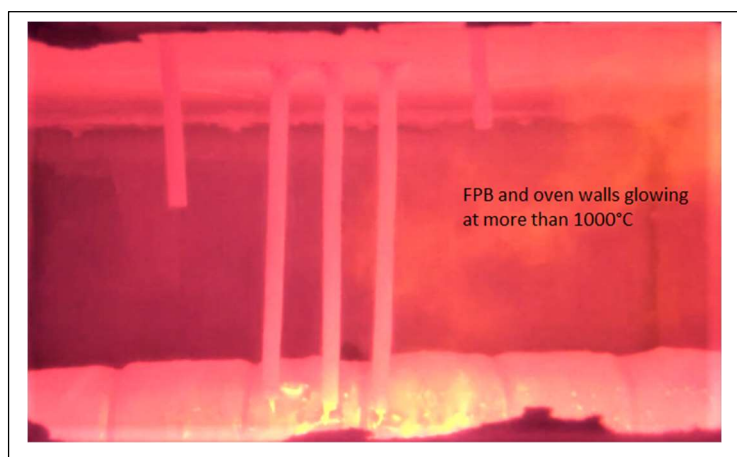
Targets of < 200°C within 30 minutes,

< 250°C within 45 minutes and

309°C (300°C +5%) within 60 minutes

3.2 Comment

Considering the optimized test set up in the closed oven by reaching all around the cable temperatures of 800-1000°C also in the non direct fire areas, the blanket while installed exposed on a bridge can be assumed to still reach even higher resistance in service condition.



Pic 8

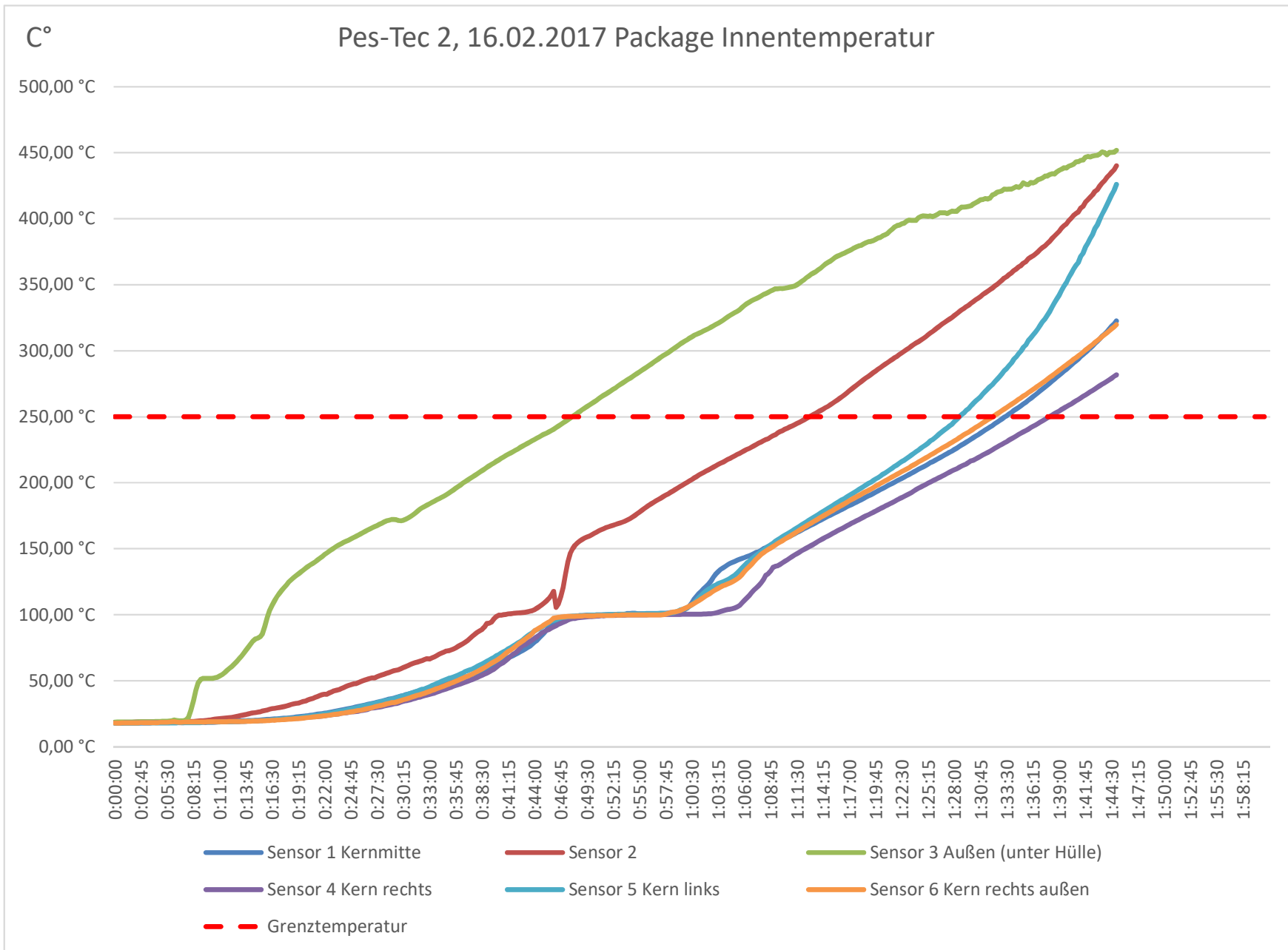
17.02.2017
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Pes-Tec Versuch 2, 16.02.2017
Flammtemperatur am Package-Sensor außen

