Low-Temperature Crack Resistance

Customer:

Oy Scantarp Ab
Lukkosalmentie 4
FI-70420 Kuopio

Research Contract:

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Target:

Three different coated fabrics:
- Vinyplan 6764 (Blue)
- Vinyplan 6571 (Yellow)
- Vinyplan 6581 (Orange)

Sample size: 203-mm (8-in.) square

Fig. 1. *Material samples under test, from left: Vinyplan 6764, Vinyplan 6571 and Vinyplan 6581.*

Testing Time:

The start of the test: 5th March, 2018
The end of the test: 7th March, 2018

Purpose of the Test:

To determine the resistance of coated fabrics to cracking when exposed to low temperature, and the subsequent ability to maintain hydrostatic resistance.

Test Method:

Low-Temperature Crack Resistance test based on ASTM D751 – 06 (2011)

Exposure

Low temperature exposure
- T(Amb): -50°C
- Duration: ~14 h

Measurements

Low temperature crack procedure: visual examination for signs of coating cracking or flaking.
Hydrostatic resistance

Feasibility of the Test Method:

The test method is not assessed in this context, but it is according to customer requirements.

Performed Actions:

Test Specimens

The coated fabrics under test were cut to 203-mm squares with edges oriented parallel to the warp and fill directions. The front side of the fabrics had been marked on the specimens. Five specimens of each material were tested to determine the low temperature crack resistance. Additionally five specimens were tested to determine the initial hydrostatic resistance of the fabrics.

Low Temperature Crack Procedure

The specimens were exposed in the low-temperature chamber at the temperature of -50°C for about 14 hours. The ambient temperature is shown in Fig. 2.

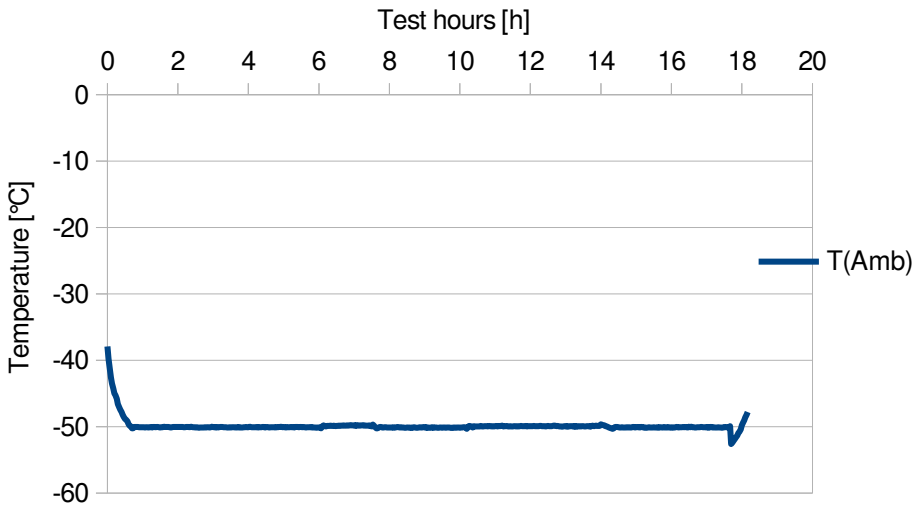
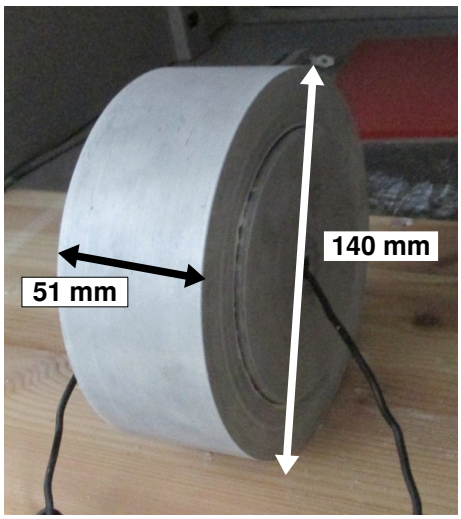


Fig. 2. *Ambient temperature in the low-temperature chamber during the exposure.*

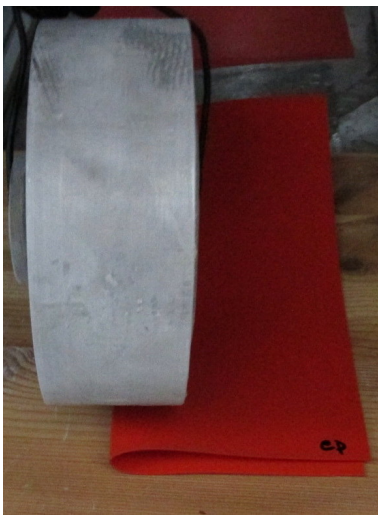
While still in the chamber, each specimen was creased 180° in the centre in the warp and fill directions.

A steel roller having a diameter of 140 mm, a width of 51 mm and weight of 4.5 kg, was used in creasing, see Fig. 3. The roller was exposed under the same low-temperature conditions as the specimens. Therefore, the temperature of the roller was the same as that of the specimen.

Each specimen was folded slightly in both the warp and fill directions while lying on a flat smooth surface and the centre of the steel roller was run over the fold a single time. The specimen was opened between the two creasing operations. The front side of the specimen was on the outside of the fold. An example of a creasing operation is shown in Fig. 3.



Steel roller, weight 4.5 kg



Creasing operation

Fig. 3. *Steel roller was used to crease the test specimens.*

After creasing, the specimens were removed from the chamber and visually examined for signs of coating cracking or flaking. No signs of coating cracking or flaking were observed. Figure 4 shows one specimen of each material before and after the low temperature crack procedure.

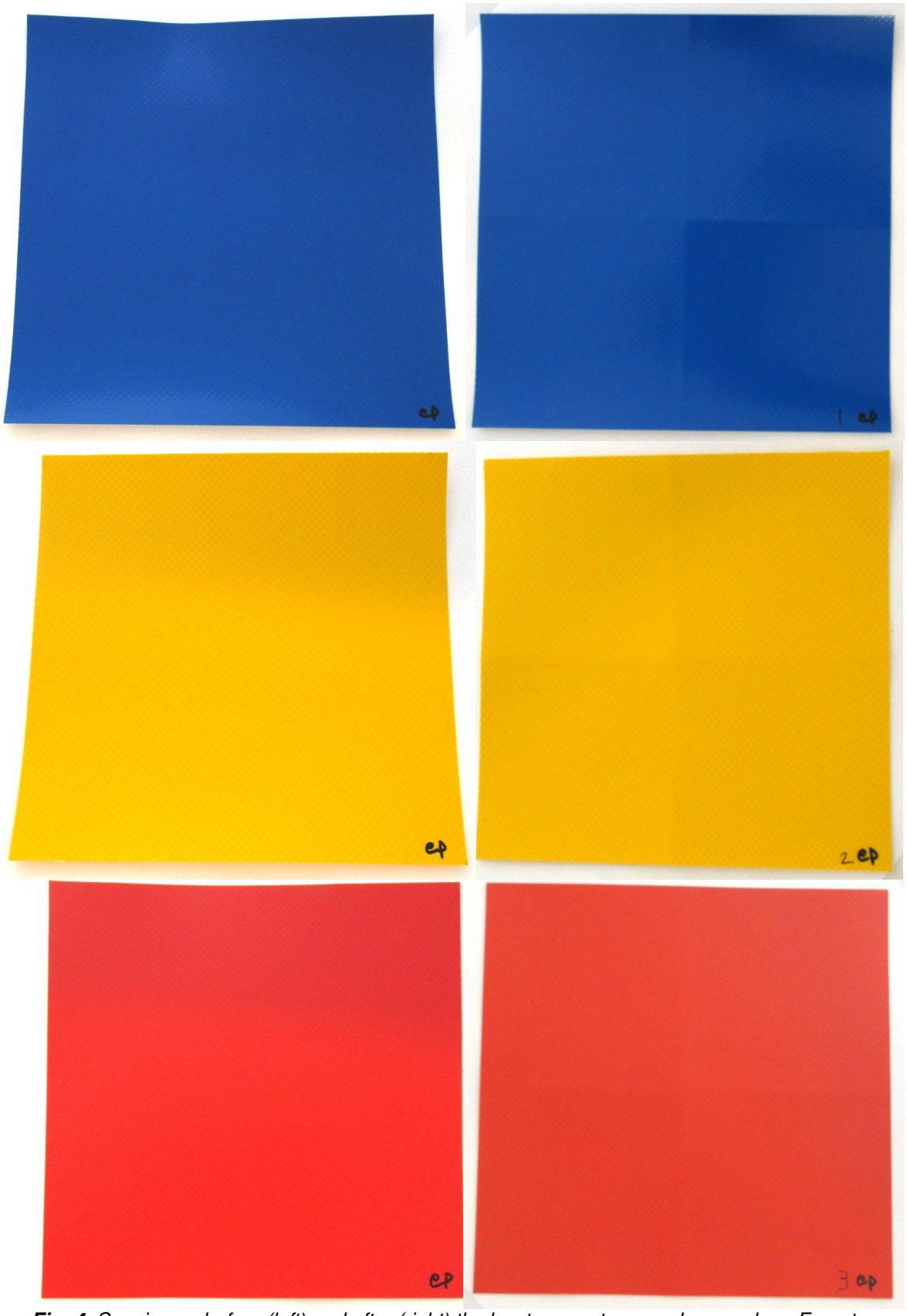
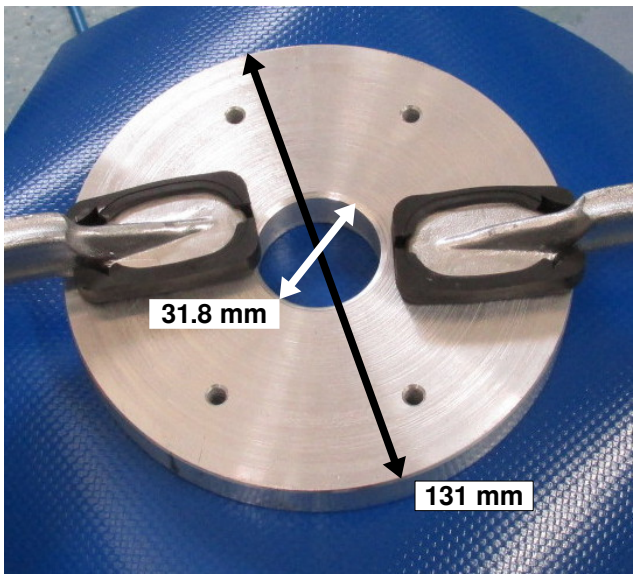


Fig. 4. *Specimens before (left) and after (right) the low temperature crack procedure. From top: Vinyplan 6764, Vinyplan 6571 and Vinyplan 6581.*

Hydrostatic Resistance
The testing machine had two circular clamps having coaxial apertures of their centres 31.8 in diameter. The specimen was placed between the clamps, as shown in Fig. 5. The lower clamping surface had a groove concentric to the aperture for an O-ring. Pressurized water was applied to the underside of the clamped specimen.



Top view

Fig. 5. *Testing machine used in hydrostatic resistance testing.*

The applied water pressure was adjusted manually and measured with a pressure gauge with an interval of 0.02 bar, see Fig. 6.

Fig. 6. *Pressure gauge showing the maximum water pressure applied to the specimens.*

The specimens were conditioned at least 2 h at standard laboratory conditions before the hydrostatic resistance testing.

The temperature of the water was the same as the ambient temperature of the testing room. The front side of the fabrics was placed next to the water level.

The pressure was slowly increased and the possible appearance of water through the coated fabric was continuously monitored until the pressure reached a value of 2.1 bar which corresponds to water column more than 20 000 mm. Ten different determinations were made for each specimen. No water through the fabric was observed, and thus the hydrostatic resistance of the coated fabrics under test is at least 20 000 mm.

In addition, the initial hydrostatic resistance of the fabrics was determined similarly. The initial hydrostatic resistance of the coated fabrics under test is at least 2.1 bar which corresponds to water column more than 20 000 mm.

Used Equipment:
The calibration is valid for one year from the date given, unless otherwise stated.
Hydrostatic testing machine
Steel roller
Thermal Humidity Chamber No. 72
Temperature: Datalogger No. 79 + k-type thermocouple, calibrated 1st June, 2017 (Datalogger) and 24th July, 2017 (thermocouple). Calibration is valid.
Pressure: Pressure Gauge No. 56_3, calibrated 5th February, 2018. Calibration is valid.

Conclusions:

Low-Temperature Crack Resistance test based on ASTM D751 – 06 (2011) was performed for three different coated fabrics, Vinyplan 6764 (Blue), Vinyplan 6571 (Yellow) and Vinyplan 6581 (Orange).

Five specimens of each material were tested. The temperature was -50°C and length of the exposure was 14 h.

All materials passed the test. The results are summarized in Table 1.

Table 1. Results of the Low-Temperature Crack Resistance test.

Material	Low-Temperature Crack Resistance test		
	Visual cracking	Hydrostatic resistance	Pass / Fail
Vinyplan 6764 (Blue)	No	> 20 000 mmH2O	**Pass**
Vinyplan 6571 (Yellow)	No	> 20 000 mmH2O	**Pass**
Vinyplan 6581 (Orange)	No	> 20 000 mmH2O	**Pass**

Remarks:

Document history: This test report is derived from the original test report ScantarpGrahn__tr120318RP.pdf

Actions, operations and reporting are in accordance with IEC/ISO 17025 'General requirements for the competence of testing laboratories'.

Signatures:

Riitta Perälä
Littoinen, 21st March, 2018
Solar Simulator Finland

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