

<b>GS Development</b> <b>Environmental Laboratory</b>	Title: Test of PAH on fire man's equipment, Berga Fire station 5 <sup>th</sup> February 2014	Date 2014-05-26
		Reg No: TR 3316
Created by: Marie Grönvall	Test Report	Version: 1
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## Test of PAH on fire man's equipment, Berga Fire station 5<sup>th</sup> February 2014

Customer: GRANULDISK AB

Requested type of test: Function

<b>Tested items</b>	Solo Rescue, # 320011-2012
<b>Arrival date</b>	2014-02-04
<b>Article no</b>	-
<b>Material</b>	-
<b>BNO</b>	-
<b>Pieces delivered</b>	1
<b>Sample no</b>	S5641

### **Purpose**

The purpose was to measure the content of polycyclic aromatic hydrocarbons (PAH) on fireman's equipment before and after wash in Solo rescue.

### **Procedure**

#### **General information**

A new fire man's equipment from Per Liberg was used during a fire practice in a container system at Berga Fire station on 5<sup>th</sup> February 2014. The equipment consisted of composite air cylinders (1 pair), face mask and harness. Since two pairs of air cylinders were required during practice, one pair from Berga fire station was also used in combination with the GRANULDISK equipment. The composite cylinders were filled with air at Berga, see Figure 1.

The fire was created with wooden pallets, rape seed oil, straw and diesel. The equipment was used during ~1 hour practice, see Figure 2.

#### **Dishwashing**

A Solo Rescue dishwasher was used, see Figure 3. The detergent (BA Cleaner from Interspiro) was added automatically during wash. A 5 minutes wash program was run (4.5min wash, 0.5min rinse). The displayed temperature in wash tank was 63°C when the wash program was started.

The washed equipment is shown in Figure 4.

#### **Wipe samples**

Wipe samples were collected by rubbing a cloth (REGAL II, Kompressor, 10\*10cm, Systagenix, vnr 283945 MRG100) against a specific area for a specific time (see S5641 protocols for details on sampling areas).

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Wipe samples were collected i) before firing practice, ii) after firing practice and iii) after wash in Solo Rescue. The "after wash" samples were taken immediately after wash on air cylinders, face mask and tubes. The "after wash sample" from belt was taken after drying over night at 40°C.

#### **Water samples**

A 250ml water sample was withdrawn from the wash tank of Solo Rescue before and after wash of the test equipment.

#### **Analysis**

Wipe samples and water samples were sent to ALS Scandinavia AB for PAH analysis.

## **Results**

The results are summarized in Tables 1 and 2. The test results are based on ALS reports (TR3317, TR3318). The content of the wiping cloth has been analyzed previously (TR3226).

#### **Comments**

- Note that the analysis cloth (=blank sample) contains PAH, see TR3226. Since only one blank cloth was analyzed, it is not known whether this amount differs between different cloths. Two of the "Before practice" samples had very low PAH content ( $\leq 0.020\mu\text{g}$ ), which strongly indicates that there is a variation between different cloths.
- Because of varying PAH content in blank cloth samples, sum of PAH carcinogenic is considered to be below detection level in
  - "After practice" samples from air cylinders and face mask.
  - "After wash" samples from air cylinders, face mask, tubes and belt (=all "after wash" samples).
- The results indicate a reduction of PAH in face mask, tubes and belt during wash.
- Note that many of the detected PAH compounds are close to detection level in the "after practice" samples. Wipe samples is therefore not a suitable method for analysis of the wash effect.

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## ***Conclusions***

**The results indicate a reduction of PAH in face mask, tubes and belt during wash.**

**Because of low PAH amounts (close to detection level), wipe samples are not considered to be a suitable method for validating the wash result of Solo Rescue. The following tests are planned:**

- 1) Analysis of PAH content in dish water before wash and after ~1-5 washes of the same fire man's equipment. After completion of the washes, the air cylinders will be wiped with isopropanol cloths. This test should indicate how much of the total PAH that is actually removed during the initial wash.**
- 2) Analysis of PAH content in dish water after i) manual dishwashing and ii) machine dishwashing of face mask.**

**A minimum of 1L dish water shall be withdrawn during all samplings, in order to maximize the ratio of [measured PAH content] / [PAH detection level].**

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**Table 1.** PAH content on fire man's equipment. Wipe samples were withdrawn before fire practice, after fire practice and after wash. Concentrations after subtraction of wiping cloth content are shown in brackets. Note that the detection level is 0.1-0.3µg for each of the PAH compounds. The table summarizes sums of detectable levels only.

		Previous test (TR3226) µg	Before practice µg	After practice µg	After wash µg
Wiping cloth <sup>A</sup>	PAH, sum 16	0.0910	-	-	-
	PAH, sum carcinogenic	0.025	-	-	-
Air cylinders	PAH, sum 16	-	0.005 (-0.041)	0.377 (0.286)	0.267 (0.176)
	PAH, sum carcinogenic	-	0.000 (-0.013)	0.050 (0.025)	0.048 (0.023)
Face mask	PAH, sum 16	-	0.141 (0.096)	0.451 (0.360)	0.079 (-0.012)
	PAH, sum carcinogenic	-	0.040 (0.028)	0.054 (0.029)	0.000 (-0.025)
Tubes	PAH, sum 16	-	0.131 (0.085)	0.638 (0.547)	0.419 (0.328)
	PAH, sum carcinogenic	-	0.011 (-0.002)	0.151 (0.126)	0.082 (0.057)
Belt	PAH, sum 16	-	0.020 (-0.026)	0.770 (0.679)	0.238 (0.147)
	PAH, sum carcinogenic	-	0.000 (-0.013)	0.189 (0.164)	0.013 (-0.012)

A) This concentration is used as comparison value for "After practice" and "After wash" samples. Only half of the concentration shall be used as comparison value for "Before practice" samples.

**Table 2.** PAH content in dishwater samples. Samples were withdrawn before and after wash of fire man's equipment.

		Before wash	After wash
Dishwater	PAH, sum 16	<0.40 µg/L ↔ <43 µg in wash tank	6.1 µg/L ↔ 659 µg in wash tank
	PAH, sum carcinogenic	<0.18 µg/L ↔ <19 µg in wash tank	0.61 µg/L ↔ 66 µg in wash tank

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**Figure 1.** Composite cylinders were filled with air at Berga Fire station



**Figure 2.** Fire man Phil (left picture) was wearing the test equipment during the fire practice in the container system (right picture).

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**Figure 3.** Solo Rescue machines at Berga Fire station.



**Figure 4.** The tested Fire man's equipment after wash in Solo Rescue.

## References

TR 3226	PAH analysis of wiping cloths
TR 3317	ALS Scandinavia AB; T1402234
TR 3318	ALS Scandinavia AB; T1402235