Date: July 30, 2018

Subject: NBC filters – Test results

According to the test results: the physical sorption performance of the filter with Benzene Concentration 5mg/L, the duration of was 2 minute until it exceeds the threshold 60ppm, the report conclusion is that the physical sorption performance of the filter is poor.

The NBC filters that supplied supplied to IDF and IMOD.

The filters meet the DIN STD EN 14387-2004+A1 (Attached), for type and class A1, B1, E1, CK and DMMP that are suitable for gas types and concentrations in combat.

The NBC filters are tested according to the IMOD procedure as follows:

1. Specifications

Test	Demands		Test method
	min	max	
Moisture, (after production)(wt%)	-	5.0	ASTM D 2867-2009
Density (g/cc)	0.45	0.65	ASTM D2854-TM-7
Hardness number (%)	85	-	ASTM D3802-2010
Ammonia content (mg/l Air /100ml carbon)	-	0.005	TM-65,TM- 75 IM-136-300-34-B-1965
Silver (Ag)(wt%)	0.03	-	EA-C-1704-1992
Copper (Cu)(wt%)	-	6	EA-C-1704-1992
TADE	-	3	EA-C-1704-1992
Zinc (Zn)(wt%)	-	6	EA-DTL-1704A-1999
Molybdenum (Mo)(wt%)	-	2.5	EA-DTL-1704A-1999
Chromium (Cr)(wt%)	-	6	EA-C-1704-1992
Surface area (m^2/g)	900	-	B.E.T – Brunauer, Emmett and Teller
Resistance (mmH20/cm^2)	0.04	-	For tube at a height of 100 mm
DMMP Gas Life (min)	80	-	Test Conditions acc. to para 2
CK Gas Life (min)	40	-	Test Conditions acc. To Para 3

2. Absorption test for DMMP (dimethyl methylphosphonate)

1. Air flow = 45±1 Lpm
2. Temperature- 40±1° c.
3. Relative humidity – 20% max.
4. DMMP concentration- 3.0±0.1 mg/l.

3. Absorption test for CK (cyanogen chloride)

1. Air flow = 30 Lpm
2. Temperature- 18±1° c.

3. Relative humidity - 75±5%. (11.6 gr-H2O/m3)
4. CK concentration- 2.4±0.2 mg/l.

4. Hazardous material

Type and class	Test gas	Minimum breakthrough time at test condition (Min)	Test gas concentration in air		Breakthrough Concentration (ml/m3)
			% by volume	mg/l	
A 1	Cyclohexane (C6H12)	70	0.1	3.5	10
B 1	Chlorine (Cl2)	20	0.1	3.0	0.5
	Hydrogen sulphide (H2S)	40	0.1	1.4	10
	Hydrogen cyanide (HCN)	25	0.1	1.1	10
E1	Sulphur dioxide (SO2)	20	0.1	2.7	5

Tested according to EN 14387-2004+A1

Table 1. Cyanogen chloride Results, as received

Sample ID	Test Date	Initial Cartridge Mass (g)	Equilibrated Cartridge Mass (g)	Water gain (g)	Flow Rate (LPM)	Temperature (C)	Concentration (mg/m^3)	RH (%)	Results	
									Conc (mg/m^3)	Time (min)
C01	25-Oct	262.23	--------	--------	30	18.7	2400	80.0 ± 2.0	8.0	75
C02	25-Oct	262.45	--------	--------	30	18.9	2400	80.0 ± 2.0	8.0	74

Table 2. Cyanogen chloride Results, pre-equilibrated

Sample ID	Test Date	Initial Cartridge Mass (g)	Equilibrated Cartridge Mass (g)	Water gain (g)	Flow Rate (LPM)	Temperature (C)	Concentration (mg/m^3)	RH (%)	Results	
									Conc (mg/m^3)	Time (min)
C03	25-Oct	262.13	295.19	33.06	30	18.8	2400	80.0 ± 2.0	8.0	51.3
C04	25-Oct	263.44	296.37	32.93	30	19.1	2400	80.0 ± 2.0	8.0	51.2

Table 3. Toluene Results

Sample ID	Test Date	Initial Cartridge Mass (g)	Equilibrated Cartridge Mass (g)	Water gain (g)	Flow Rate (LPM)	Temperature (C)	Concentration (mg/m^3)	RH (%)	Results	
									Conc (mg/m^3)	Time (min)
C05	21-Oct	263.18	--------	--------	45	43.5	3500	<10	0.38	108
C06	21-Oct	262.43	--------	--------	45	44.1	3500	<10	0.38	107