

FIRE OF INFLAMMABLE LIQUID

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Translation

REPORT

No.: P 653/99-530-1

**ABOUT RESEARCH
of fire extinction efficiency**

Automatic fire extinguishing system BONPET

Ordered by: BONPET d.o.o., Ravne 100, 8281 SENOVO

Order/contract: No. 3/99 from 11.05.1999

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Auktorizacija: Auktorizacija državnega št. P-023/11, določena za avtorizacijo št. št. 950-1/96-91
/RUS: СУРБАГ ВОРСТА (Certificate of Recognition No. 4448.010030.79007 /RUS)
UKRAINSK REGISTER OF SHIPPING (Certificate for Approval of Testing Institution No. 01000794003402
RUSSIAN MARITIME REGISTER OF SHIPPING) (Certificate of Accreditation of Testing Laboratory No. 01.01.01.175)

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1. **PRODUCT:** Automatic Fire Extinguishing Expedient BONPET
2. **SUPPLIER:** BONPET d.o.o. Ravne 100, 8281 SENOVO, Slovenia
3. **PRODUCER:** Kabo Kogyo Co. Ltd, TAD Corporation, Japan
4. **SAMPLING:** Testing pieces were supplied and assembled by orderer's representative

5. DESCRIPTION OF EXTINGUISHING EXPEDIENT BONPET:

BONPET extinguishing liquid is in red coloured glass ampoules dimensions $\phi 60 \times 280$ mm. The liquid is transparent pink coloured. By temperature increase of the liquid (85-90°C) increases pressure in the ampoule that causes a burst of ampoule and liquid sprays into the room. Ampoules are fixed with special tin-iron holders that are placed in the room by producer's instructions. In general on 8 m² or approximately 4 m² of space one BONPET ampoule should be placed.

6. CONDITIONING OF SAMPLES:

Conditioning is not required.

Date of testing: 31.5 1999, environment temperature: 21°C, relative humidity: 62%

7. TESTING PROCEDURE:

While there is no standard testing prescribed for testing efficiency of extinguishing expedients for fire extinguishing in closed spaces we made the test in the room built in accordance with standard SIST ISO 9705. This is a room 2,4m width, 3,6m length and 2,4m height made of gas-concrete blocks. In one wall there is a opening 0,8m x 2m.

With a test we should find out how BONPET extinguishes a fire of liquids in a closed room.

Two tests were made:

1. Test fire extinguishing with two ampoules of BONPET
2. Test fire extinguishing with one ampoule of BONPET

7.1 FIRE BURDEN:

By both of the tests a pot of diameter 92 cm (0,72m²), filled with 17l of water and 7l of heptane was placed on the back side of the testing room.

7.2 FIRE EXTINGUISHING EXPEDIENT:

By the first test two ampoules of BONPET were fixed under the ceiling side by side, by the second test one ampoule of BONPET was placed under the ceiling on the same place.

7.3 MEASUREMENTS:

Temperature of the air is measured as shown in appendices No.1 and No.3. Measuring place No.8 is beside ampoule(s), measuring place No.7 is 30cm under the ceiling, No.5 is 83cm under the ceiling, No.3 is 113cm under the ceiling and No.1 is 173cm under the ceiling.

7.4 VENTILATION

Testing room is closed under test. A 6cm width rift above the door is left (air hole 0,06m x 2m = 0,12m²). Outgoing smoke is scooped and forced-led away.

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8. TEST OBSERVATIONS

1. test (two BONPET ampoules):

Time (min:s)	Observation
0:0	Heptane ignition
0:10	Door closing
	Quick increasing of temperature in the test room caused by burning heptane. Th room is heavily filled with smoke.
2:45	Sound of crack (after room cooling we find out that both of ampoules cracked at the same time) Temperature close to ampoules was about 400°C. Immediate extinguishing of fire
	Room cooling. No re-ignition.

After test end the height of heptane in the pot is about 8mm. A thin layer of foam is all over the surface of liquid. By the re-ignition of heptane with a burning piece of cotton-wool the whole surface burns instantly but only for about 2 seconds, then it continues on the place where cotton-wool is placed. Burning is non intensive and stops immediately after door closing. Heptane height is still 4mm.

The test is repeated with the same amount of fuel and the same air conditions (door closed) without extinguishing expedient. Total heptane burns out.

2. test (one BONPET ampoule):

Time (min:s)	Observation
0:0	Heptane ignition
0:10	Door closing
	Quick increasing of temperature in the test room caused by burning heptane. Th room is heavily filled with smoke
0:48	Sound of crack . Temperature close to ampoule is about 500°C. Immediate extinguishing

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	of fire.
	Room cooling. No re-ignition.

After test end the height of heptane in the pot is about 8mm. A thin layer of foam is all over the surface of liquid. Quicker increase of temperature and fire extinguishing is caused probably while the room is still warm (the walls weren't cooled completely).

By the re-ignition of heptane with a burning piece of cotton-wool the whole surface burns instantly. The door stays open. Extinguishing with mixture of 8l water and 0,6l of BONPET expedient is successful.

9. TEST RESULTS:

Test has shown that one ampoule of automatic extinguishing expedient BONPET placed in the room width 2,4m, length 3,6m and height 2,4m (20,74m³) is enough to extinguish burning liquid 0,72m³.

10. APPENDICES:

- 1 ... sketch of the testing place with two ampoules (Test No.1)
- 2 ... sketch of the testing place with one ampoule (Test No.2)
- 3 ... temperature development diagram (Test No.1)
- 4 ... temperature development diagram (Test No.2)
- 5 ... photos:
 - 1 ... view through the room door
 - 2 ... ampoules under the ceiling over the pot
 - 3 ... heptane ignition in the pot
 - 4 ... view through the door after extinguishing
 - 5 ... re-ignition of heptane-remains in the pot
 - 6 ... placement of the ampoules for Test No.2
 - 7 ... heptane ignition at Test No.2

Report prepared by Milan Hajdukovič, univ.dipl.ing.