Closed Joint-Stock Company "New Impulse Technologies"

SIBERIAN AFFILIATE OF ALL-RUSSIAN SCIENTIFIC AND RESEARCH INSTITUTE FOR FIRE DEFENSE OF THE MINISTRY OF EMERGENCY SITUATIONS OF RUSSIA (FSI ARSRIFD MES of Russia)

Testing Laboratory

MINUTES NO. 169
of testing multifunctional powder spraying device impulse module "IMPULSE-STORM" at two-barrel powder spraying from 20 sprayers

THE TESTS WERE CONDUCTED SPECIALY FOR STUDING PARAMETERS OF POWDER CLOUD SPREADING AND EXTINGUISHING EFFECT ON LARGE OPEN AREAS.

METHOD OF EXTINGUISHING – CROSS-EXTINGUISHING

Date April 20, 2004

Conditions on proving ground:
* temperature, C^0 17
* atmosphere pressure, kPa 99,9
* relative humidity, % 25

Name and characteristics of samples

Multifunctional powder spraying device IP "Impulse-Storm".
Producer: Closed Joint-Stock Company "New Impulse Technologies", ID 71985175.

Test Methods

Determining main space-time parameters of a powder cloud flow at powder supply by means of IP "Impulse-Storm". According to the program of test methods.

Measuring instrumentation and devices:

1. Air medium optical density sensors (30 items).
2. Interface transformers ADAM 4054 (2 items).
3. Analog data entry modules ADAM 4018(2 items).
4. Computer with characteristics: processor PIV-1800 MGertz, RAM 256 Mb, HDD 40 Gb, video card 32 Mb. (2 items).
5. Thermoelectric transformers of TXA type according to GOST R 50431-92 with wire diameter not exceeding 0.1 мм (16 items).
6. A PC based controlling and measuring complex "Sprut".
7. Precision scales of at least 5 g.
8. Tape-measure, 10 m.
9. Speed and wind direction measuring device.
10. Angular value measuring device.
11. Digital photo camera, two video cameras.

Devices:

1. Bars-holders securing safe fixing of optical sensors, thermoelectric transformers and special model fire centers of B class in the area of a supposed powder spraying cloud.
2. Shield-bar.
3. Special combined bar.
4. Accumulative battery 12 B, CT-60 type (2 items).
5. Measuring slats made of wooden bar 40x40 mm 5 m long having black and white color band marking, band length 0,5 m (3 items).

Spending materials:

1. “Twisted-pair” cable (250 m).
2. Gasoline A-76 according to GOST 2084-77.

Test results

Powder spraying from 20 sprayers was performed in the present test, powder mass came to 600 kg. According to the data received from medium optical density sensors, graphics of dependence of relative medium optical density change on time were built. According to the graphics, maximum change of relative medium optical density (D,%) and duration of fire extinguishing concentration action (Tcon, sec) were determined. The graphic shows a powder cloud in 1 and 1,5 seconds after the start of extinguishing.

Horizontally and vertically – distance and height of spreading in meters.

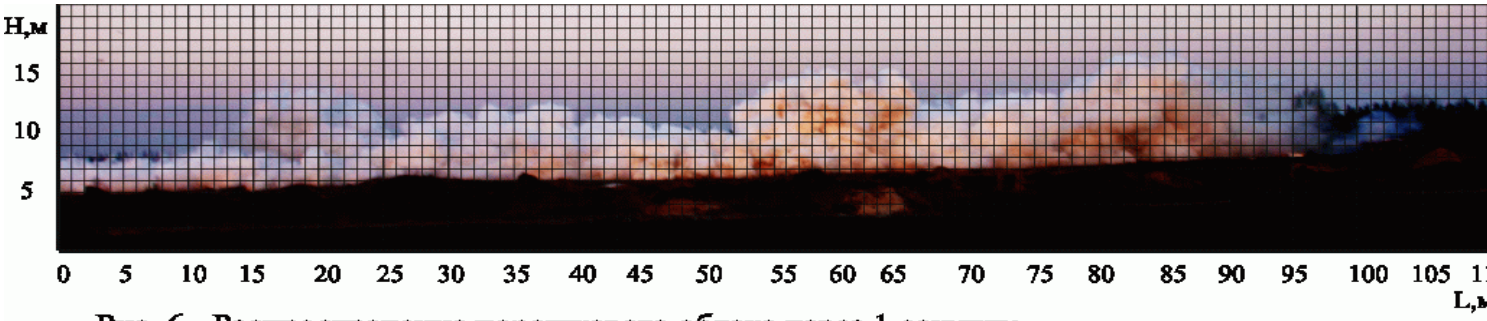

Рис. 6 - Распространение порошкового облака через 1 секунду.

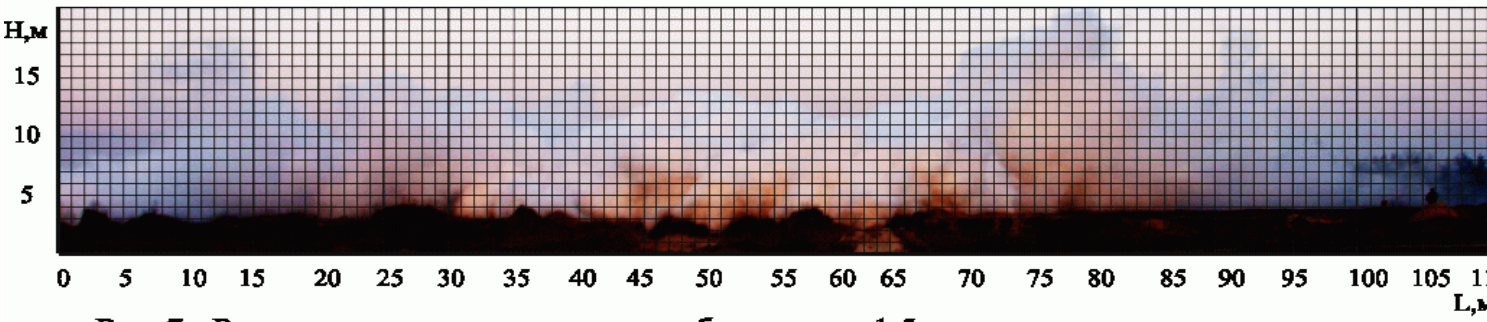

Рис. 7 - Распространение порошкового облака через 1,5 секунд.

According to the indications of thermoelectric transformers the fact of extinguishing of model fire centers was determined by means of exponential dependence received at sensor calibration, a calculation of maximum powder flow concentration was made (Pmax) based on data received of relative powder flow optical density change on a proving ground:
Picture 1 – at the height of 0.25 meters. Picture 2 – at the height of 4 meters. Graphic’s vertical axis – concentration indices gram/cubic meter, horizontal axis – proving ground dimensions, on which sensors are fixed. On the table – conditions on proving ground:

* temperature, C 17
* atmosphere pressure, kPa 99,9
* relative humidity, % 25

Условия проведения эксперимента:

Количество распылителей, шт.	20
Расстояние от кассеты, м	60
Масса порошка, кг	600
Скорость ветра, м/с	3-5
Направление ветра	Восточное
Атмосферное давление, кПа	99,9
Влажность воздуха, %	25
Температура воздуха, °С	+17

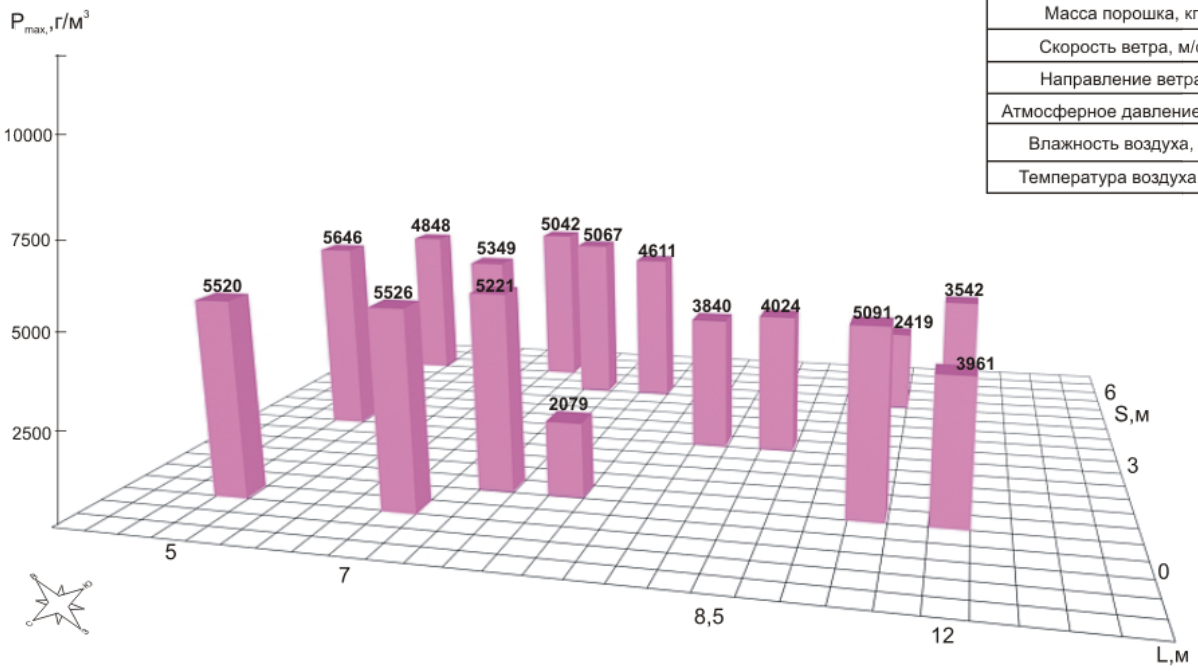

Рис.1 Распределение максимальной концентрации (P_{max}) в объеме испытательного поля на высоте 0,25 м.

Условия проведения эксперимента:

Количество распылителей, шт.	20
Расстояние от кассеты, м	60
Масса порошка, кг	600
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Влажность воздуха, %	25
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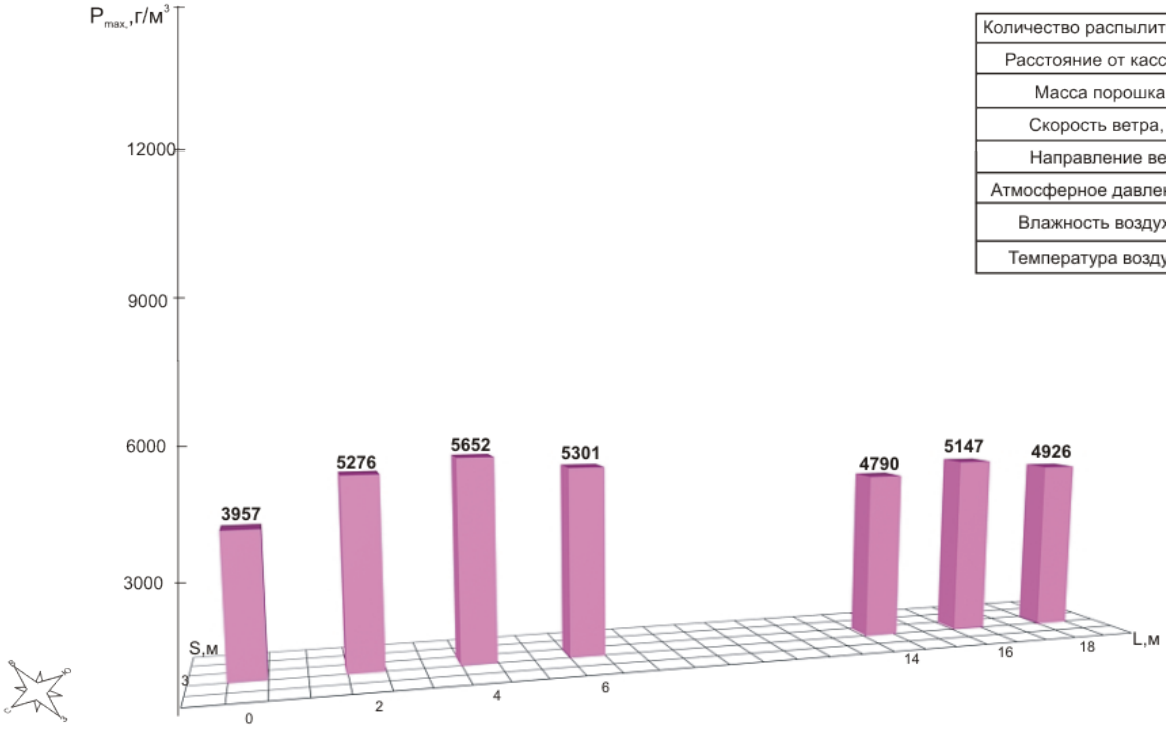

Рис.3 Распределение максимальной концентрации (P_{max}) в объеме испытательного поля на высоте 4 м.

By means of video and photo materials received a calculation of average parameters of powder flow was made:

Number of sprayers.	Distance of powder cloud spreading, L, m	Front width, G, m	Height, m	Powder cloud volume, m^3
20	**198**	**38**	**10**	**20900**

Result:

Powder concentration exceeds many times that necessary for extinguishing.
Time for powder cloud spreading does not exceed 2 seconds.

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