New Impulse Technlogies company

www.impulse-storm.com

The “DOUBLE STORM” Technology

Incomplete, brief,* comparative *technical description

It is destined for the partners of New Impulse Technologies only and with the sole purpose of understanding its main principles and degrees of effectiveness.

Powder fire extinguishers

At present, powder fire extinguishers remain the most commonly used type of fire extinguishers, their principle of action is mainly based on inhibition of the chemical process of burning.

By their composition, depending on the type of a powder fire extinguisher, fire quenching powders can differ one from another, they can be sodium bicarbonate, sodium carbonate, phosphorous and ammonium salts etc. with a complex of various fillers and supplements. Furthermore, there are fire quenching powders for special use.

Thanks to their high fire quenching effectiveness, powder fire extinguishers are the most economically advantageous fire extinguishing means based on the showing “ratio of fire extinguisher cost to area of extinguishing”.

The service life period of powder fire extinguishers mounted on vehicles until the next inspection is 1 year. For fire extinguishers installed in premises this period comes to 2 or 3 years.

The main disadvantages of fire extinguishers of this type are as follows:

- after their application the powder, being sintered, forms sediments on the surface, which are difficult for removal;

- fire quenching powder is capable of caking, especially in case of vibration impact;

- difficulty of supply at long distances;

- lower, as compared to fire quenching gases or aerosols, fire extinguishing effectiveness;

- complex chemical composition of powders inevitably results in chemical pollution of the premises after extinguishing.

Gas fire extinguishers

Let's consider a fire extinguishing mechanism with inert gases on the example of carbonic acid gas. When gas is supplied to the protected volume, the level of oxygen in the premises reduces. After oxygen concentration reaches 12.5%, burning stops. It is no doubt that fire extinguishers and systems using CO_2 are effective: extinguishing happens very quickly, probability of re-ignition is low, and the cost of gas itself is relatively low. However, there are serious disadvantages putting restrictions on the use of inert gases as fire quenching ones, firstly, because the fire quenching concentration exceeds many times the concentration safe for a man. Secondly, since saturated vapors pressure at normal temperature is great, CO_2 must be stored in a high-pressure balloon, and, as a consequence, requirements to transportation, assembling, and operation of gas fire extinguishers (systems) increase. Thirdly, at a low temperature (below -20ºC) the intensity of gas discharge is insufficient to extinguish a fire. At a temperature of below minus 40ºC a fire extinguisher is virtually unserviceable.

Besides inert gases sulfur hexafluoride, or insulating gas (SF_6), belongs to nontoxic gas fire quenching substances. A four-hour inhalation of this substance in a concentration maximally possible in toxicological researches (82% of SF_6 volume in a mixture with 18% of O_2 volume) does not cause death of test animals and clinically apparent poisoning both during exposition and during the next 14 days of control. However, when using insulating gas as a means for volumetric fire extinguishing one should take into account a possibility of formation in the fire conditions of toxic products of its thermal decomposition. The experiments revealed, for example, that white mice die after 20 min. of insulating gas inhalation, 3 to 7% of which decayed when passing through a pyrolysis reactor heated to 850°C. At that, among volatile thermal decay products sulfur dioxide (CO_2) and hydrofluoride (HF) were detected, which are highly toxic compounds having a strong smell and causing strong irritating action on mucous coats of respiratory tracts and eyes.

Till the middle of the eighties of the last century a wider use for fire extinguishing was found by gases – inhibitors of burning having inhibitory action on chemical reactions in the flame like Halon 13B1 (CF_3Br), Halon 114B2 ($C_2F_4Br_2$), Halon 12B1 (CF_2ClBr) etc. However, knowing the necessity of protecting the ozone layer of the Earth's atmosphere and the solutions of the world community taken in this connection on termination production of ozone destroying substances, including 13B1, 114B2, 12B1 gases, served a push to searching for new, ecologically pure fire extinguishing means and, in particular, the Novec™ 1230 composition. Unfortunately, most of fire extinguishing gases found their application in fire extinguishing installations for volumetric fire extinguishing only.

"Double Storm"

In 2008, the researches of New Impulse Technologies successfully solved the task of creating a method for fire extinguishing, which can be compared with fire extinguishing gases by its fire quenching effectiveness, and by its economical showings – with powder means.

For this purpose, technical requirements to microcapsules for gas transportation from the muzzle to the flame were formulated. The microcapsules created are small-size hollow spherical solid particles having microcracks on their surface.

The key physical properties are:

Form:	spherical
Color:	grey, white
Particle size:	5 – 80 micron
Packed density:	0.25 g/cm^3
Melting temperature:	1300^0C
pH in water:	neutral

The spherical form with its minimal area to volume ratio means that the maximal volume of liquefied gas penetrating in the result of capillary effect inside a microcapsule is achieved. The solidity according to Moos 7 and spherical form are the absolute condition to prevent caking of the fire extinguishing powder. Besides, sphere is an ideal form to secure powder flow.

Properties and advantages

Spherical form	Ideal form, allows achieving the maximal gas volume.
Lightness	Incredibly light.
Inertness, solidity	Secures high stability to acids and alkali, high stability to caking and maintains permanent serviceability of a fire extinguisher within an unlimited period of time, 30 years and longer.
Free flow property	Allows using a fire extinguisher easily for extinguishing at a considerable distance.
Insulating properties	Low electrical conduction allows using microcapsules for extinguishing electric installations under voltage without any limitation.
High melting temperature	Does not create particle sintering in a fire.

Microcapsules, in the result of their inert composition, have high stability to a number of chemical elements. They have no impact on chemical composition or reactions of materials and products when extinguishing a fire. After extinguishing, the chemical medium of the premises remains without a change. During extinguishing there are no dust clouds baring the coverage and complicating breathing, during extinguishing the air in the premises remains safe for people, what allows proceeding to extinguishing immediately after ignition.

The flame extinguishing mechanism is connected with the delivery of a fire extinguishing gas by means of microcapsules directly to the burning reaction zone and dispersion of microcapsule splinters to the flame. In the result, the fire extinguishing effectiveness increases 3 to 5 times as compared to the known fire extinguishing methods.