Impulse Storm-A technology.

Test results and suggestions for the use of

Self-Expanding Firefighting Cooling System (SEFCS).

This proposition is created on the following basis:

1. Results of years of testing of our own heavy fire extinguishing Impulse Storm technology systems on government test-fields of Russia, Ukraine, Brazil, Yemen and Egypt. The plan and structure of tests were performed according to the scheme of the Brazilian Federal Fire Department, according to which the equipment manufacturer never knows the plan of future tests that is written and performed by those fire teams, who will be extinguishing the fire using this test equipment in the future. In other words, the manufacturer of firefighting equipment must create and provide equipment for testing purposes and this equipment has to be able to put out any real fire, without any prior training in pre-written plan.

2. The research results and public debate of NFPA Technical Committee on Foam for 2013 - 2014.

Required information:

Impulse Storm technology uses highly upgraded tiny engines with solid rocket fuel that emit cold inert gas and aerosol as the pressure generator. The pressure generated by the Impulse Storm generator is used for stable and secure pulverization of water, foam, powder or all of three components simultaneously.

Own tests:

During the period of 1998 –2014, the company conducted hundreds of tests for Impulse Storm technology in different climatic conditions of the Earth, starting from the tests outside the Arctic Circle during a winter night where the temperature is 48° below zero, ending with tests in conditions of equatorial heat, lack of water and dry Sahara Desert and extremely wet and hot conditions of the Amazon jungle.

These tests were conducted with the objectives of creating a new technology capable of operating effectively in all conditions, in the absence of any external source of energy or water and under the destruction caused by large-scale technological accidents, earthquakes or war.

This technology has extinguished the following during the tests: LNG, gasoline, oil, natural gas, methanol and ethanol, black powder, liquid and solid propellants as well as cooling and suppression of electric transformers. All tests were completed successfully and documented. Documentary video material is available.

NFPA notes concerning another Self-Expanding Firefighting Foam System that does not use the Impulse Storm technology.

Note: Standard firefighting systems that use huge underground water storages, pumping stations and a complex network of water pipes are not considered here as the benefits of SEFCS compared to them is confirmed by numerous tests and conclusions during public discussion of the NFPA Committee.

Quote NFPA Committee Statement: Self-Expanding Firefighting Foam System **"has proposed a dramatic decrease in the required discharge time (s) for application of foam to tank fires. The FF recommended application times are 2 or 3 minutes, depending on tank size, compared to 50-65 minutes depending on fuel type required by NFPA 11 Para. 5.4.2 and 60 minutes required by EN13565-2 Table 3. These times are for fixed systems on cone roof tanks.** »

After analyzing the actions of other Self-Expanding Firefighting Foam Systems that do not use the Impulse Storm technology NFPA Committee made the following observations, which no one could resolve.

Quotations:

Committee Statement (CS): This recommendation is supported by only one fire test on an 82 ft diameter tank containing gasoline. In this test there was virtually no freeboard of tank wall above the fuel and foam application was started immediately after ignition. We believe that this does not replicate real world conditions and that much additional testing is needed to validate this system.

Committee Statement (CS): FF supports the idea of immediate application by suggesting that the system will be actuated by detectors. No provision is made for backup manual actuation as required by NFPA 11 Para. 4.9.1.2 and EN 13565-2 Para. 4.7.2 Moreover, FF does not provide fire test data simulating a scenario in which detector driven automatic actuation fails and manual actuation is required. We believe that this is important because tank fires are often ignited by lightning that has the potential to disable detectors and/or automatic actuation systems, making it important to test with longer preburns and design systems for the longer run times that would be required in the case of long preburns caused by failure of automatic actuation.

Committee Statement (CS): Performing hydraulic calculations for the FF system appears to us to be quite a challenge. The foam solution is stored in a pressure vessel that is pressurized with carbon dioxide, a gas that is soluble in water. Whether there is any gas headspace or all of the carbon dioxide is in solution is not clear. The system relies on the pressure of the carbon dioxide to drive the solution through piping and the discharge device. It is obvious that as the solution is discharged the headspace in the pressure vessel will increase, reducing the pressure and, therefore, the flow rate. The pressure/temperature curve of carbon dioxide is quite steep, suggesting a large variation in discharge pressure and flow with variations in ambient temperature. Further, as the solution flows through the piping to the fire its pressure will decrease due to pipe friction. That will allow the solution to release more carbon dioxide that will then exist as bubbles in the solution increasing its volume and, therefore, its velocity and friction loss. At the same time the density of the solution is decreasing, decreasing friction loss. FF does not suggest a calculation method to handle these problems.

Committee Statement (CS): Solutions of carbon dioxide in water are quite acidic, having a pH value between 3 and 4, about the same as vinegar. FF proposes corrosion protection for the pressure vessel but does not suggest how this might be accomplished.

For brevity of this proposal a number of other claims of NFPA to other self-expanding firefighting systems, that do not use the Impulse Storm technology, we will show in a shortened way:

- The presence of high pressure cylinders (15 bar) in immediate proximity to explosive and flammable objects. It is prohibited by the standards of many countries.
- Inability to transport foam or water to a greater height.
- Direct dependence on external electrical or mechanical interference.
- Availability of cranes with mechanical or electrical control cannot guarantee 100% operation and longevity.
- The necessity to use only one type of foam.
- The time-consuming and rather complex recharge which takes up to few weeks.
- Many other claims.

In 2014, professional testers of Federal Fire Service of Russia and the Russian Federal Grid Company of Unified Energy System (FEES) performed tests of SEFCS Impulse Storm-A for extinguishing of oil tanks and Impulse Storm-S for cooling and extinguishing of transformers. Additional materials and videos are attached.
It was confirmed during the tests that all of these mentioned issues and questions of NFPA Committee are resolved and implemented. A system has been developed and proved its efficiency by the following:

1. It does not need any external source of water, foam, powder or electricity.
2. It has an absolute reliability of operation and performs its task in conditions of thunderstorms, earthquakes and global destruction during technological disasters.
3. It has the ability to guarantee the suppression of fire immediately after inflammation or in a few minutes after it. The preliminary burning during the tests was 120 seconds (established by testers).
4. Has no pressure in “standby”.
5. Does not need a service of the manufacturer for maintenance and recharging.
6. Comes with a triple set of generators for immediate recharge (in 30 minutes timeframe).
7. It has no mechanical or electrical valves and this ensures reliable operation over many years and overall longevity of the equipment.
8. Has the possibility of manual remote start without the use of electrical impulses.
9. It is intended for any purpose, such as transformers or other cooling units, or fighting fires. If you change the vector of use, it does not require any design changes.
10. Can use any water, foam or powder, and any pulverization systems. Does not require the redesign of the entire system of water or foam pulverization that exists now at the facility.
11. Cost and service of SEFCS Impulse Storm-A (S) is several times lower than any existing fire-fighting system.

A short comparison with standard and other SEFS systems.

Traditional foam systems require:

1. A dependable water supply;
2. A dependable power supply;
3. A reliable pump;
4. A good supply of quality foam concentrate;
5. A reliable proportioning system;
6. A good aerating nozzle;
7. A skilled pump operator who can make it all work together properly when you need it most.

Even new foam system has dependencies such as a source of compressed air, proportioning system, etc...

Traditional Self-Expanding Foam Firefighting System have:

1. Foam premix stored under high pressure in the pressure vessel, not less 16 bar.
2. Big size pressure vessel 120 m^3 or more.
3. Difficult design and expensive service.
4. Impossibility of fast recharge - up to one or two months.
5. Big time delay between the breakout the fire and the actuation of the system.
6. Need of use only of one type of foam.
7. High price full complete equipment and service.

Impulse Storm and other SEFS comparative data

Parameters	other SEFS	Impulse Storm-A
Size of foam vessel need for the extinguishment of the full surface fire of a 40.000 cubic meters storage oil tank.	120 m^3	15 m^3
Delay between the breakout the fire and the actuation of the system	8 – 10 seconds	0,5 – 2 seconds
After the actuation, the extinguishment time is done at all sizes of tanks.	60 – 120 seconds	25 seconds
The foam vessel stay permanently under pressure:	16 bar	normal atmospheric
Opportunity to dispersion firefighting powder or only water for cooling	not	yes
Type foam use	only one type from produced	any
Time recharge	Unknown	30 minutes
Staff for recharge	only produced company	Users staff

Systems Impulse-Storm-A.

Abstract

Dependence on water

In conventional storage tank fire extinguishing foam systems the availability of firewater is essential. A number of steps are required to convert foam concentrate, water and air into expanded foam. The expanded foam can subsequently be applied onto the burning surface. In the majority of cases these activities take place close to the scene of the fire. Quite a team of trained manpower is required to set up these relatively complicated systems. In view of the stressful situation during any fire, mistakes are likely to be made resulting in low-performance of the system. Unmanned storage sites cannot count on turnout of sufficient fire-fighters within a reasonable period of time.

Pump station by NFPA Standard

Over the past decades, the user had no choice but to accept these complicated and expensive systems. Sites that had no access to adequate water were left without protection. The owners/management, the Fire Administration and the Environment Protection Authorities had no choice but to accept the situation.

Pressure generators by Impulse-Storm-A technology

Conclusion.

There are sites where:

- The implementation of conventional fire protection systems is facing serious technical problems
- The cost to set up an installation complying with NFPA recommendations is too high
- There is insufficient manpower available at short notice to operate a labour-intensive mobile or semi-fixed system
- There is a need for an acceptable level of reliability

Completely new foam, water and powder dispersion system Impulse-Storm-A technology was developed, which fully solves the problems described above.
The automatic and autonomous storage tank fire extinguishing system responds immediately after the ignition, and does not require any external supply of water or energy to operate.

Absolutely independent and completely autonomous system. Work guarantee without external of water and power of 10 years.
Volume of fire extinguishing liquid or powder is 60 - 7500 l.
Capacity is 20-350 l/sec. Time before coming into action is 0.5-3.5 sec.
Fire extinguishing process off-line.

Purpose

- Fire suppression or water cooling industrial, household and others explosive and fire hazard objects.
- Forest fire and high-rise buildings fire suppression.
- Effective fire extinguishing and high fluid supply intensity
- Using of different fire extinguishing fluids
- Different nozzles for jet forming, including fire-spraying
- Simple design
- Multiplying use
- Starting: heat or electrical impulse, mechanical device or by hand or means combination

Features ISa-800, 2000, 7500			
1. Fire extinguishing fluid volume, l	800	2000	7500
2. Mass of supplied system, kg	250	300	1000
3. Lag effect (start time), sec	0.5...2	0.5...3	0.5...3.5
4. Fluiding supply intensivity, l/s	10...50	10...100	50...300
5. Reloading time, hours not more than	0.5	1	1
6. Temperature range, °C	-50...+50	-50...+50	-50...+50
7. Operation term, years	10	10	10
8. Material fibreglass.			

Water\foam device ISa-7500

Just one device Isa-7500 extinguishing fire oil tank for 5 000 tons.

Just two devices Isa-7500 extinguishing fire oil tank for 20 000 tons.

Video action Impulse Storm-A technologies HERE