Conception
Development of Pulse Powder Fire Extinguishing

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1. Modular principle of arranging the future of fire prevention systems

Fire is a widespread natural calamity, causing huge damage and killing thousands of human lives. More than 15,000 people have been lost in fires and damages to property more than 5 billion rubles have been caused in our country for a year. Apart from it, fires cause huge harm to the environment. That's why, development and improvement of the means preventing objects of industry public amenities, municipal services and transport from fire are actual problem.

As shown by many years experience, the main factors defining timely smothering of arising fire seats are effectiveness, fast-action, independence and trouble-free operation of fire extinguishing means during a long service life within a wide temperature range of use with minimal costs (expenses) for their maintenance. Also, fire extinguishing means should have low cost acceptable for mass consumers. However, the existing means of fire prevention do not meet the above requirements in full measure.

Nowadays the most widespread means of fire prevention are fire extinguishers. To a considerable extent, it is connected with their low cost, acceptable for consumers. However, effectiveness of their use is limited by the fact that they should be used by people near the fire who know how to use them, take stock of situation and make the most optimal decisions. Any delay or mishandling of fire extinguishers can cause abrupt increase in burning surface and change a fire seat into a large-scale one when the use of fire extinguishers becomes useless.

The existing means of fire signaling do not extinguish fire but they only sound an alarm. In this case the efficiency of appearance the fire will depend on the arrival time of the fire brigade at a fire seat and the rate of fire propagating at this time. The existing traffic jams on roads and near burning buildings or lack of good roads in remote settlements make the signaling system quite ineffective. This is corroborated by the tragic accidents that took place in Vladivostok and Krasnodarsky krai.

Common use of complicated stationary automatic systems of fire extinguishing is impossible because of their high cost.

So, to prevent fire centers the use of inexpensive independent (from external power supply units) module means of fire extinguishing at the objects protected is most advantageous.

2. Advantages of powder fire extinguishing means

Among the existing means of fire extinguishing-water, foam, gas, aerosol and powder – the powder ones have a number of important advantages. They are universal, have high efficiency and low cost. Unlike the systems of volume fire extinguishing (gas, aerosol), they do not require the tightness condition of the objects protected and piping arrangement to supply fire extinguishing powder inside the object, and, in contrast to the water and foam ones, they have far wider operation temperature range (especially in the field of low temperatures) and long service life. At the same time they do not cause any pronounced damage to the surroundings, do not contain toxic ingredients and can be used practically at any objects.

So, it is powder fire extinguishers that are the most widespread means of extinguishing fire seats; they constitute over 60% of all extinguishers produced in the world.

3. New generation of powder fire extinguishing modules on the base of achievements of defense industry

The fire extinguishing modules (MPP) developed abroad are low-efficient. So, for example, 4 lit module of Chinese production smothers a fire seat at an area of 4 sq. m, 4 lit module (South Korea) smothers at 10 sq. m, 6 lit module (India) extinguishers at 3 sq. m. This is quite inconsistent with the present knowledge of high potential effectiveness of powder fire extinguishing substances. The cause analysis of low efficiency of foreign modules showed that the structure of gas-powder jet thrown out of them does not provide the necessary high concentration of powder, high head and the proper velocity of gas-powder flow to provide its permeation to burning surface through upgoing turbulent

streams of combustion products arising during the fire. Practically all the modules produced abroad are articles of pumped-in types. To avoid gas leak during storage the level of operating pressure is set to be equal to 8-12atm, and output holes intended to outflow fire extinguishing powder have small cross-sections. An increase in gas pressure and cross-sections of outputs runs with the following essential complication of modules construction and rise in their prices, respectively. Accordingly, these articles have consumption characteristics of fire extinguishing powder not enough for effective smothering of fire seats.

Having deeply studied the development state of fire extinguishing means and having analyzed their advantages and drawbacks, ZAO Istochnik Plus using the latest achievements of defense industry have developed and put into serial production a wide range of quite new, universal and inexpensive, acceptable for consumers the fire extinguishing modules MPP Tungus. While in stand-by for 10 years without maintenance, in case of arising fire seats the MPP Tungus independently with high efficiency and reliability in self-contained mode smother them at their early stage and keep them from changing to a large-sized fire.

High technical, technical and economic and performance characteristics of modules were achieved due to using in them:

- low-temperature gas generating devices developed on the base of modern solid gas generating composites, named cold gas sources (CGS) that keep up in them advantages of special products produced by defense industry and at the same time contain in principle new features that open new possibilities for civil goods;

- fine-grained fire extinguishing powder ISTO-1 of own development with improved performance (warranty storage term 10 years and working temperature of minus 60 to plus 90ºC that smothers fire seats both in surface area and in volume).

CGS provide high dynamic performance of fire extinguishing jet necessary for fire extinguishing powder to fall on the burning surface and smother fire seats effectively. And the powder particle size distribution provides long retention of the necessary fire extinguishing concentration.

The MPP Tungus are universal fire fighting means smothering fires of practically all classes except for smouldering materials. The modules are superior to other types of fire extinguishing means, both domestic and foreign analogues. One module equipped with 10kg powder is capable of smothering fire seat at the surface area to 80m^2 , in volume to 216m^3 and from a height to 16m.

Unlike other modules produced in our country, the MPP have extended operation temperature range of minus 60 to plus 90°C and can be used practically in any climatic regions, are pulse action articles and can extinguish electric equipment under voltage without taking into account the value of breaking voltage; are activated from electric signal of low power (starting current 120mA), as a result of it, they are simple in design and their fail-free operation has been kept for 10 years. They do not require special conditions of application (tightness of rooms, piping arrangement. They extinguish fire seats both in closed rooms and open areas. There is no pressure in the modules in the course of operation, it appears only in sending a starting signal to the module, so they are safe during operation and storage.

Owing to their independency and fast-action the MPP Tungus smother fire seats at early stages of their arising without people's participation. The modules Tungus are reusable articles and can be reloaded at anynnn service stations of fire extinguishers.

Depending on construction version the modules can be set out vertically, horizontally or inclined (under a slope) and provide ejection of fire extinguishing powder in any direction and at any orientation of powder jet in space. In connection with this the opportunity of forming shadowy zones is ruled out, due to it the possibility of the fail-free smothering of the rooms piled with equipment or objects with a complicated shape increases greatly.

At present in ZAO Istochnik Plus 36 versions of the MPP Tungus are being produced serially, including:

- pulse action modules with the help of which under the fire safety Standards NPB-88 it is possible to extinguish electric equipment under voltage without limitation of the breakdown voltage value;

- heat-resistant modules with operation temperature of minus 60 to plus 90°C having no analogues in the world practice;

- fire/explosion-proof modules allowed by ROSTEKHNADZOR for use at fire-and explosion-hazard petroleum chemical and processing objects, mines and pits;

- self-triggering fast-action modules equipped with flame sensors provide detecting and smothering fire seats for several seconds from the moment of their arising;

- portable self-triggering floor-mounted modules that do not require assembly and design working activities;

- high-altitude modules smothering fire seats from a height to 16m;

- module with adjustable angle of powder supply that can extinguish fire seats at any point of the object protected from a height to 16m and at a distance to 14m.

Eight versions of the MPP Tungus have been put into mass production, including:

– small-size module Tungus 0.65 for fire prevention of electric cabinets and boards;

– module Tungus 2 has been developed according to the recommendations of Mosenergoproekt to protect no-go cable channels and also stalls of garages and buildings;

– modules Tungus 4, Tungus 6 are used for smothering fire seats in buildings in various purpose open areas;

– module Tungus 9 is a high-altitude module to smother fire seats at production facilities;

– module Tungus 10 extinguishes fire seats in vertical cable channels and in the rooms with complicated shape equipment;

– module Tungus 10st with adjustable angle of powder supply to extinguish warehouses, storages, hangars;

– module Tungus 24 to protect cable channels with cross-section to 2.2×2.2m with length (to 32m); the module cost is one-third as much as the same of analogues having equal performance in fire extinguishing efficiency.

Construction embodiment of modules of the range presented provides its equipping with units of fastening to the walls or ceilings. Thus, by equipping the fire extinguishing

system with a suitable number and the necessary range of modules, the opportunity of protecting any in purpose and shape objects from power distribution cabinets 1m^3 in volume to warehouses of hundreds cubic meters in volume at a height to 16m.

Modular construction principle of pulse powder fire extinguishing makes possible to change its configuration according to the Customers request, gives opportunity of increasing the existing systems of fire prevention. The prospects of integration of the system of pulse module powder fire extinguishing into a single system of fire prevention at the enterprise are shown by application experience of the modular system at different industrial enterprises.

4. Self-contained fire extinguishing setup (AUPT) using the MPP Tungus and starter USP-101

The AUPT is intended to detect automatically and liquidate fires in closed volumes at the early stages of igniting.

The setup consists of one (or a few in the loop) device USP-101 and the MPP Tungus. Depending on the volume protected the MPP Tungus of various production capacities can be used (See table):

MPP type	Direction of spraying powder in space (height, m)	Volume protected, m³	
		Fire, Class A (solids)	Fire, Class B (POL)
Tungus 0.25	any	2.4	1.2
Tungus 2,0	any	38	8
Tungus 4	top-down (2-9)	100	20
Tungus 6	top-down (2-9)	150	33
Tungus 9	top-down (2-13)	171	42
Tungus 10	bottom-up (15)	216	75
Tungus 10st	any (to 16)	to 240	to 53
Tungus 24	horizontal	250	40

Independent signaling/starting devices USP-101 respond to the heat of fire, operate when reached a certain threshold temperature. At that time powerful electric current pulse (not less than 3A with a length 1ms) starts the MPP Tungus. One device USP-101 can start to 8 MPP at a time, the length of connecting wires with cross-section 0.5mm² being to 50m.

The signaling/starting device USP-101 for 10 years of operation showed high reliability without any false responses in the most heavy-duty conditions of operation: in vibration (moving railway transport) and in electromagnetic radiation (in retransmitters, at modular electric power stations).

Reliable and easy-to-use in the starter USP-101 operation is achieved due to science-intensive materials-thermo-sensitive metals with shape memory fabricated in Tver State University and enterprises of SB RAS.

The whole process from the moment of detecting fire to its smothering takes less than 1 min.

If necessary, it is possible to set additionally a manual starting device and send a signal about responding the setup to a sound alarm and/or to the guard central control board.

Besides, the setup can be made portable: completely assembled in factory conditions on a separate metal framework. To put it into stand-by, it is necessary to shift the toggle switch into working position.

The advantages of such self-contained fire extinguishing setup are as follows:

- smothering ignitions of various materials, including solids, liquids, gases, electric plants under voltage;

- long service life (warranty term without maintenance is 10 years);

- energy-independent (operates without power supply units);

- fast-acting (ejection time of fire extinguishing powder is less than 1s);

- no fire alarms and automatic devices (no delay to start the system of fire extinguishing);

- operating temperature range of the MPP and USP-101 of minus 60ºC to plus 90ºC;

- four values of the threshold temperature of responding USP-101 (45ºC, 72ºC, 93ºC, 110 ºC);

- high noise stability, vibration- and shock- proof;

- low cost;

- easy-to-use.

Erection of independent fire extinguishing systems does not require special training of fitters and is made with the help of common tools. During the whole service life only the MPP and USP-101 are inspected visually and the integrity of electric connections is checked periodically.

The cost of independent fire extinguishing setup as a part of 1 MPP Tungus and 1 USP-101 does not exceed the cost of a mobile phone.

Low cost and high performance of the MPP Tungus and USP-101, their fail-free and energy independence, long warranty term (10 years) make possible their mass application.

5. Variety of problems solved with the help of the MPP Tungus and AUPT on their base

The products fabricated by the enterprise find wide application on the whole territory of Russia, and also in China, Mongolia, Nigeria, CIS countries to prevent various purpose objects from fire.

More than 600 enterprises and organizations of Russia, CIS and foreign countries are the products Customers of these products. The modules are widely used in China for fire prevention of objects of metallurgical enterprises and electrotechnical corporations. In 2008 one of the Chinese representatives suggested using the MPP Tungus for fire prevention of objects of the Asian gas pipeline that will be laid through the territory of Kazakhstan and Uzbekistan, from the Caspian Sea to China. The representatives of Mongolia also suggested using the MPP Tungus for fire prevention of ore-dressing and processing enterprise that is being built.

The main trends of using the MPP Tungus are shown in Annex.

6. Readiness to realize the articles developed

At the production facilities of FGUP FR & PC ALTAI production of modules with annual output 180 thousand items has been put into serial flow-line production. The manufacture of modules has been certified by SOUYZSERT (Certification Agency) for the correspondence of the system of quality management of enterprise to the requirements of GOST P ISO 9001-2001. High quality of products is provided by step-by-step control of modules at all stages of production by high-skilled specialists of the Quality Control Department of the defense enterprise FGUP FR & PC ALTAI.

At present ZAO Istochnik Plus is the only enterprise in our country manufacturing modules with 100% equipping of articles with loading elements, assembly units and parts of domestic origin.

The MPP Tungus have got the following documentation:

- Certificates of Conformity and Fire Safety from POZHTEST FGU VNIIPO MCHS of Russia (Moscow);
- Certificates of Certification authorities EnSERTIKO;
- ROSTECHNADZOR Authorization to use the MPP Tungus at fire- and explosion- hazard petroleum chemical and processing objects, mines and pits based on the Resolution of NANIO TSSBE;
- Authorization to apply at railway objects, based on expert's report of FGUP VNIIZHT (the MPP range is included into the Specialized Collection … of OAO RZHD).
- Sanitary-Hygienic Resolutions confirming the ecological safety and possibility of their using practically at all objects.

7. Recognition

The modules Tungus were highly appreciated by the heads of MCHS RF, MCHS Mongolia, Moldova, fire prevention authorities of India, the Russian Embassy in Mongolia, representatives of Finland, Estonia, Heads of Siberian and the Far East Regional Centers of MCHS RF, and also directors of domestic enterprises, in particular, of Concern KAMAZ, demonstration tests with the help of the MPP Tungus have been shown

to them. The scientists of France, England, Italy, USA at the International Conference "High Energy Materials", Arkachon (France) showed great interest in the MPP Tungus.

The products of enterprise have been awarded 11 Gold Medals of the All-Russian Exhibition Center, Siberian and Altai Fairs, the Diploma of the National Prize "For Strengthening the Security of Russia", and many other Diplomas of the International Exhibitions.

ZAO Istochnik Plus was awarded Great Gold Medal "Gold Mercury-2007" of the National Prize of the Chamber of Commerce and Industry, Great Gold Medal "European Quality", awarded the titles "Laureate of the Russian Economy in 2006" and "Sales Leader-2006 in the Field of Rescue and Fire Extinguishing Means", "The Winner of the Regional Competition", the Best Industrial Enterprise of the Altai Region-2005, 2006, 2007" presented with the Challenge Banner of the Altai region and Diplomas of the Regional Administration. For great contribution in the protection of the population and territory from extreme situations of natural and technogeneous character ZAO Istochnik Plus has been awarded the Diploma of the Headquarters of the Siberian Regional MCHS Center of Russia.

ZAO Istochnik Plus closely collaborates with the MCHS RF that accredited our enterprise to provide the national security of objects and population of the country. It is the member of the Manufacturer Union of the Administration of the Altai Region, Chamber of Commerce and Industry, International Association SISTEMSERVIS, Association of Security Enterprises of the Siberian Region, World Academy of Sciences of Complex Security.

Conclusion

The MPP Tungus is the universal means of fire extinguishing that smother fire seats in independent and self-operating modes at the early stage of their appearance.

In their technical, economic and operating characteristics the MPP Tungus are much more superior to home-made and foreign analogues.

Compared with other types of fire extinguishing means they have higher efficiency. They do not require special conditions of application (high tightness of rooms, piping

arrangement, special temperature range of operation). They can be used for 10 years without technical maintenance, and are acceptable for consumers.

In their functional possibilities they are far more superior to the widely used in practice manual means of fire extinguishing and can be their worthy alternative.

Owing to it they have the widest possibilities for fire prevention of various purpose objects.

Annex

5.1 Fire prevention of garages

Fires develop into large size very fast, they are accompanied by explosions of petrol tanks, gasoline cans and gas cylinders, all types of available combustibles create additional danger for operating fire brigades.

Garages fires create ecological danger for neighboring houses.

Fires cause irreplaceable harm to owners and other people.

Large quantity of objects does not make possible to apply everywhere stationary automatic fire extinguishing systems due to their high cost and power unit limitations. Garage premises refer to non-residential ones. So, according to NPB-88-2001, NPB -PO-90 and SNIP 21-02-99 it is recommended that independent (self-operating) fire extinguishing setups should be used in garages. This makes possible to use AUPT developed on the base of the MPP Tungus in large quantities (only in Moscow more than 5 mln. cars in garages), essential economy due to the scale of application will be achieved. This is energy-saving technology. If assume, that the automatic system of fire extinguishing consumes 100W, the use of AUPT to protect the garages of Moscow will give economy in additional power on the order of 500MW.

The built-in garages of cottages of the USA Embassy in Russia are equipped with these AUPT setups. The tests carried out by the officers of the Embassy before erecting were the criterion of choice.

5.2 Fire prevention of technical and auxiliary rooms

Most fires occur in the rooms used seldom. As a rule, these rooms are small, and the process and life-support equipment is usually placed there. Staff work in these rooms when performing routine maintenance, the rooms have signs “No trespassing”, “Danger, do not enter”, etc.

The equipping of auxiliary rooms by stationary automatic systems of fire prevention is limited on the base of economic reasons. Essential financial costs would have required for their installation both for developing systems and maintain them in working conditions as without maintenance all initial costs can be considered lost in a year or two. Besides, for the proper workability of stationary automatic systems it is necessary to provide uninterruptible power supply but this is practically impossible. For example, in the most fire protected country Sweden where all rooms are fitted with automatic systems of fire extinguishing 85% fires occur in the result of mains interruption.

5.3. Fire prevention of buildings

The statistics show that the highest number of fires occurs in buildings and more 70% in uptown, and 88-90% of the dead and 70% of the injured fall on fires of uptown. More than 50% fires appear in connection with faulty electric equipment. Fires in schools, nursery schools, sanatoriums, medical institutions cause profound concern. In most cases their fires arise in auxiliary rooms, cellars and attics difficult to access.

In case of facing the building with combustible composite materials the fire can move not only upright but down along the building facade. For example, during the fire that took place in the office building of Astana the fire from the roof achieved the lower floors in a few minutes. The absence of efficient measures to smother fire can cause irreversible effects: fire propagation throughout the building and prevent people from evacuating.

According to the reasons stated in Section 5.2, the use of automatic stationary systems of fire extinguishing in auxiliary rooms is practically impossible. So, in these cases it is the most expedient to use the self-contained or self-triggering MPP Tungus.

Smothering fires on the upper floors of buildings is extremely difficult. Connection to water supply points and laying fire hoses, opening doorways take a lot of time in the course which fire can destroy a building completely. In these cases it is far more efficient to supply fire extinguishing substances through windows with the help of automatic ladders, bent lifts and also by throwing containers or grenades with fire extinguishing substances inside the rooms.

Today our enterprise is ready to develop fire extinguishing means delivering fire extinguishing substances directly into the fire seat and start up them into operation without using lever devices, for example a cock (it can be replaced with the button initiating CGS). The rest - increase in pressure in the barrel, ejection of fire extinguishing substance - will be made automatically.

5.4 Fire prevention of building service rooms, shift trailers, worker huts (including warehouses) at building sites and distant areas

The main problem of fire prevention in temporary building objects is their remoteness and operation time constraints of prevention systems, necessity of dismantling and transferring to other objects. In this case the removable AUPT completely assembled on the metal case (See above) are capable of providing fire prevention.

To transfer a signal about responding AUPT to guard control board and/or a sound alarm, the means of the radiosystem Strelets that has the transmission range to 6km with 6 retransmitters that allows protecting an object at surface areas more than 50ha without using wire communication can be used.

The radiosystem Strelets has high interference immunity from electromagnetic noise that has been validated by the practice of its use for 5 years without any false alarm at the power substations of Moscow and the Moscow region and traction substations of Oktyabrskaya railway.

5.5. Fire prevention of electrotechnical equipment positioned in cabinets, transformer substations, cable channels etc.

According to the statistics more than 50% fires in houses and in public buildings occur due to faulty equipment, most of all from cables, wires and wiring things of power supply circuits.

The main causes of fires arising from electric appliances and equipment are:

- limited range of their service;
- deviation from fire safety requirements while developing, designing, assembling and operating.

Many years experience confirms high efficiency of using the MPP Tungus for fire prevention of electric equipment. The MPP Tungus-0.65, Tungus-2 are used to protect the electrotechnical equipment in cabinets depending on sizes of the volume protected.

The MPP Tungus-2 is recommended for OAO Mosenergoproekt to protect no-go cable channels from fire.

The MPP Tungus-6, MPP Tungus-9, MPP Tungus-10st, MPP Tungus-24 are used for fire prevention of transformer substations and cable channels with cross-section to 4.5m^2 at a distance to 32m and the MPP Tungus-10 for a vertical cable channel 15-20m high.

The MPP Tungus are widely used to prevent from fire electric equipment, distribution and measuring devices, electric control unit and transformer substations at the objects of oil and gas industry (project OAO NefteGazProekt, Tyumen), cable channels and buildings at Magnitogorsk, Nizhnii Tagil metallurgical works, Serov zavod of ferroalloys, Ust-Kamenogorsk heat power station, cable collectors and traction-reducing substations in Moscow and Novosibirsk undergrounds and also diesel-generators, diesel-generator rooms, boiler houses, mini-boiler houses and diesel-electric power stations of a container type.

5.6. Fire prevention of typical MPS objects

In accordance with the Expert Resolution of FGUP All-Russian Research Institute of Railway Transport OAO RZHD confirmed expediency of using the modules of powder

fire extinguishing (MPP) Tungus for fire prevention of electric signal boxes, high voltage chambers, diesel rooms, traction and transformer substations and also common purpose industrial enterprises, the following in accordance with VNPB-2. 02/MPS-02 refers to:

- Workshops, divisions and sections common for works to repair rolling stock;
- Workshops to repair rolling stock: passenger cars, refrigerator cars and diesel-train cars;
- Workshops to repair electric locomotives, diesel locomotives and powered cars of diesel-trains;
- Repair depots for passenger cars, refrigerator-cars, electric locomotives, diesel locomotives and motor-car sections of electric- and diesel-trains;
- Container depots;
- Wheel repair workshops;
- Premises of objects and enterprises of railway transport, including energy equipment and common technical rooms, warehouses, laboratories;
- Special objects and premises of railway transport, including:

a) Washing-steaming stations, workshops to fabricate glue-bolt insulating rail joints, objects of railway;

b) Works to fabricate spare parts and switch equipment;

c) Enterprises of handling and commercial activities.

Besides, in accordance with the List of Technical Means of Automatic Fire Extinguishing, Guard and Guard-fire Alarm Recommended for Use at the Objects and Rolling Stock of the Railway Transport of OAO RZHD approved on June 7, 2007, the MPP Tungus-2, Tungus-4, Tungus-6, and Tungus-24 are allowed to be used at the railway rolling stock.

The effect component of introduction of the AUPT based on the MPP Tungus and the thermal starter USP-101:

- totality of common object characteristics makes possible to unify the system of fire prevention of typical RZHD (railway) objects;
- reduction in automation range reduces the volume of spares storage;

- absence of batteries and other power supply units significantly reduces the volume of technical maintenance, eliminate the battery replacement, does not increase the power of charging stations, etc.

At present in accordance with the recommendations of OAO RZHD the technology of preventing from fire electric cabinets STSB, KTSM posts, diesel rooms, traction and transformer substations, POL storages.

5.7. Prevention of storages and production premises from fire

Significant industrial and economic growth in the country provides further demand for qualitative storage and production surface areas with high ceilings. At the same time demand always exceeds proposal and is going on to be high: the surface area of most storages planned to be introduced from 2007 till 2010 will be more than 10,000 square meters and the height will be on the level of 12-15m.

In accordance with item 1.2 the norms and rules of design given in NPB 88-2001* do not cover the design of automatic fire extinguishing setups for storage buildings with the height of stacking more than 5.5m. At first, this is connected with the fact that high racks form big shadowy zones where traditional calculation methods and the MPP positioning at the object to be protected are not acceptable.

On the other hand, according to the requirements of NPB 110-03 protection of storages with automatic fire extinguishing setups, including with the height of stacking more than 5.5m, is necessary. The features of these storages are high altitude of rooms (to 16m inclusive), positioning of racks with their height practically to the ceiling, narrow passages between racks, rooms available both with heating and without it.

To solve the problems of fire prevention of storages ZAO Istochnik Plus has developed and put into production a wide range of the MPP Tungus.

The advantages of the MPP Tungus-10 compared with other types of modules are:

- placing of the MPP on the ceiling, wall, horizontal or inclined plane;
- spraying the fire extinguishing powder jet at a various angle;
- height of setup is 16m;
- surface to be protected to 80m^2;

- volume to be protected to 240m^3;

- surface area to be protected during local fire extinguishing at a distance to 12m, in the horizontal position to 14 m^2;

- the rack surface to be protected at local fire extinguishing to 36m^2;

- the rack volume to be protected at local fire extinguishing to 54m^3.

Owing to its versatility in application at the objects to be protected the MPP Tungus-10 has no analogues.

The use of the MPP Tungus providing the supply of fire extinguishing powder to fire seat in any directions avoids the formation of shadowy areas and due to it increases the reliability of smothering fires, extends their functional possibilities and the field of application.

The typical examples of using the MPP to protect warehouses are given on site www.antifire.org. If any, the specialists of ZAO Istochnik Plus will help the design organization interested in the choice of the MPP type relative to a specific object, in calculation of their quantity necessary for this object and layout scheme.

5.8. Fire prevention of remote settlements

The main problems of providing fire safety in Russia are connected with complicated fire preventing situation in the country in all regional centers. The half of all fires and losses from them and more than 60% death toll (it is approximately 8 thousand people) fall on the part of population living in these settlements (approximately 34 million people or 27% of the total number).

Mainly, it is connected with remoteness of rural settlements from fire brigades (more than 3km). Low efficiency of fire brigades arrival at fire seat depends on bad roads. Technical possibilities of small settlements are limited, so fires are smothered by anything available. As a result of it, they are constantly under threat of large fires, and the source of them can be, in particular, forest fires.

In accordance with the technical regulations put into effect the time of the first fire brigade arrival at the fire seat for rural settlements is 20 minutes. It is not difficult to imagine what will remain from a house of wood in the village in 20 minutes.

In connection with this, it is supposed to provide settlements with inexpensive (far cheaper than knapsack setups) modular fire extinguishing setups of the MPP Tungus-24 and MPP Tungus-10st types mounted without any difficulty on tractors or trucks available in settlements. In operating efficiently the fire seat can be smothered by a single shot of the MPP Tungus-24 and in some cases the further development of fire can be stopped or extinguished finally by any means at hand, or suppressed until arrival of fire brigades.

5.9. Fire prevention of gas industry objects

Fires at gas industry objects have high velocity; fire propagates like avalanche and the loss is estimated in hundreds of million rubles. The application of effective systems of fire prevention with minimal time of their operation is of great importance in these conditions.

The fire fighting at these enterprises by traditional methods (water, gas, foam) is ineffective due to low rate of filling the whole room with fire extinguishing substance supplied through pipelines.

Departmental standards of OAO Gazprom banned the application of foaming agents and aerosols in conditions of compressor stations directly. Fire extinguishing setups using fine-sprayed water are unpromising for protecting complex gas preparation plants (UKPG). They cannot be used at minus temperatures as it is necessary to assemble filters to clean water from mechanical inclusions.

The systems of gas fire extinguishing using CO_2 and drencher setups with addition of foaming agent are the most widely used in gas industry. However, they have some shortcomings. In case of using gas extinguishing system with CO_2 if CO_2 percentage reduces in the room, burning can arise again. Electromagnetic, pyrotechnic and other complicated devices are used to start up the means of gaseous fire extinguishing. Setups with combined electro-pneumatic startup the workability of which cannot be controlled on erection, acceptance tests and further service are also in use. Nowadays, the systems of gaseous fire extinguishing remain the most expensive ones. The fire extinguishing system based on CO_2 should provide the specific system of staff survival and additional service.

Besides, it is necessary to have an additional building to store gas vessels and lay pipelines. The use of CO_2 in those cases when people happened to be in the room protected does not leave any hope for their rescue.

The application of the drencher system when foaming agent is added in water requires huge amount of water, at the same time its use does not guarantee the proper extinguishing in shadowy places.

Gazprom showed negative relation to means of powder fire extinguishing based on the fact that because of complicated configuration of the inside workshop layout of gas-pumping aggregates, powder systems do not provide 100% cover of burning surface, as a result of it, the extinguishing in the so-called shadowy areas will not be provided.

The modules of powder fire extinguishing Tungus developed in ZAO Istochnic Plus provide the supply of fire extinguishing powder in any directions by direct sputtering without using guide pipes that avoids forming shadowy areas. Besides, the use of the MPP Tungus provides:

- High intensity of supplying fire extinguishing powder into burning area and comparatively small amount (unlike other substances) necessary for smothering;

- Fast action caused by the fact that modules are directly at the object to be protected (the time of supplying powder reduces to minimum);

- High reliability owing to using parts developed on the base of defense achievements;

- High efficiency based on the use of the fine - dispersed fire extinguishing powder ISTO-1 that smothers fire seats both in surface area and volume;

- Low costs that are the smallest under the technology used in comparison with all types of fire extinguishing systems. Modules can be installed with the lowest erection and economic costs without the main production shutdown. Also, the use of modules makes possible to remove the problem of technical maintenance;

- They are 2-3 times cheaper compared with the existing analogues.

Our enterprise can develop modules with the required technical and operation characteristics for fire prevention of gas industry objects.

At present the MPP Tungus is being used for fire prevention of methanol pumping UKPG of Orenburg gas deposit.

5.10. Fire prevention of chemical industry objects

The powder fire extinguishing modules can be used for extinguishing:

- polymeric and oligomeric compounds that based on their fire- and explosion-danger refer to combustibles (PMS-20, SKTN, compounds);

- solutions where water-insoluble benzyl, toluene are used and water is not efficient for their extinguishing;

- solutions where completely or partly water-soluble process mixtures based on lower alcohols and acetone are used;

- for extinguishing highly inflammable liquids incapable of hydrolyzing by water and capable of hydrolyzing with formation of readily inflammable liquids.

According to NPB 110-03, rooms to perform paint-preparative and painting work should be fitted with automatic fire extinguishing setups independently of the room surface area. If the surface area of these rooms is 40% and more of the total surface area of this building, the whole building should be equipped by the systems of automatic fire extinguishing, except for the rooms stated in item 4 NPB-110-03. Drying chambers using highly inflammable and combustible varnish-and-paint materials are also subject to equipping by the system of automatic fire extinguishing.

5.11. Fire prevention of mines and drifts

The investigation of the fire occurred at Darasun mine showed that the fire extinguishing means used were not effective enough.

At present under the supervision of Rostekhnadzor there are 279 underground mines, 6435 opencast ore mines under the organizations of ferrous and nonferrous metallurgy and gold-mining industries, 1754 soil-conservation and crushing-and-sorting ore mills for initial processing of minerals, 218 objects of transport and special purpose underground building, and also opencast mineral mines (651 of them refer to dangerous production objects).

The tests performed in opencast mines of Novorosstsement confirmed the efficiency of using the MPP Tungus. On the base of test results Rostekhnadzor issued the Authorization for using the MPP Tungus in operating equipment in mines.

5.12. Protection of fire-hazard objects at open areas

The problem of the fire prevention of such objects is usually solved rather conventionally. If there are no stationary automatic (or triggered manually from the control board) fire extinguishing system, manual fire extinguishers stock is generated that can be used by the staff for extinguishing ignitions while they arise. However, the effectiveness of extinguishing by manual fire extinguishers is relatively low due to their low power and depends significantly on the size of fire seat and the rate of its detecting. The manual fire extinguisher can be used at small distances practically close to the fire seat, so, it is practically impossible to smother powerful burning fire seat manually. In these cases long-rang powerful fire extinguishing means are necessary.

The use of the powerful MPP Tungus can be the solution to the extinguishing problem of objects ignitions at open areas. The range of ejecting fire extinguishing powder of the Tungus-10st and Tungus-24 is 15 and 20m, respectively, the surface area protected being 14m^2.

5.12.1. Fire prevention of gasoline stations and oil cargo piers

With yearly growth of cars number the network of gasoline stations both at outskirts and directly in settlements, town residential communities is getting more and more. Modern gasoline stations meet safety requirements. However, it is necessary to take into account the situation of accidental gasoline spill and its ignition directly at the site of fuelling transport at fuel filling columns or oil cargo piers.

The application of stationary automatic fire extinguishing setups makes possible to liquidate the fire in seconds.

To protect gasoline stations the automatic powder fire extinguishing setup (AUPPT) Tungus has been developed. Full-scale firing tests have been performed by the Committee of FGU VNIIPO MCHS Russia, ZAO SKON (Ekaterinburg) and ZAO Istochnik Plus

(Biysk) at the gasoline station model and the efficiency of the setup has been validated. Based on the results of the work performed recommendations to protect gasoline stations with the setup Tungus have been approved by N.P. Kopylov, Chief of FGU VNIIPO MCHS Russia. These recommendations can be applied for gasoline stations of any category with different height of installing the powder fire extinguishing module setup.

5.12.2. Fire prevention of oil industry objects

The MPP Tungus are used for fire prevention of oil heating units at Usinsk-Usa oil pipeline, oil cargo piers in Us-kut, and open diesel fuel storages in Yakutia.

Also they can be used for fire prevention of oil tanks. They can be placed near the tanks and provide powder supply through vertically placed pipes into the tank. For example, the module Tungus-10 ejects fire extinguishing powder upright at a height to 25m without using pipes and far higher than when used pipes.

The modules Tungus-10st can be mounted at a floating roof and eject powder inside the tank much earlier than steam-air medium under the tank lid will explode. The MPP Tungus-10st can be mounted on screw-clamps along the gap perimeter between the floating roof and the tank wall, on the tank walls behind the tank perimeter at a necessary nozzle angle relative to the liquid surface.

5.12.3. Fire prevention of the Far North objects

The main risks that threaten the security of the Arctic North and Yakutia are:

1. Disfunction of the fuel-energy complex.
2. Weak infrastructure of the transport network that makes difficult to operate efficiently in extreme situations.
3. No production sources of consumption reserves (food, building materials, medicines, oil products).
4. During the deliveries of goods to the Northern Territories (of Russia) large amounts of oil products should be delivered by boat and loaded for storage into tanks standing, mainly, on the river banks.

5. Severe climatic conditions when the ambient temperature in winter for a long time is within the range minus 30…50ºC and can achieve minus 60ºC.

All this put strict reqirements on providing fire safety of objects in these regions and on fire equipment.

The MPP Tungus most completely satisfies the stated service requirements, extinguishes fire seats at temperatures to minus 60ºC, and has reliability on the level of special articles developed by defense industry.

Based on the opinion of specialists of the enterprise Termnefteproekt (Krasnodar) there are great prospects in using powder fire extinguishing modules to protect objects in Siberia and the Far North where the use of water for extinguishing fires is complicated by rigorous climate.

5.13. Fire prevention of objects of the Defense Ministry

In accordance with the Task Federal Program the MPP Tungus have been introduced and are being introduced at the objects of the Defense Ministry of RF. In 2007 it was decided to replace the system of gaseous fire extinguishing at hi-tech objects of Strategic Rocket Forces (SRF) for powder extinguishing systems. At present this decision has been realized on the base of the MPP Tungus 6 and Tungus 10 at three objects of SRF (identification codes No515, No520, and No560).

This year R & D on creating independent device on the base of the MPP Tungus 6 and Tungus-10 to slowdown the fire propagation for protection of special article stacks stored in warehouses has been finished successfully.

There are great prospects in protecting ammunition storehouses that exist in large quantities both at the territory of our country and abroad.