

## **PFM-1 Mines Destruction Technology**

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Dear Co-Chairs,  
Ladies and Gentlemen,

In Nairobi States Parties to the Ottawa Convention agreed to support the investigation and further development of technical solutions to overcome the particular challenges associated with destroying PFM mines (Action # 14 of Nairobi AP).

The problem of PFM mines destruction is very serious. Only Belarus, Russia and Ukraine still have in total quantity approximately 20 million pieces of anti-personnel mines PFM-1 with a fluid explosive charge. Destruction of mines of this type can not be implemented without technology that is ecologically proved, safe as much as possible for personnel as well as highly productive.

There are **3 371 984** PFM mines in Belarus at the moment in following munitions:

- cassettes KFS-1;
- BKF blocks;
- reactive missiles.

Each mine contains approximately 40g ( 0,04 kg) of the fluid and highly dangerous explosive.

Elaboration of methods of mine destruction by specialists from Russia, Ukraine, Canada and Germany was based on technologies of mine burning and blasting, including its cassettes and blocks. By scientist's reports the enormous amount of the harmful and hazardous substances are released during the mine burning and blasting.

Forming of the:

- cyanides,
- dioxins, furans, phosgens, biphenyls,
- lead oxide and aluminum oxide,

comes as the result of the destruction process.

The level of environment contamination by open mine blasting in 50 meters-zone is **1800-2000** times higher then the corresponding maximum permissible contamination level. In Europe the permissible level, for instance for the dioxins is 0,1 nanogrammes per meter<sup>3</sup>, for the cyanides is less then 0,1 nanogrammes, it is equal for Russia, Ukraine and Belarus.

The Belarusian company " Stroyenergo " supported by the National Academy of Sciences of the Republic of Belarus went the other way, in which destruction process is based on another technological approach.

The **unit " Spider "** has been designed, developed, tested and finally offered to be implemented in its practical realization a new plasma chemical technology for the destruction of PFM antipersonnel

mines. This technology is not characterized by the disadvantages mentioned above and, in addition, it provides a very high capacity rate, that is estimated to be 480 antipersonnel mines per hour.

Here is the way of the procedure of the explosive substance extraction from the plastic mine body and its consequent destruction.

From the cassettes KSF-1 comes unscrewed electrical capsule barrels. Then the cassette gets inserted into the charging device of the explosion protection container and gets directed along the axle with a help of magnetic sensors. After that content of the cassette gets air-pumped into the case that's divided into two parts. Mine blocks are get supported by the pneumatic cylinder from the other side.

Then into the all 72 PFM mines simultaneously get inserted with the aid of pneumatic cylinders two needles with the 5 mm diameter. One of the needles connected to the vacuum collector, another one delivers alcoholic liquid for the compensation of pressure and phlegmatization of explosive substance.

It takes 2 minutes to extract liquid explosive that gets delivered into the receiver and then constantly gets air-pumped out through the other receiver into the plasmatrone facility # 1, in which takes place the process of the oxidizing pyrolysis of the liquid by the plasmatrone of 300 kW of power at the temperature over 4000° C. During this process of complete decomposition all chemical liquid compounds are turning into harmless compounds. The extraction of the explosive out of cassettes that are in BKF blocks and out of 26 mines that consists in every reactive missile 9M27K3 envisages by the same way with the insignificant differences.

From the plasmatrone unit # 1 formed gases get leaded away into the plasmatrone unit # 2 in which within 4 second period incineration takes place under the temperature over 4000° degrees.

In order to avoid the possibility of recombination of atoms into more complex compounds as well as the production of dioxins, biphenyls as well as any other similar compounds, the air-gas mixture gets delivered into the corresponding afterburning furnace for the further heat strengthening.

During the output from the high temperature zone the mixture is rapidly cooling and its atoms combine again and form neutral molecules of the simple stable compounds (such as CO<sub>2</sub>, CO, HCl, N<sub>x</sub>O<sub>y</sub> as well as PbO).

At the next stage, the process of the air-gas mixture cleaning and removal of the admixtures is taken place. After that the air-gas mixture is to be delivered through the corresponding spray trap into the plate-and-frame ion-exchanging filter, that is developed by the National Academy of Sciences of the Republic of Belarus for its additional purification and the removal of the nitrogen oxides as well as the other admixtures.

In order to ensure the performing the final sanitary cleaning, the technological scheme includes additional purification to ensure the entrapping of the residual concentration of the carbon monoxide. And only after the completion of the whole procedure cleaned gases are getting released into the atmosphere. The Spider unit is equipped with on-line monitoring system to control the amount of the harmful and hazardous substances in the waste gases.

Emptied cassettes of mines with detonators are going into a plasmatrone unit # 3, where they get paralyzed by the plasmatrone. Waste gases are to be transported into the plasmatrone # 2 where they are to be carefully burned out.

There is a system of the video control that is intended to perform a visual control on the unequipment processes. This system comprises four cameras in every essential point of viewing for insuring perfection of the whole destruction procedure.

Capacity of two “Spider“ unites is **920** mines per hour or **13 480** mines a day.

In the case of destruction of PFM mines in Belarus it would take **250** working days.

This new technology of PFM mine destruction is safe for the environment as well as for personnel.

“Spider“ unit comprises an explosion protection container specially calculated, designed and tested by the explosion of the 5,2kg of trinitrotoluene.

In 2005 proposed technology of mines PFM-1 destruction had been successfully tested in Republic of Belarus at special location of National Academy of Science and properly documented. Complete purification of the gases till the permissible level for the Belarus, Russia and Ukraine can be confirmed by documents and calculation reports.

This installation structure of ammunition discharging has been elaborated based on the invention of the citizen of the Republic of Belarus – Mr. Leonid Markovets, General Director of the Company “Stroyenergo” (Minsk) and patented as **“The unit for the unequipment of the ammunition“**.

Thank you for attention.