

NEW INGREDIENTS IN NITROCELLULOSE BASED PROPELLANTS

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In Sweden there is an ongoing effort to develop a new gun propellant for the Uniflex 2*, 155 mm modular charge system aimed for a new Swedish field howitzer Archer*. The Archer Artillery System is a 155 mm L/52 howitzer mounted on a modified articulated hauler. The system-solution features several advantages among which increased fire-power and mobility are a two.

The propellant charge first suggested for the Archer system was a bimodular charge system with two different propellants. This is a common solution that has several disadvantages in relation to a unimodular charge where all the modules are equal. To design a fully functioning unimodular system is however rather difficult, and numerous efforts has been made (by several manufacturers) to design such a system.

The use of new energetic fillers developed at FOI, makes it possible to tweak the burning characteristics in such a way that the design problem of a unimodular charge might be solved. A recent government funded project has addressed the possibility to develop a low sensitivity unimodular charge system where several propellant components have been up-dated.

After a screening of possible filler and binder systems, a system based on nitrocellulose (NC), guanylurea dinitramid (FOX-12) and energetic plasticizers was selected. The reason to select NC was price and performance whereas FOX-12 and NENA were selected due to the low sensitivity and good burning behaviours. Acardite II was the first choice of stabilizer and is considered among the best stabiliser for NC/energetic plasticizer systems. Acardite II is however, as many other well known stabilizers, known to form nitrosoamines when it reacts with the nitrous oxides formed in the decomposition of the propellant matrix. As nitrosoamines are infamous for their carcinogenicity a new group of compounds was investigated, not previously used as stabilizers for NC, namely phenyl aliphatic ethers.

In this work, the preferred phenyl aliphatic ether was 1,4-dimethoxybenzene. With this compound as a stabilizer, the propellant fulfils the storage stability test (STANAG4582) at

90 °C, corresponding to 20 years of storage at 25° C. The new compound is considered as a replacement stabilizer for diphenylamine derivatives used in NC-containing propellants.

The conclusion is that these new stabilizers have similar or better effect in stabilizing NC-based propellants than diphenylamine-derivatives and that they do not form carcinogenic nitrosamines.

* Uniflex 2 and Archer are both trademarks belonging to BAE-systems Bofors AB.