

Insensitive Ammunition for the Artillery

Dr. Paul Wanninger
Rheinmetall Waffe Munition GmbH

Dr. Almuth Kessler
Rheinmetall Waffe Munition GmbH

Dr. Alain Freche
Eurengo France

The requirements for insensitive Artillery ammunition are tough. Beside the acceleration and spin there is a lot of technical requirements to fulfill (fig. 2).

If you compare melt cast, cast PBX and pressed PBX for the use in an Artillery charge you will find a lot of disadvantages for the melt cast, e.g. the low melting point, the poor mechanical properties and the low initiation level. Also the melt cast charges are never homogenous, they have a high density gradient. For big charges like 155 mm only cast PBX charges with no density gradient and a high insensitiveness make sense (fig 3, 4).

The production of cast PBX charges can be done in different ways depending on the production rate. The use of I-RDX or SNPE and some special ingredients lead to a mixture with low viscosity and high homogeneity, despite the solid content of 90 % (fig. 5, 6, 7, 8, 9)

The GAP-Test gives a value about initiability of HE-Charges. Regarding the 25 kbar minimum of the WIWEB laboratory the values of RH 26[®] formulation are with 35 to 45 kbar in a safe field (fig. 10).

Last years we have developed two new artillery shells with ranges of 30 and 40 km. An additional requirement was the penetration of a concrete wall. With a special fuze we reached more than half a meter penetration in a defined reinforced concrete wall (fig. 11, 12, 13, 14)

During qualification we carried out all types of vulnerability tests with the new ammunition: Fuel fire in two directions, horizontal and vertical, bullet attack with two different bullets, soft core and hard core, shaped charge impact and sympathetic reaction.

Due for the storage of the shells in very short distance in the original pallet, the acceptor charge detonated simultaneously. To reach type III it would be necessary to reduce the performance of the formulation drastically, our calculation shows only with a loss of more than 50 % of the performance we can fulfil the type III requirement. To avoid sympathetic reactions there are other possibilities like shielding of the shells by pumice or similar materials (fig 15 until 28).

The insensitive behaviour of a charge is strong dependent on the mechanical properties, that means low Young's modulus and high elongation (fig 29)

The Rh 26[®] formulation is now used for two different shells with calibre 155 mm, mortar shells of 81 and 120 mm and for the 120 mm tank ammunition. A very special and cost effective way is to use the 155 mm howitzer on ships of the Bundesmarine (fig. 30, 31, 32, 33, 34).

The charge Rh 26[®] fulfills all the different requirements, a step forward to achieve IM for our troops (fig 35)