

## Write-up on

### “Development of High Explosive Formulation having high shock insensitivity, high velocity of detonation and high blast effects for filling PCB warhead of PJ-10 (BrahMos) missile”

#### Description of Technology:

The developed technology comprises of a high explosive formulation HEMEX having unique characteristics pertinent for filling Penetration cum Blast (PCB) warhead for PJ-10 (Brahmos) missile. HEMEX is a HMX based melt cast aluminized composition tailored to realize contrary property requirements of high shock insensitivity with high velocity of detonation (VOD) and high blast performance. The design parameters manipulated to realize these unique characteristics are selection of explosive and non-explosive ingredients, their proportion, particle size of ingredients, processing temperature and duration, viscosity, evacuation pressure and duration, casting method etc. HEMEX composition has a relatively high density of about 1.84 g/cm<sup>3</sup>, high VOD of about 7600m/s, and high shock insensitivity of 3.5 x 10<sup>3</sup>MPa compared to existing formulations for warhead application.

Vacuum casting method has been developed for HEMEX filling in the PCB warhead for PJ-10 (Brahmos) missile. The filling parameters like vacuum pressure and duration, temperature of melt, increment size etc. have been established to minimize defects in the filling. Casting under vacuum also helps uniform and homogenous flow of HEMEX melt in all the regions of the warhead.

#### Application Areas:

India & Russia have developed the Brahmos missile, a state-of-the-art weapon system, in joint collaboration. The PCB warhead of the missile is mainly designed for use against surface ships and may also be used to destroy other targets like air-force buildings and installations, naval bases, POL depots, factories, power engineering centers etc.

#### Its USP – such as Certifications and test results etc.:

The indigenously developed HEMEX filled PJ-10 (Brahmos) warhead has been exhaustively evaluated for blast and fragmentation parameters, environmental tests and mechanical qualification tests, fragment impact test, drop test and explosive train test. The warhead has passed all the tests. The HEMEX based indigenously developed warhead has been accepted for integration in the Brahmos missile.

The existing standard melt facilities available at ordnance production centers are suitable for preparation of HEMEX composition. The formulation may also find similar application in future military applications. The machinery and equipment required for filling of the warhead is indigenously available in India.

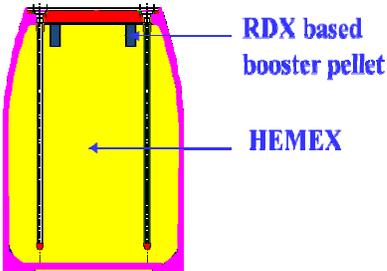
CQA(ME) has issued safety certificate for production of HEMEX composition and its filling of warheads.

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**Photograph of PJ-10 (BrahMos) Filled Warhead**



**Filled  
Warhead**



**Cut view  
Filled  
Warhead**