FORMULATION OF AN ENVIRONMENTALLY BENIGN EXPLOSIVE

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The development of new explosive formulations has historically been a difficult balance of trade-offs between performance and sensitivity. Sensitivity was evaluated to enable safe handling, processing and loading, as well as have reliable initiation. Assessments of performance would ensure that the desired outcome could be realized, whether blast, fragmentation, or other specialized effect. With ongoing emphasis towards Insensitive Munitions (IM), the sensitivity aspect has increased to include the response of explosives and munitions to external stimuli including bullet impact, fragment impact, cookoff (fast and slow), sympathetic detonation (or sympathetic reaction), and shaped charge jet impact. Formulations efforts were modified to evaluate IM qualities during early development. Formulations were further refined to be optimized for both performance and IM response. More recently, the environmental impact is being considered early in development. Environmental impact is considered in multiple phases of the life cycle for explosives and munitions that utilize them. Areas for concern include production of the ingredient, production of the formulation, loading of munitions, and the munitions use, specifically in the case of unexploded ordnance and low order detonations. A significant number of munitions utilize ingredients such as RDX and TNT, both of which are toxic and listed as possible human carcinogens. Recent efforts have utilized alternatives to TNT as the melt phase for melt cast explosives for both IM improvement and elimination of the TNT. Other efforts have evaluated RDX replacements as the high explosive used for performance and sensitization. This presentation documents some of the efforts and the developmental process utilized.