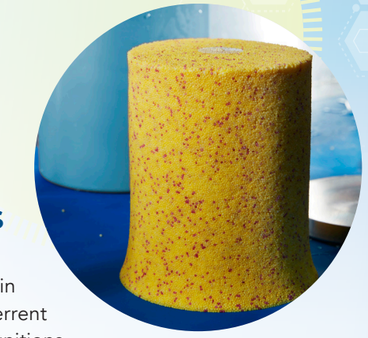

CRITICAL ROLE OF EXPLOSIVES

Chemical explosives play an integral role in the U.S. nuclear deterrent and conventional munitions. Manufacturing these key components in an efficient, agile, and response way is crucial to meeting evolving global security needs. Collaborative teams at EMDEC can also characterize and test HE materials, as well as evaluate new and emerging technologies and assess their potential impacts on production.

PARTNERING ACROSS THE EXPLOSIVES ENTERPRISE

EMDEC's enclave model provides a seamless partnership between NSE design and production agencies, aiming to improve responsiveness through increased collaboration and agility. Through innovation, development, and maturation of materials and manufacturing approaches, partnerships work to reduce the time to achieve high yield rate production. The collaboration also serves as a testbed for next-generation approaches and efficiencies.

In many cases, enclave partnerships include housing identical equipment at the design and production agency sites, allowing teams to co-develop technology approaches and production deployment. For example, LLNL and Pantex have identical HE mixing equipment, which enables each site to compare benefits of the new technologies versus conventional methods.

For more information on EMDEC: **sd.llnl.gov**

Lawrence Livermore National Laboratory

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Energetic Materials Development Enclave Campus

A manufacturing transformation partnership

EMDEC

WHAT IS EMDEC

The Energetic Materials Development Enclave Campus (EMDEC) is a manufacturing partnership that leverages a suite of capabilities at Lawrence Livermore National Laboratory (LLNL).

The enclave – located at both LLNL's Livermore campus and Site 300, its experimental test site– enables collaborative development and delivery of energetic materials and solutions for the nation's nuclear weapons stockpile.

EMDEC's capabilities span the full range of processes required to synthesize, formulate, fabricate, manufacture, assemble, and test larger high explosives (HE) and novel materials. It provides a collaborative space for Nuclear Security Enterprise (NSE) partners to address current stockpile manufacturing challenges, inform design decisions for warhead modernization programs, and develop next generation innovations in HE materials and manufacturing.

LEVERAGING DECADES OF SCIENCE & TECHNOLOGY INNOVATION

EMDEC leverages the scientific and technological underpinnings of LLNL and partner sites. The longstanding investments in materials science, chemistry, simulations, and experimental capabilities are leading to today's realizations, as well as future expansion of the enclave. EMDEC is already making significant contributions, and the impact will continue to grow as planned developments come to fruition.

SYNTHESIS AND FORMULATION

The west side of EMDEC encompasses the HE synthesis and formulation buildings. The mini plant and pilot plant are housed here, which are used for small-to-pilot-scale HE synthesis testing and safety assessments before scaling up. The HE slurry coater, another crucial capability for rapid formulation of HE composites at larger scale, enables efficient testing and development of concepts in support of the stockpile.

PRESSING, MACHINING, AND ASSEMBLY

The central area of the campus includes buildings for pressing, machining, and assembly, where explosive ingredients are prepared for integrated testing and qualification. HE powder is consolidated using heat and pressure to form a dense, explosive part. It is then shaped using lathes, mills, and saws to precisely machine the explosive. Finally, the part is assembled with support components.

ADVANCED MANUFACTURING OF HIGH EXPLOSIVES

The Facility for the Advanced Manufacturing of Energetics (FAME) is an emerging capability at EMDEC. New, first-of-their-kind technologies have been developed and implemented to safely 3D-print HE. These machines will support agile manufacturing developments for U.S. stockpile modernization.

CAMPUS GROWTH AND NEW CAPABILITIES

Expansion at EMDEC is designed to anticipate future needs, specifically in the areas of responsive production and safety. Recent breakthroughs in advanced manufacturing of HE will open new design options, optimize testing and validation, solve challenges, improve legacy processes, and reduce waste. The vision is to continue to grow new capabilities and advancements, such as prototyping and testing calibrated safety controls.

EXISTING ***EMERGING*** ***FUTURE***