

Response Surface Optimization of Manufacturing Munitions

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ABSTRACT:

Picatinny Arsenal has been tasked with developing Lead-Azide propellant for Army munitions. The process under investigation is physically smaller than what has previously been used and will incorporate newer technologies. The process settings and operations for this smaller process have not yet been fully characterized.

This research uses a statistically designed experiment to optimize the response surface of the process settings. The objective is to discover the ideal process settings that will produce a Lead-Azide that meets military specifications and is similar to the Lead-Azide produced by the original process. An optimal solution is required quickly; however, experimental runs can take as long as a week to run. Therefore, sequential and efficient experimentation is required.

This research problem has also been incorporated into the Mathematics curriculum at the U.S. Military Academy. The research is an excellent example of the usefulness of designed experiments and response surface optimization.

KEY WORDS: Designed experiments, response surface optimizations, steepest ascent, Lead Azide, Picatinny Arsenal, munitions, optimization, applied statistics, mathematics, curriculum.

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