



Energy Efficiency and Waste Reduction at Northrop Grumman

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Northrop Grumman



Company Description

- Defense, Aeronautics, Space, and Mission Systems
- Products sold to the United States and their allies

The Proving Grounds (TPG)

- Located in Elk River, MN; 65 employees on site
- Assemble and test ammunition and munition products
- The nation's largest privately owned proving grounds

Precision
Guidance
Kit (PGK)



B-2
Stealth
Bomber



Incentives to Change

Corporate Goals

- Northrop Grumman increases focus on sustainability improvements and reduction of its environmental impacts
 - Improve energy efficiency and decrease green house gas emissions
 - Decrease landfilled solid waste from testing

Align Facility and Process Sophistication with Products

- New product development requires a wide variety of facilities
- Product complexity demands rigorous testing



Ammunition Testing & Evaluation Process

- Ammunition is tested methodically on site to ensure safety, function, survivability, and accuracy
- Some testing involves “soft catching” the projectile to monitor on-board electronics and component performance
- A large quantity of fiberboard construction material bundles are used for soft catch tests
- Some can be reused, however most is scrapped and shipped out as construction debris waste



Approach to Soft Catch Testing

- Discussed overall soft catch testing process with the test engineers
- Reviewed past solutions and critical target material characteristics
- Observed range test set up and configuration
- Attended live soft catch ammunition testing
- Received input from experienced test technicians
- Collected information on raw material cost, weight, and resulting waste generated
- Brainstormed improvement opportunities with testing team



Soft Catch Considerations

- Raw materials needed and solid waste generated from process
- Material handling and projectile retrieval
- Projectile survivability
- Raw material availability and durability
- Storage of target materials
- Cost of materials, equipment, and labor
- Employee health and safety
 - Current material crumbles during handling and produces airborne dusting



<https://www.edcmag.com/best-safety-glasses/>



<https://www.health.ny.gov/publications/2805/index.htm>

Recommendation

Trial Recycled Crumb Rubber Material as a Potential Reusable Substitute for Soft Catch

- Crumb rubber is available in different specifications and sizes
- Sold and shipped in super sacks
- Can be stacked in a similar manner
- Many available handling solutions
- Crumb rubber can be reused by reloading it into a new super sack



<https://hapman.com/equipment-and-systems/bag-handling/bulk-bags/bulk-bag-unloaders/>



https://www.alibaba.com/product-detail/rubber-crumb-granules_50044931389.html



<https://www.nationalboxexchange.com/fibc-bulk-bags/>

Recommendation Benefits

Significant Reduction or Elimination of Landfilled Waste

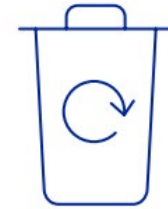
- Estimated reduction of 176 tons per year
- Crumb rubber can be reused and recycled for further testing
- Beneficial reuse of readily available waste stream/recycled tires

Improved Projectile Retrieval Process

- Eliminate current bundle material handling and storage challenges
- Many bulk material handling options readily available
- Crumb rubber available in different specifications and sizes

Reduces Projectile Testing Cost

- Save \$170,000 annually on material purchasing and waste disposal

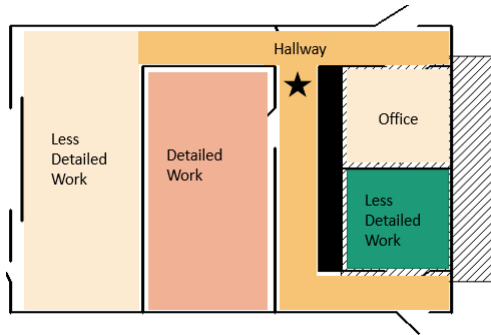


Solid Waste
Diversion

Energy Efficiency Recommendations

LED Lighting

- Accelerate LED retrofit across the site to improve energy efficiency and reduce green house gas production
- Lighting audit included improving lighting quality in critical areas



Compressed Air

- Utilize small dedicated air compressor for HVAC ties in explosive operations buildings
- Allows for shutdown of large process compressed air systems, reducing leak inefficiencies and wear of compressor cycling during off hours/weekends
- Promote reporting and repair of compressed air leaks

Solutions

Recommendation	Annual reduction	Total cost	Annual savings	Payback period	Status
Soft Catch Ammunition Testing Material and Procedure Update	176 tons	\$176,000	\$170,000	1 year	Trial Development
Compressed Air System Updates	194,000 kWh	\$82,300	\$45,300	6 months – 1 year	Recommended
LED Retrofit with Ballast bypass	154,000 kWh	\$70,800	\$24,100	3 years	Recommended

Personal Benefits

A Once in a Lifetime Experience

- Welcomed into the community
- Broadened horizons, industry and role outside of my studies in biomedical engineering
- Deepened respect for those who help defend the United States

