Corn Based Blast Media Project

Presented to:

NASA RAP/P2 Workshop

By:

Chuck Griffin, KT-A2

KSC TEERM Manager

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Agenda

- NASA TEERM
- TEERM Overview
- Coating removal with plastic media
- Coating removal with Corn Hybrid Polymer (CHP)
- Proposed Project
- Summary

What is NASA TEERM?

- NASA HQ established the Technology Evaluation for Environmental Risk Mitigation Principal Center (TEERM) (formerly the NASA Acquisition Pollution Prevention (AP2) Program Office) in 1998
- Identifies and validates sustainable environmental and energy technologies through joint activities
- Focus is environmentally-driven mission risk reduction.
- Efforts commonly involves two or more NASA stakeholders
- Collaborative approach benefits project members in multiple ways:
  - Resources are shared
  - Increases technical confidence
  - Improves the overall technical quality
  - Accelerates implementation

TEERM Partners

NASA:

- Shuttle Program
- Constellation Program
- KSC Corrosion Laboratory
- Regulatory Risk Analysis and Communication (RRAC) Principal Center
- Recycling and Affirmative Procurement (RAP) Principal Center

DoD:

- Joint Group on Pollution Prevention (JG-PP)
- Air Force Space Command (AFSC)

International:

- Portuguese Center for Pollution Prevention (C3P)
- European Space Agency (ESA)

Background on Current Coating Removal Method

- Plastic Media Blasting (PMB) is widely used in the military, aerospace and commercial sectors to perform coating removal as part of maintenance, repair, and overhaul activities.
  - PMB is economical
    - Historically inexpensive media (*tied to petroleum prices)*
    - Fast stripping rate
    - Dry process, so eliminates wastewater
    - Reusable
    - Recyclable
  - When properly used, PMB is safe on delicate/sensitive substrate
    - PMB is used to de-coat the Shuttle's Solid Rocket Boosters (SRBs), and is being slated for use under the Constellation Program.
  - If no post-blast chemical wipe-down performed, generates no Volatile Organic Chemicals (VOC) or Hazardous Air Pollutants (HAP)

Background on Current Coating Removal Method

- **Potential Problems with PMB:**
  - As higher air pressures are used for blasting, it can lead to reduced resistance to metal fatigue, the hiding and causing of surface cracks, and buckling. These problems have caused some controversies in the aerospace industry where materials such as aluminum and high-strength composites are required to carry dynamic or fatiguing loads.
  - One environmental disadvantage of PMB is that it is derived from a non-renewable source (petroleum).
  - Some operations still perform chemical (methyl ethyl ketone) wipe-down after PMB

Corn Hybrid Media

- **Potential Alternative to PMB**: Corn Hybrid Polymer (CHP) Media Blasting
  - Technical Benefits:
    - Uses similar equipment and techniques as PMB, but the media properties result in a gentle, reliable stripping action. Good for use on:
      - Thin aluminum, particularly soft alloys
      - Sensitive composites (e.g., fiberglass or aramid (Kevlar®)).
    - Because of CHP breakdown characteristics, CHP can potentially achieve longer product life and less frequent blast booth filter change outs
    - UV fluorescence aids inspection → may eliminate post-blast chemical wipe-down process

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Corn Hybrid Media

- **Environmental Benefits:**
  - Media is derived from renewable source (100% organic, non-toxic, and biodegradable)
  - CHP is anticipated to be approved as a USDA BioPreferred product.
    - Can help in meeting regulatory requirements as well as Section 9002 of the Food, Conservation, and Energy Act of 2008 (source: USDA BioPreferred Prog).
    - Midvale Environmental Technologies, the CHP distributor, has a recycling program where the used blast media is returned for recycling.
      - » The spent media is returned to the distributor, evaluated and recycled into a product called StarZorb.
      - » StarZorb is an absorbent used to collect hazardous waste
      - » After the StarZorb is used, a Treatment, Storage, and Disposal facility (TDSF) will properly remanufacture the product as an ingredient in cement.

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Corn Hybrid Media Regulatory Findings

- **States**
  - The Midvale Environmental Technologies/ADM CHP has been evaluated by several state environmental agencies relative to its recyclability under the Resource Conservation and Recovery Act
    - Florida Department of Environmental Protection (FDEP)
      - FDEP Variance letter regarding CHP recycling process
      - “The Department will concur that StarZorb is exempt from hazardous waste regulation pursuant to 40 C.F.R. 261.2(e)(1)(i) and (ii) only when StarZorb is used as an absorbent at the Continental Cement/Green America LLC facility of Hannibal, Missouri and is subsequently introduced to their cement kiln for clinker production.” (source: FDEP response for concurrence, July, 2008)
- **Federal**
  - USEPA has concurred with State findings on recyclability of Midvale/ADM CHP

Corn Hybrid Media
Prior Technical Work

- JG-PP Corn Hybrid Polymer Coating Removal on Delicate Substrates project:
  - Conducted by the United States Navy in conjunction with the National Defense Center for Environmental Excellence (NDCEE) and JG-PP
  - NASA TEERM monitored the effort
  - Corn hybrid blasting showed an acceptable stripping rate without damaging substrate surface
  - Based on the project findings, CHP was implemented at the Naval Submarine Base Kings Bay, at Robins Air Force Base, and at Fleet Readiness Center Southeast.

TEERM Proposed Project

- **Objective:** Determine if CHP qualifies as a “drop in” replacement for plastic blast media for NASA and other stakeholders.
- **Approach:**
  - ✓ Leverage completed technical studies and regulatory decisions related to corn hybrid polymer media blasting
  - – Identify interested team members (KSC, MSFC, USA, ATK Thiokol, EG&G, Yang Enterprises, ADM, Midvale Technologies to date)
  - – Identify critical performance requirements for coating removal and document in a test plan
  - – Facilitate testing
  - – Report results and conclusions
  - – Assist as needed with implementation

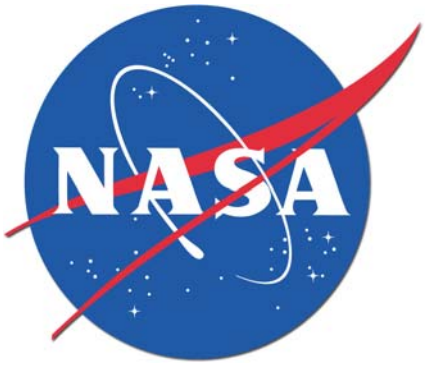
Summary

•Corn Hybrid Polymer media blasting is one example of a technology TEERM is evaluating for migration to NASA

•TEERM has the ability and flexibility to help NASA Centers and Programs potentially qualify environmentally preferable and lower risk materials for space and ground systems

• TEERM's value-added services comprise staying atop the latest technology developments and regulatory trends

Questions?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BACK UP SLIDES

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