Process of Transferring New Energetic Materials from Concept to Production at Holston Army Ammunition Plant

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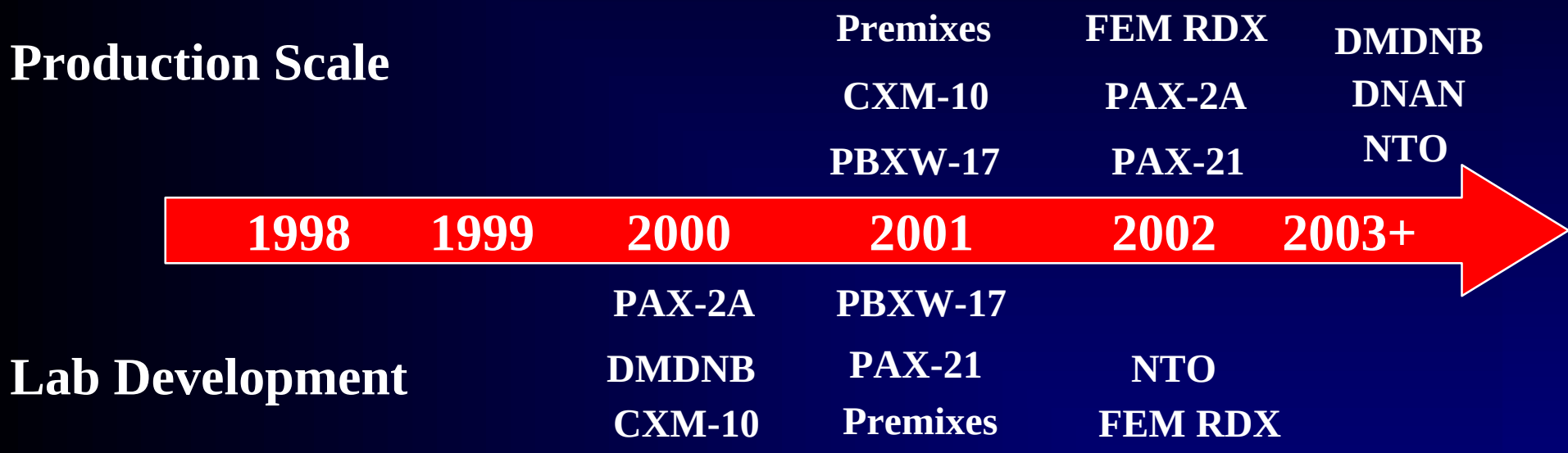
BAE SYSTEMS


HOLSTON
ARMY AMMUNITION PLANT
BAE SYSTEMS
U. S. ARMY MATERIEL COMMAND

HSAAP TRANSITION TO PRODUCTION TIME LINE



New Product Development

Quality Management Processes

- ✓ISO 9001 2000
- ✓Life Cycle Management
- ✓Six Sigma

Conceptual Process or Product

Management Review

Technical Review

Lab Scale Development

Scale-Up Activities

Full-Scale Production

Evaluation

Process / Product Improvement

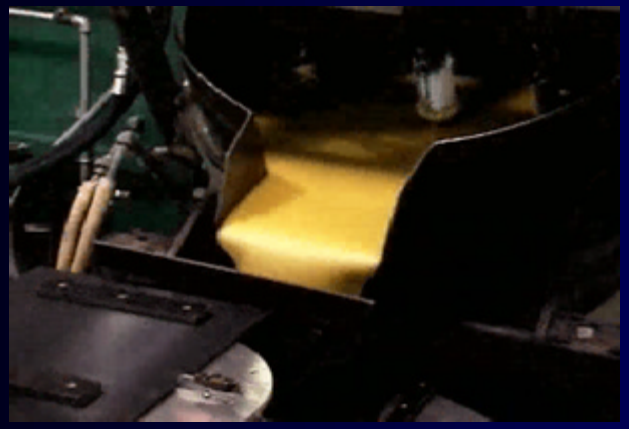
BAE SYSTEMS

Featured Products

- PAX-21
- FEM RDX
- DNAN
- HMX & RDX Premixes
- PBXW-17
- DMDNB
- PAX 2A
- NTO

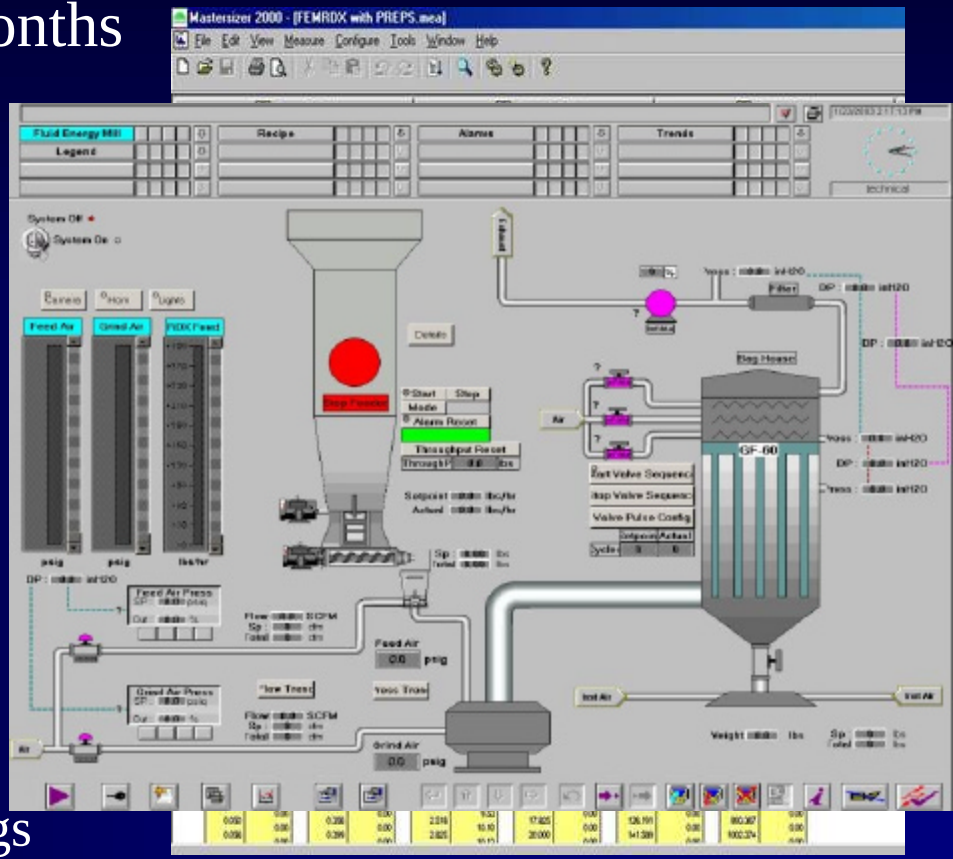
PAX - 21

- Comp-B Replacement IM Castable
  - 60mm Mortar (D&Z Kansas)
  - Others under evaluation
- Development ➔ Production: 10 Months
  - Utilized Existing Equipment and Process Knowledge



FEM RDX

- Concept → Production: 8 Months
- Mill Specifications:
  - Capacity (50 – 500 LB / hour)
  - Target product particle size (3-20 micron)
- Programs:
  - PAX-21
  - PAX-194
  - JAASM
  - Gun and rocket propellants
  - Commercial automobile air bags



BAE SYSTEMS

DNAN

- Key Ingredient in PAX-21
- Material Problems
  - Sole source from China
  - Material does not meet purity specification
- 2 Stage Program:

  1.0 DNAN Purification Method → 4 Months

  2.0 DNAN Synthesis → Ongoing Program

HMX & RDX Premixes

- Concept → Production: 6 Months
- "CXM Type" Products for Cast Cure Mixes
- Benefits
  - Improved safety at LAP plant
  - Reduced processing costs at LAP plant (no drying)
- Typical Coatings
  - IDP; HTPB; DOA
- Certified Viscosity of premix for PBX manufacture
  - Reduces risk at LAP plant

PBXW-17 (aka PBXN-11)

- Concept ➔ Production: 4 Months
- IM Pressed Explosive
- Traditional HSAAP Manufacturing Technology
- Programs
  - APOBS (Ensign Bickford A&D)
  - Mongoose (BAE SYSTEMS)

DMDNB

- Development ➔ Production: 16 Months
- Chemical Taggant for Plastic Explosives
- Was Produced Solely by Dow Chemical
  - Facility shut down Q4 / 2002
- Identified by the Army as a Critical Material
- Now Produced at HSAAP

PAX-2A

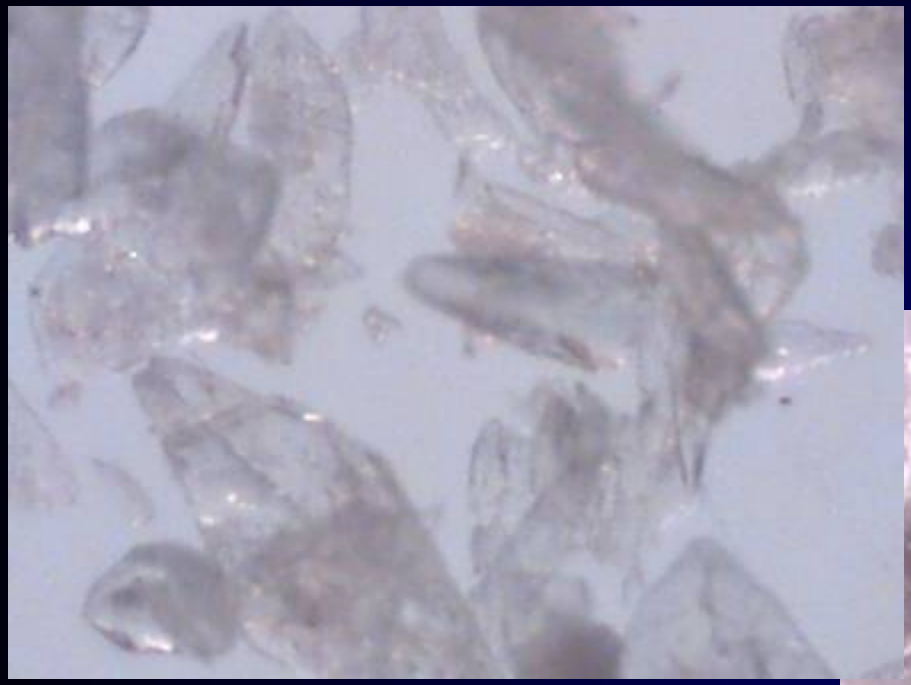
- Concept ➔ Production: 18 Months
- Polymer Coated HMX Explosive
- Leading IM Replacement for Comp A-5
- Traditional HSAAP Manufacturing Technology

10x Magnification

NTO

- Concept → Production: Production Scale-up Ongoing
- IM RDX Replacement
- Novel Method for Triazolone Synthesis
  - Highly suitable for Agile Facility
- Currently Undergoing Evaluation by U.S. Air Force
- Synthesis & Recrystallization Work Being Sponsored by Eglin AFB

TO & NTO Crystals



TO (200x Magnification)

NTO (60x Magnification)

Challenges

- Resource Sharing Across Programs
- Rapid Learning Curve
- “Comfort Factor” of Introducing New Technologies / Processes
- Waste Stream Management i.e. Ammonium Perchlorate (AP), Nitroaromatics

Summary

- Proven Synthesis, Scale-Up and Production Methods
- Average Time Scale = 9 Months
- ISO 9001-2000 Certified Manufacturer