Engineering Study for Polymer Cased Telescoped Ammunition

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Project Scope

- Develop Rough Order of Magnitude (ROM) cost estimates for production capital equipment and facilities needed to make Cased Telescoped (CT) ammunition
- Most CT components are common w/current brass-cased ammo except the cartridge case and link (polymer)
- Focus on new or unique equipment & facilities needed
- Consider three production rates:
  - 200 million rounds per year
  - 400 million rounds per year
  - 1 billion rounds per year
- Production concept developed to a level of detail sufficient to support ROM estimate
Cased Telescoped (CT) Ammunition

Key Technologies
- Telescoped cartridge
- Polymer cartridge case and endcap
- Compacted/consolidated propellant
- Spiral 2: 35% wt reduction
- Spiral 3: 41% wt reduction
Site Selection

Process Overview

Part / Assy.

Potential Locations
Capital Cost Estimating Process

• Define equipment
  – Each material, component, or assembly in process

• Estimate equipment cost
  – Generated both high and low estimates using input from Subject Matter Experts; many actual costs used

• Calculate throughput of selected equipment
  – Factored scrap and estimated or actual equipment availability ($A_o$)

• Calculate number of parallel production lines for each step
  – Based on above throughput for each machine

• Estimate facility and installation costs
  – Conservative estimate using Lang Factor
  – Lang Factor is multiple of equipment cost to account for new facility construction and equipment installation
Polymer Part Processing Example

Bulk Transport
- Truck / Railcar
  - Pneumatic Transfer (vacuum)

Bulk Transport Unloader
- w/Diverter
  - Pneumatic Transfer (pressure)

Storage Silo
- (Case Polymer)
  - Pneumatic Transfer (pressure)

Drier
- (Case Polymer)
  - Pneumatic Transfer

Other Driers

Feeder Hopper
- Gravity Transfer

Injection Molder
- (Cartridge Cases)
  - Gravity Transfer

Inspection Station
  - Gravity Transfer

Parts Bin
- (Accepted)
  - Assembly Process

Parts Bin
- (Rejected)
  - Scrap or Regrind (?)

Gravity Transfer

Total number of parallel production lines determined by demand and mold cavitation.
- 16-cavities 32-cavities
  - 200M: 14 lines 7 lines
  - 400M: 28 lines 14 lines
  - 1B: 70 lines 35 lines

Total number of parallel production lines determined by demand and mold cavitation.
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  - 400M: 28 lines 14 lines
  - 1B: 70 lines 35 lines

Total number of parallel production lines determined by demand and mold cavitation.
- 16-cavities 32-cavities
  - 200M: 12 lines 6 lines
  - 400M: 23 lines 12 lines
  - 1B: 57 lines 29 lines

Cartridge Cases

Endcaps

Links

Assembly Process

Scrap or Regrind (?)

To additional IMM
Capitalization Scenarios

• Low Cost Scenario
  – USG contracts with commercial vendors to produce all polymer parts
  – Vendors amortize mold and equipment costs over production runs

• Medium Cost Scenario
  – USG buys molds - higher degree of configuration control
  – USG contracts with commercial vendors to produce all polymer parts using USG molds

• High Cost Scenario
  – Most similar to current brass-cased ammunition production (GOCO)
  – USG establishes dedicated facility for polymer part production and buys molds and equipment for production of injection molded parts
  – Greatest uncertainty in estimates; maximum number of mold cavities possible drives number of parallel lines needed
Capital Cost Summaries

- Low Capitalization Cost Scenario
- Medium Capitalization Cost Scenario
- High Capitalization Cost Scenario

Estimated Capital Cost (2010 Dollars, millions) vs. Annual Demand Rate (million rounds per year)
Summary

• Developed Rough Order of Magnitude (ROM) capitalization cost estimates for cased telescoped (CT) ammunition production for three production rates and three capitalization scenarios
  – Low, Medium, and High capitalization costs for production of
  – 200 million rounds per year
  – 400 million rounds per year
  – 1 billion rounds per year

• Identified new infrastructure that will be needed
  – Change from metal processing (punching, drawing, etc.) to injection molding operations
  – Facilities, equipment, and trained personnel

• Defined production line concepts and tooling to a level of detail needed to support ROM estimates