

Propellant processing of HTM & LTM

Objective : Propellant processing of High Thrust Motor (HTM) of 760 Kg and Low Thrust Motor (LTM) of 60 Kg

Introduction: The PJ-10 project has a solid rocket booster to boost the missile to the required Mach no for the ramjet engine to take over. The solid rocket booster comprises of high thrust motor and low thrust motor. High Thrust Motor (HTM) and Low Thrust Motor (LTM) is having the solid propellant system based on HTPB /AP/Al. The booster case is made out of high strength steel. It encases a 8-petal finocyl case bonded composite propellant. The case is lined with EPDM insulator.

2.0 Technical specification of High thrust motor:

Dimensions :

- | | |
|----------------|--------|
| a. Length (mm) | ~ 5000 |
| b. Dia (mm) | ~500 |
| c. Weight (Kg) | ~760 |

Technical specification of Low Thrust Motor:

Dimensions :

- | | |
|----------------|-------|
| a. Length (mm) | ~ 400 |
| b. Dia (mm) | ~ 600 |
| c. Weight (Kg) | ~ 60 |

Physical / Mechanical Properties :

- | | |
|---|-----------------|
| a. Density (g / cc) | ~ 1.75 |
| b. Tensile strength (Kg / cm ²) | : More than 5.0 |
| c. Elongation (%) | : More than 30 |
| d. Tensile modulus (Kg/cm ²) | : 30 - 50 |
| e. Peel strength (Kg/cm) | : More than 0.8 |
| f. Tensile Bond Strength(Kg / cm ²) | : More than 5.0 |

Ballistic properties:

- | | |
|--|-------------------------|
| Burn rate (mm/s @ 70kg/cm ²) | : 20 (40 Kg BEM motor) |
| Pressure Index (n) | : 0.40 |

NDT acceptance as per the acceptance criteria will be provided

Propellant processing :

The lined motor case on receipt from Project 'PJ-10' is inspected before casting of the propellant. Raw materials are processed in advance. Mixing of propellant formulation is carried out in vertical mixer. Motor case is assembled with mandrel and base plate. The insulator is abraded and liner is subsequently applied over the insulation before propellant casting for better bonding. Casting of the motor is carried out under vacuum and then cured in an electrically heated hot air oven. After decoring, the excess propellant at the nozzle end is removed by end trimming operation. Cast motor is finally radiographed, inspected and certified 'fit' for delivery to Project 'PJ-10'.

Acceptance Criteria:

The finished Booster propellant is checked for its dimensions and subjected for nondestructive testing (Radiography). Excess propellants obtained during end trimming operation are used for preparing test pieces for mechanical properties and density. Mechanical, physical and ballistic properties are also determined from the propellant grain obtained from casting 40 Kg and 115 mm dia mould using propellant slurry from bowl of final mix. Peel strength is also determined from propellant processed from final propellant mix. Booster propellant should be inspected for various dimensions after all operations. The measured dimension should conform to drawing.