



PEP-1

Parametric Study on Taper-ended Tubular Solid Propellant Grains

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The design of the solid propellant grain is a decisive aspect of the solid propellant rocket motor performance. Tubular grain design is a favorable design since it produces a high neutral thrust profile. However, neutrality of tubular grains deteriorates as the aspect ratio of the grain deviates from an optimum value that is dependent on the web thickness. In some cases, the undesirable phenomenon of erosive grain burning may take place. One simple solution to restore neutrality is to add taper to the ends of the grain. Loss of motor filling comes as penalty for adding these tapered ends. The grain should thus be tailored to simultaneously satisfy both desired design objectives namely, neutrality and filling.

The present paper aims to address the dependence of these two design objectives on the design of a taper-ended tubular grain. The designs that are likely to yield erosive burning are also addressed. A parametric study is conducted involving the aspect ratio of the grain, its web thickness, and the taper angles on both ends.