

Materials Tip



Materials Engineering Branch

Electro-Slag Remelted Steel Instrument Bearings			
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A request was made for approval to use electro-slag re-melted (ESR) 440C steel bearings instead of vacuum melted (VAR) 440C steel. The use of ESR steel would reduce the bearing delivery time by about four months because it is stocked by Miniature Precision Bearing (MPB) Corporation. A copy of an MPB study of inclusion content in air melted, VAR and ESR 440C steel was included with the request.

The inclusion study concluded that only 13% of air melted steel was acceptable for bearings whereas 89% of ESR and 97% of VAR steel was acceptable for bearing fabrication. Thus, MPB concluded that ESR steel was almost as free of inclusions as VAR steel. As a result MPB began using ESR steel for many bearing types to avoid rejected bearings due to pitted surfaces. Experience with space flight bearings has shown that bearing failures do not result from fatigue cracks that originate at inclusions. Therefore the small increase in inclusion content in ESR steel (vis-à-vis VAR steel) is not expected to increase the bearing failure rate.

Although VAR 440C steel is preferred for space flight bearings, ESR 440C steel bearings are acceptable if the surface roughness is not increased.