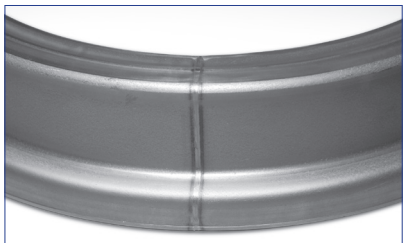
SEAL CASES MANUFACTURED USING INNO-SPIN™ PROCESS PASS RIGOROUS TESTING STANDARDS

Amsted Seals and Forming has introduced Inno-Spin™, a new method of manufacturing traditionally stamped round and cylindrical metal components. First used for rail bearing seal cases, Inno-Spin involves welding strip steel into a ring which is then spin-formed into a finished component. This innovative process reduces material consumption, resulting in a number of added benefits including lower cost and a reduced carbon footprint.

The results are in: integrity of welded seal cases proven equal to that of stamped parts

Stamped Case



Welded Case

Amsted Seals and Forming needed to create a weld able to withstand the spin-forming process and pass all Association of American Railroads (AAR) requirements for metal seal cases. To ensure the integrity of the welded seam, the product was also subject to a variety of tests beyond what is required by AAR standards – including tensile/elongation, Charpy impact, guided bend tests, and rubber bond tests.

By working with welding technology and automation experts, Amsted Seals and Forming was able to develop a weld system capable of producing superior welds for low carbon and stainless steel strip material. The seal cases manufactured utilizing the Inno-Spin process were found to be acceptable with comparable weld strength to stamped parts.

Completed Welded Seal Case Testing

Test Conducted	Pass/Fail Specification
AAR M-959 4.2.1 (Dimension and Tolerance)	PASS
AAR M-959 4.2.2 (Removal Force)	PASS
AAR M-959 4.2.3 (Environmental Resistance)	PASS
AAR M-959 4.2.4 (Infrared Emissivity)	PASS
AAR M-959 6.1.1 (Accelerated Life Test)	PASS
ASTM A370-10 (Tensile and Elongation)	PASS
ASTM A370-10 (Charpy Impact Test)	PASS
180° Bend Testing	PASS
Rubber Bond Test	PASS

AAR testing results

The following tests were run in accordance with AAR Specification M-959:

4.2.1 Dimensions and Tolerances

30 AAR Class F bearing seal samples were selected at random from a production run of several thousand. Measurements were made on each seal at Brenco's Petersburg, VA facility and compared to the dimensions listed in Figure 4.1 of the AAR Manual of Standards and Recommended Practices, Journal Bearings and Lubrication. All dimensions measured complied with AAR M-959.

4.2.2 Removal Force

Seal removal forces were measured in accordance to M-959 specifications. All press-out forces exceeded the minimum limit specified in AAR M-959 Appendix B1.1.

4.2.3 Environmental Resistance

Seals were sent to Heatbath Corp of Indian Orchard, MA for humidity testing per ASTM D-2247. No changes in the chemicals or processes used to bond the rubber seal element to the seal case were allowed. Emphasis was placed on the welded portion of the case as compared to the base metal. All five seals passed the acceptance criteria written in M-959 Appendix B 2.1.

4.2.4 Infrared Emissivity

Three seals were tested for consistency in infrared emissivity. No changes in the chemicals or processes used to bond the rubber seal element to the seal case were allowed. All three seals passed the acceptance criteria written in M-959 Appendix B 3.1.

4.3.6 Accelerated Life Test

Four bearings were equipped with equal number of test and control seals. Tests were performed on the Brenco test lab's fatigue Rig #2 in accordance with the operating parameters listed in AAR M-959, Appendix C, Section 6.1.1. The seals were removed after the completion of the test and no detrimental conditions were observed.

Additional testing results

In conjunction with the AAR M-959 testing, several additional tests were conducted to ensure the integrity of the welded seam:

Tensile/Elongation Test

30 samples were submitted to an independent laboratory for tensile testing, 15 samples included the welded seam and the other 15 were of the base metal only. The coupons were tested in accordance with ASTM A370-10 with the pull direction being perpendicular to the axis of the weld seam. The tensile strength and elongation of the welded samples were found to be comparable to the base metal with no failures having occurred at the weld.

Charpy Impact Test

Welded samples were tested and compared to base metal samples in accordance with ASTM A370-10. The impact results of the welded samples were found to be comparable to the base material.

180° Bend Test

This test determines the quality of weld at the root and face as well as the degree of penetration and fusion to the base metal. Samples are placed into a fixture and bent 180°. No cracks greater than 1/8 of an inch are allowed in any direction. Five samples were tested in the "face" and "root" configuration. Dye penetrant was used to verify the visual observations. All of the samples passed the acceptance criteria with no cracking seen.

Rubber Bond Test

Welded sections of three different seals were submerged in Shell Canada Alvania D EP for 28 days @ 100° C per AAR M-942 Appendix B, 4.3. The rubber sealing elements were inspected, and an attempt was made to separate them from the seal case at the weld. The welded seam had equivalent/acceptable bond strength even after heated grease exposure.

The testing described herein was performed to evaluate the weld integrity according to user specified requirements for rail bearing seals. Additional qualification testing can be done to meet the individual needs for each application.

INNO SPIN™

Rethink Stamping

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