

Annal Trans EVEL AD A 0 5 6 9 3 2 REPORT NO. NADC-78027-60 versus EVALUATION OF POLYETHYLENE KALUMINUM ALLOY CLOSURES FOR HYDRAULIC COMPONENTS . A. J./ Russo OC FILE COPY Aircraft and Crew Systems Technology Directorate NAVAL AIR DEVELOPMENT CENTER Warminster, Pennsylvania 18974 Caron AIG 1 MARCH 78 FINAL REPORT -AIRTASK NO. A530-5303/001-2/7000-000-001 Work Unit TS 805 APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED Prepared for NAVAL AIR SYSTEMS COMMAND

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UNCLASSIFIED SECURITY CLASSIFICATION OF THIS PAGE (When Date Entered) The results of the evaluation indicated that closures of both polyethylene and aluminum generated essentially the same contamination and were not subject to degradation after repeated assembly. VORTERNE VS. ALAMENDA JUI white sector internet -State State S/N 0102- LF- 014- 6601 UNCLASSIFIED SECURITY CLASSIFICATION OF THIS PAGE (When Data Enter

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EVALUATION AND DISCUSSION

BACKGROUND

As requested by the Naval Air Systems Command (AIR-530312) under AIRTASK A530-5303/001-2/7000-000-001, Work Unit TS 805, the Naval Air Development Center evaluated the contamination generation characteristics of the high density polyethylene formed screw caps and plugs versus metal aluminum alloy machined closures.

The primary use of these closures is to protect the threads, flares and sealing surfaces of hydraulic units and to prevent the intrusion of dust, dirt, moisture and foreign matter into parts during storage and shipment. These closures are covered by reference (a), which specifies the use of metal closures. Specifically, in this evaluation, it was desired to ascertain if formed polyethylene closures could be used in place of expensive machined aluminum closures which were proposed for the new lip-seal separable hydraulic connectors. Figures 1 through 4 illustrate the various types and sizes of polyethylene and aluminum test closures that were evaluated.

TEST DETAILS

A Greer hydraulic test stand filled with MlL-H-83282 hydraulic fluid was used to conduct the contamination tests on the polyethylene and aluminum closures in sizes $-\delta$, -12 and -21. The fluid was filtered for four (4) hours prior to testing and analyzed for initial contamination.

All samples were subjected to fifteen (15) repeated assemblies, in accordance with paragraph 4.2.2.3, Repeated Assembly, of reference (a). Visual inspection was made on each closure during the repeated assembly testing for any unusual failures. One hundred milliliter of hydraulic fluid was collected from each sample after fifteen removals, and was analyzed for contaminant using a HiAc Particle Counter, Model PC-305.

TEST RESULTS

The repeated assembly test was passed successfully by all closures. The results of the contamination level tests after fifteen cycles of assembly are shown in Table 1. The results show, generally, little difference between the polyethylene and aluminum closures in the number of contamination particles generated. The largest amount of contamination generated on any sample did not exceed Class 7 of NAS Standard 1638. No unusual occurrences, such as thread chipping, shredding, jumping or stripping occurred during the fifteen (15) assemblies on any samples.

CONCLUSIONS

Based on the repeated assembly and contamination tests conducted, the polyethylene and aluminum screw caps and plugs were both found to be satisfactory closures.

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Since no degradation occurred and the contamination generated by both the polyethylene and aluminum closures after the fifteen (15) assemblies was essentially equal and was less than Class 8 of NAS Standard 1638, either material is considered acceptable for use in Navy Aircraft and Ground Support Equipment. Specifically, either material is considered acceptable for lipseal type closures to be used with lip-seal fittings. Based on the test of these particular type of closures, either the polyethylene or aluminum would be considered acceptable for the MS type fittings also.

The polyethylene closures for lip-seal connectors are molded while the aluminum are machined. Because of these different manufacturing methods, the aluminum closures are approximately eighty (80) times more expensive than the polyethylene closures.

It is further recommended, based on the cost, that the polyethylene closures be utilized for lip-seal fittings.

REFERENCES

(a) MIL-C-5501F Caps and Plugs, Protective, Dust and Moisture Seal, General Specification of 20 Mar 1973

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RESULTS OF PARTICLE COUNT - PLASTIC VS. METAL THREADED CLOSURES NUMBER OF PARTICLES* PER 100 MILLILITER OF HYDRAULIC FLUID MIL-H-83282 TABLE 1.

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Aluminum AlloyDP-8154949Screw Caps - "O" Ring SealDP-12107984Figure (3)DP-212235010Aluminum AlloyDP-82362715Screw Cap - MIL-C-5501DP-82362715Figure (4)DP-8221629Screw Plug - MIL-C-5501DP-8221629Figure (4)DP-8221629Screw Plug - MIL-C-5501PP-8221629	DP-8 9170 DP-12 8755 DP-21 10202
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Aluminum Alloy Screw Plug - MIL-C-5501 Pigure (4)	DP-8 23627 15
	DP-8 22162 9:

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*Average of six (6) runs



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Screw Cap -8 Size Teflon Gasket Seal



Screw Plug -8 Size "O" Ring Seal



Screw Cap -12 Size Teflon Gasket Seal



Screw Plug -12 Size "O" Ring Seal

Screw Cap -21 Size Teflon Gasket Seal Screw Plug -21 Size "O" Ring Seal

FIGURE 2. MACHINED ALUMINUM ALLOY CLOSURES





FIGURE 4. ALUMINUM ALLOY CLOSURES - PRESSED FORMED SPEC. MIL-C-5501 - FLARED FITTINGS

