

NAVISTAR, INC.		
CEMS (CORPORATE ENGINEERING MATERIAL SPECIFICATION)		NUMBER: CEMS BT-21
TITLE: Hydraulic Performance Test		CURRENT ISSUE DATE: August 2009
WRITTEN/REVIEWED BY: Materials Engineering	APPROVED BY: Materials Engineering	SUPERSEDES ISSUE OF: October 2001
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<i>This specification may involve hazardous materials, equipment, and procedures. This specification does not purport to address all of the safety issues associated with its use. The user is responsible to consult appropriate safety and health practices and to determine the applicability of regulatory limits prior to use.</i>		
Change Notice: Replaced "International Truck and Engine Corporation" with "Navistar, Inc." per corporate directive.		

1.0 SCOPE

This method covers a test procedure for the determination of compatibility of combination hydraulic and transmission fluids with "O" rings used in Navistar machines.

2.0 APPARATUS

- 2.1 Two double acting cylinders with rods connected.
- 2.2 Each cylinder composed of piston taking seven "O" rings.
- 2.3 Two identical heads each taking three rod seal "O" rings and three tube seal "O" rings.
- 2.4 Each "O" ring is pressurized equally.
- 2.5 Piston diameter: 3 inches (76 mm).
- 2.6 Rod diameter: 1-1/8 inches (29 mm).
- 2.7 Tube and rod finished to 6 microinches (0.152 mm) AA.

3.0 MATERIAL

"O" rings for test must meet the Navistar Engineering Drawing FZG-467 for Hydraulic "O" Rings.

- Ring Sizes:
- 2-5/8 x 3 x 3/16 inches (67 x 76 x 5 mm);
 - 2-3/4 x 3 x 1/8 inches (70 x 76 x 3 mm);
 - 1-1/8 x 1-3/8 x 1/8 inches (29 x 35 x 3 mm).

4.0 PROCEDURE

Cylinders cycled such that on alternate strokes one cylinder loads the other. Pressure is applied to each side of each cylinder an equal length of time and is periodically switched.

Test conditions are as follows:

- 4.1 Pressure during stroke: 1500 ± 50 psi (10.3 ± 0.3 MPa).
- 4.2 Pressure at end of stroke: 1600 psi (11.0 MPa) max.
- 4.3 Cycle rate: 10 cpm.
- 4.4 Length of stroke: 12 inches (305 mm).
- 4.5 Length of test, 70 durometer rings: 100 hours.
- 4.6 Length of test, 90 durometer rings: 200 hours.
- 4.7 Fluid temperature: 235 to 240°F (113 to 116°C).
- 4.8 Filtration: 25 mm, min.
- 4.9 At end of test, disassemble the cylinders and grade the "O" rings per "O" Ring Failure Classification Guide shown on page 2.

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5.0 REPORT

Report the classification that the “O” rings meet.

“O” RING FAILURE CLASSIFICATION GUIDE

Condition: (listed in ascending order)		Classification				
		I	II	III	IV	V
A	permanent set	see below	none	noticeable	sharp edge	no sealing
B	swell or shrinkage		within specifications	out of specification not noticeable visually	out of specification noticeable visually	malfunction
C	hardness change		within specifications	out of specification	not sealing properly	brittle or cracked
D	pitting		none	noticeable	excessive leakage	extreme – not sealing
E	blistering		none	noticeable	excessive	not sealing
F	twist or roll		none	indications of	severe	fractured
G	extrusion		none	slight	excessive	not sealing
H	wear (abrasion)		none	slight – leakage within specifications	excessive – not within leakage specification	not sealing
J	material degradation		not visually apparent	slight	excessive	extreme
K	fracture		none	none	surface or short and deep	deep separations

Classification I: Not distinguishable from new condition by any means.

Classification II: Not distinguishable from new by visual inspection; however, slight material changes have occurred resulting in a change in volume or hardness. Any change will be within specifications. The “O” ring is reusable.

Classification III: Functioning per specifications but would not be reused in a normal rebuild because of visible damage or material change out of specifications.

Classification IV: Functioning; however, inspection reveals progressive damage or material degradation which would result in unit failure.

Classification V: Not functioning because of extensive damage or material degradation.

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