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WEAR TESTING OF EJECTOR PINS

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INTRODUCTION

Six (6) samples of ejector pins were received from Progressive Components, located in Wauconda, Illinois. The ejector pins were submitted for wear testing. The pins were either metric or standard sized, and were made by several different companies. The following report documents this testing.

SAMPLE IDENTIFICATION

Sample	Nominal Size	Description
1	1/4 in	DME THX
2	1/4 in	PCS
3	6mm	DME Metric
4	6mm	Misumi
5	1/4 in	PRO EP 2
6	1/4 in	PRO EP 1

TEST METHOD

The MTS 810 Material Test System was used to cycle the ejector pin samples ¾ of an inch at 1 Hz with a fixture provided by Progressive Components. The fixture consisted of two jaws made of P20 steel that clamped the specimens between them by use of two springs that were tightened in place with shoulder bolts. The samples were not greased. A photograph of the test setup can be seen in Figure 1.

Wear was defined as a degree of wear, determined by rating the surface of the ejector pin on a scale of 1 to 3. Wear determinations were conducted per the criteria below and thickness measurements were conducted on the pins. The pins were considered to have failed when either the wear reached a degree of 3 or the pin lost 0.0004 inches of material. Photographs of the test samples before and after testing can be seen in Figures 2 and 3, respectively.

The degree of wear scale, shown on the gradient bar chart (page 3), was defined as follows:

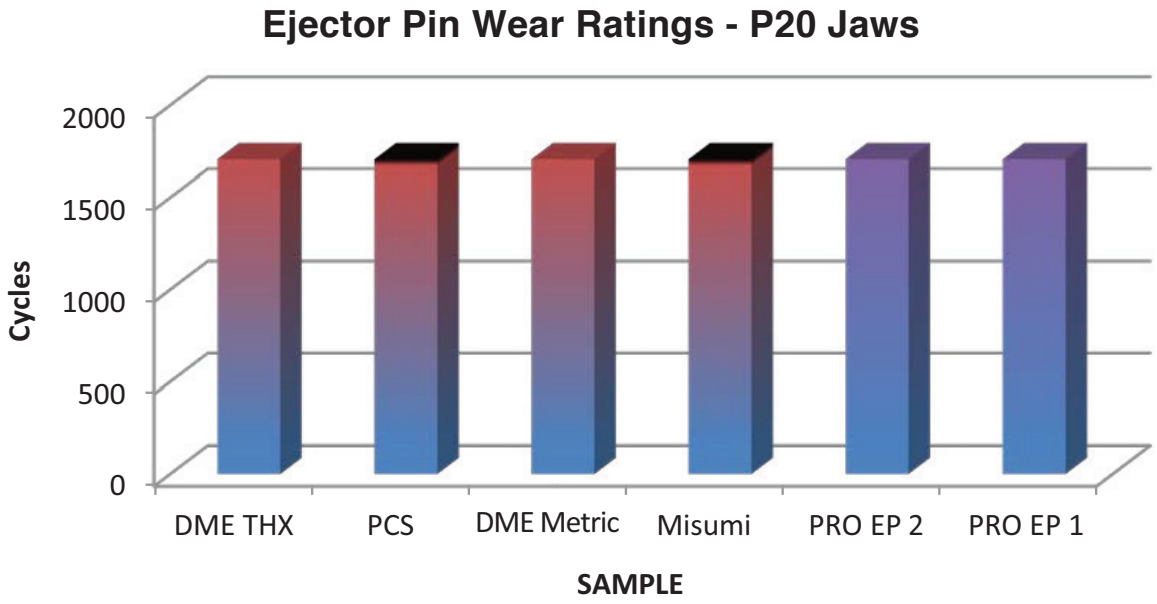
0. No Wear (Blue)
1. Slight wear lines or burnishing present (Slight Wear, Purple)
2. Wear or galling starting (Significant Wear, Red)
3. Heavy wear or galling present (Failure, Black)

SUMMARY OF TEST RESULTS

- The test was stopped at 1,706 cycles because the load required to move the pins increased to the limit of the test machine.
- Heavy galling was seen on Sample 2 (PCS) and Sample 4 (Misumi) at 1,706 cycles.
- Wear and galling were seen on Sample 1 (DME THX) and 3 (DME Metric) at 1,706 cycles.
- Burnishing of the surface was seen on Sample 5 (Pro EP 1) and Sample 6 (Pro EP 2) at 1,706 cycles. No galling or dimensional loss was observed.

TEST RESULTS

	DME THX		PCS		DME Metric		Misumi		PRO EP 2		PRO EP 1	
Cycles	Wear	Diameter	Wear	Diameter	Wear	Diameter	Wear	Diameter	Wear	Diameter	Wear	Diameter
0	0	0.2495	0	0.2494	0	0.2355	0	0.2354	0	0.2495	0	0.2493
1706	2	0.2495	3	0.2495	2	0.2355	3	0.2355	1	0.2496	1	0.2494



TEST EQUIPMENT

1. MTS 20 kip load cell, MTA-041.1, S/N 104447841, Calibrated 12/03/2013, Calibration Due 12/03/2014.
2. MTS Actuator Position LVDT, MTA-041.3, S/N 301P, Calibrated 12/03/2013, Calibration Due 12/03/2014.

Revision Number	Date	Description of Changes
0	6/3/14	
1	9/2/14	Changed name of Sample 5. Edited graph to show gradient rather than solid colors.
2	11/11/14	Changed name of Sample 5. Edited test results table and graph to show sample names rather than number.Added close up photos of each sample after 1706 cycles.
3	6/9/15	Increased font sizes. Corrected typo to Test Method section title. Moved all photos to page 4.
4	2/12/16	Added color description and reference to the bar chart to the degree of wear scale in the Test Method. Added burnishing to degree 1. Sample 3 was reclassified as degree 2 due to the presence of wear lines leading to galling.
5	3/30/16	Updated caption for Figure 4 to include a more accurate description of the samples.

DIGITAL PHOTOGRAPHS

Figure 1: Test fixture setup.

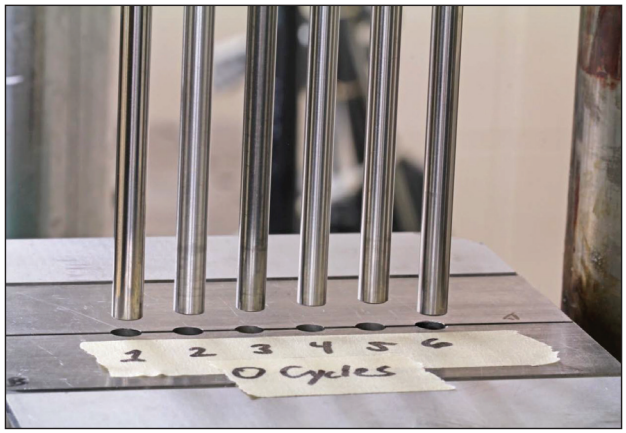


Figure 2: Test samples at 0 cycles.

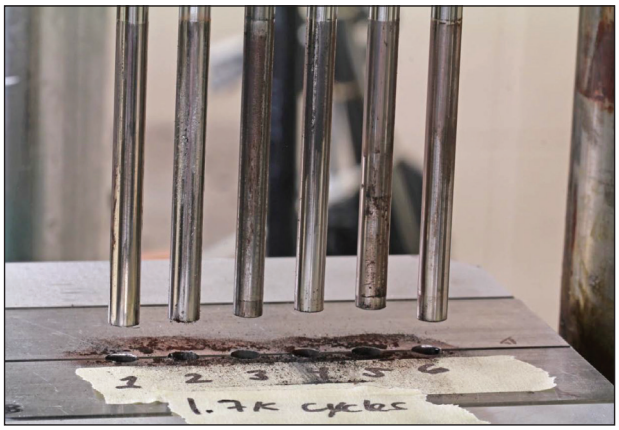


Figure 3: Test samples at 1,706 cycles.

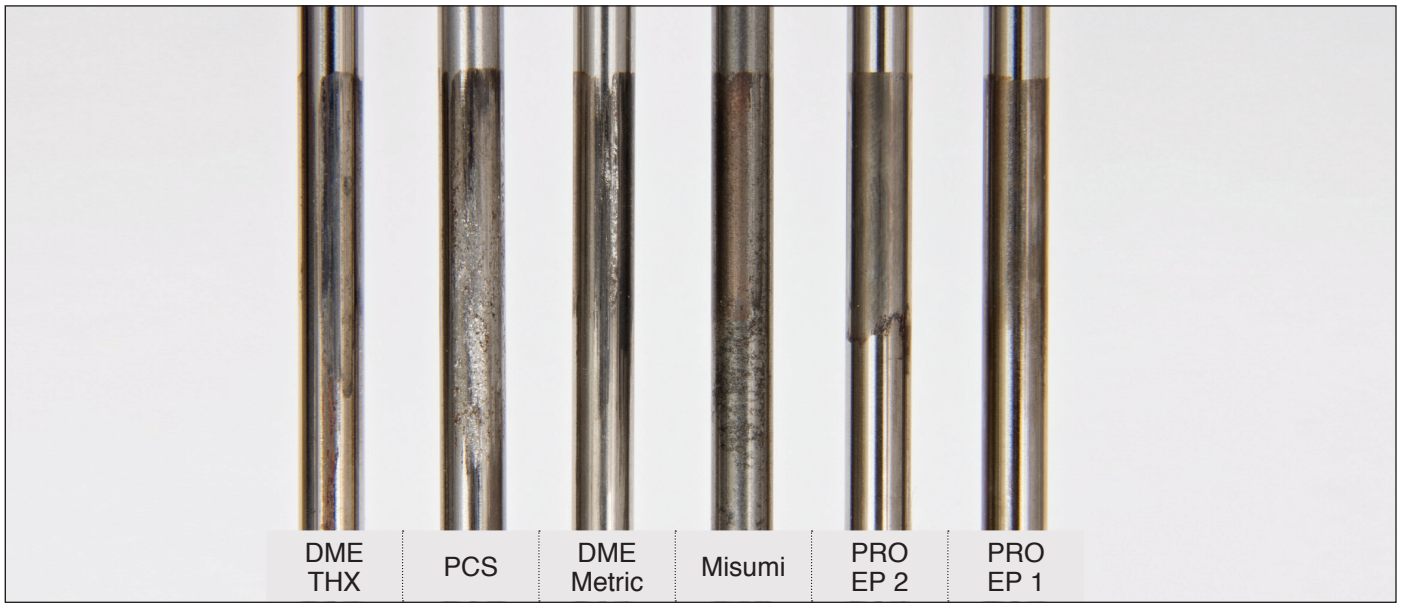


Figure 4: Test sample close ups at 1,706 cycles showing samples 1-4 (DME THX, PCS, DME Metric, Misumi) at varying degrees of wear and galling. Sample 5-6 (PRO EP 2, PRO EP 1) showing burnishing, not galling.