

Wear Rate and Coefficient of Friction Data Summary From Testing Performed at Oak Ridge National Laboratories*

A Comparison of wear rate and friction coefficient of different coatings of aluminum cylinder bore liners was performed using a modified ASTM G133-95 linearly reciprocating wear test with piston ring and cylinder lining segments. The results are tabulated below.

Coating Cylinder Lining	Wear Volume (mm ³)	Initial Coefficient. Of Friction	Final Coefficient. Of Friction
NiCom® (std) [†]	0.0056	0.11	0.10
Cast Iron	0.015	0.11	0.10
Hard Anodize (6061)	0.1156	0.13	0.12

[†] Nickel/SiC Composite Coating.

- **Test Conditions:**

Piston ring: Hard Chrome plated steel ring

Lubricant: Goodwrench 5W 30; applied on the cylinder lining using a cotton swab.

Temperature: Room Temp

Load: 150 N

Frequency: 15 Hz

Stroke: 8 mm

Test duration: 3600 sec.

The NiCom® coating performed the best, exhibiting an exceptionally low average wear volume of 0.006 mm³. NiCom® specimens showed very little wear with no obvious debris and the honing pattern was still visible within the wear track. The results were very consistent with a small variability in friction force throughout the test.

The average wear volume for gray cast iron, 0.059 mm³, was an order of magnitude higher than that of the NiCom® specimens. The honing pattern for the gray cast iron specimens was also visible in the wear track and no wear debris was detected. Again, the results were very consistent with little to no variability in the friction data.

The hard anodized Al specimens, however, showed positive-going, periodic fluctuations in the frictional force trace. The increasing magnitude of the friction force fluctuations suggest that adhesion occurs between the two mating samples, causing higher wear compared to the NiCom® and gray cast iron specimens. The average wear volume for hard anodized Al was almost twice as large as for gray cast iron, and there was very little wear debris visible.

* A. Datta, J.D. Carpenter, R.D. Ott and P.J. Blau, *Tribological Characteristics of Electrolytic Coatings for Aluminum Engine Cylinder Lining Applications*, SAE Technical Paper Series, 2002-01-0490 Presented at SAE 2002 World Congress, Detroit Michigan, March 4-7, 2002