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International Research Group on Wear of Engineering Materials
BAM VI.2 Tribology and Wear Protection

On the correlation between friction and wear

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A device manufacturer was experiencing unacceptable wear life in a key mechanism of a product. It had become the limiting factor in marketing the device. The mechanism that was failing employed unlubricated reciprocating sliding motion of contacting austenitic stainless steel parts. A study was conducted to arrive at a sliding couple that would solve the service life problem and not produce major redesign of the device. The parts that were failing had a high coefficient of friction and this was deemed necessary for proper function. Thus, the project became one to identify a sliding couple that does not wear, but has a high coefficient of friction (0.5).
More than 90 mating couples were tested in a laboratory bench test using the present device couple, type 303 stainless steel selfmated, as the friction, wear, and debris “control” couple. A wide variety of lubricants and 3rd bodies, copper base alloys, ferrous materials and metallurgically dissimilar materials were tested to see if they reduced system wear compared to the control. It was determined that selected lubricants would reduce system wear. A few did, but they also reduced system friction and thus could not be used. A number of counterfaces were identified that would produce significantly reduced system wear and had high friction mated with type 303 stainless steel. Overall, this study confirmed that lack of correlation between system wear and system friction. Also, this study dispels the notion that using metallurgically dissimilar metals or a hard counterface reduces unlubricated wear. Most dissimilar soft metals exacerbated system wear. Thirty-one of the ninety-six couples tested had worse system wear than the 303 selfmated. This study confirmed that the wear and friction characteristics of unlubricated metal-to-metal tribocouples are not very predictable. Laboratory screening tests are worth the time and expense