Engineering Property - Abrasion Resistance

There are two types of abrasion - sliding and impingement. Sliding is the passing of an adjacent surface across the rubber surface. Impingement is wearing of the rubber exemplified by sand particles hitting the surface. Most wear in actual service occurs as a combination of both sliding and impingement.

When sliding, localized friction forces can impose high energy levels on the rubber. Abrasion and wear takes place when the rubber cannot withstand these forces.

Impingement by particles occurs in applications such as chutes, rebound plates and sandblast hoses. Elastomers can yield easily and distribute stresses imposed by particle impingement. A sandblast test shows that with a 90° impingement angle, soft resilient rubber is more abrasion resistant than steel or cast iron. However, not just any elastomer can be used. Under this same condition, a tough tire tread will wear out more rapidly than a soft elastomer. The angle of particle impingement has a significant effect on which material should be used. Laboratory abrasion tests are difficult to correlate with end-use applications. Measurement of properties can be helpful in selection of materials, but do not compare to rates in actual service which can be thousands of times greater with regard to velocities and temperatures.

There are at least 25 laboratory abrasion test devices, an indication that this type of test is difficult to correlate with service performance. The most widely recognized test device in the rubber industry is the National Bureau of Standards Abrader, a sliding type abrader. The NBS Abrader uses a constant velocity, under a fixed load using a specified abrasive grit.
See above Figure 1 for diagrammatic sketch.

It does not tell how a compound perform under widely varying conditions, not does it tell anything about cut resistance, chunking, or flat spotting.

The abrasion resistance of vulcanizates of Die-Thane urethane rubber, as measured on two laboratory tests, the National Bureau of Standards test and the Taber Abrader, are shown in Table 1.

Note these two tests give different values. The differences in performances of vulcanizates of Die-Thane can be explained however. The National Bureau of Standards tests simulates a very harsh service. In this case, the hardest vulcanizates hold up best. The Taber test is much less severe. Softer compounds perform better than the harder ones because they are more resilient and "give" under load.

In spite of the difficulties in obtaining meaningful laboratory abrasion test values. Die-Thane is considered to have excellent sliding abrasion resistance and has performed well in many applications where wear is a problem. Die-Thane has outworn conventional rubber and plastics often by a factor of as much as 8 to 1.

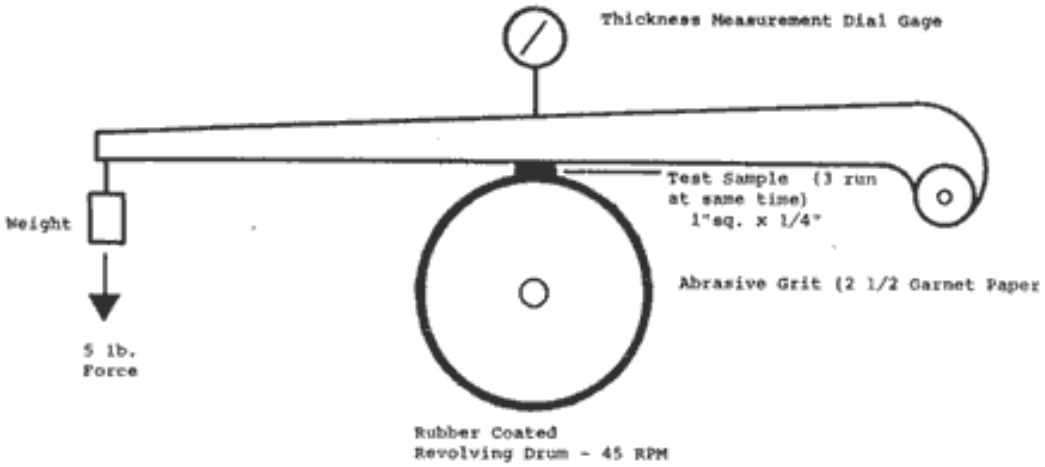

TABLE I

ABRASION RESISTANCE			
Die-Thane	Hardness	NBS Abrasion index	Taber Abrasion
Durometer A	Durometer D	ASTM D-394, Method B	Resistance, Wt. Loss* ASTM D-1044
80	-	110	-
85	-	200	-
90	-	175	79
95	48	300	118
-	-	500	373

*mg/100 rev.; H-18 wheels, 1000 gm, wts.; 5000 rev.

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