structure numbers have substantially different relative significance at different grain sizes and at different grades. Both the first-pass forces and the ratios of the two forces give the same qualitative results but not as sensitively.

Conclusions

1 Variations in stiffness of the mechanical part of the test system do not appear to have an appreciable effect on force measurements obtained with the single-pass procedure.

2 Variations in rigidity of the mechanical system do alter the measurements obtained with the two-pass procedure. This means that:

(a) Wheel grading would be complicated by making it necessary to duplicate system rigidity between test locations.
(b) The two-pass procedure may be a valuable research tool for studying the effects of system rigidity on grinding behavior.

3 The two-pass procedure evaluates grinding wheel hardness more sensitively at light cuts.

4 The second-pass force is a more sensitive indicator than either the first-pass force or ratios of the two forces.

Acknowledgment

Thanks are due engineering students, Floyd Wright and Robert Vanderlaan, for their diligent and enthusiastic help in this study.

References


DISCUSSION

L. P. Tarasov

The description of the single-pass procedure implies that more than one such cut is made before the force is recorded, for unless this were done, there would be no reason for \( F_D \) to be smaller than the single-pass force. Yet in trying to predict the depth of cut for the two-pass procedure from the single-pass data, it appears that the calculation is based on just one cut at 48 lb crushing force and one at 18 lb. A more detailed description of the procedures followed would help to clarify the situation.

Why should \( F_D \) be called the crushing force? Calibration of the dynamometer can be accomplished just as easily in terms of \( F_W \), which is the force acting in the actual crushing direction.

It would be helpful to have the grit size in Fig. 12 and the grade letter in Fig. 13. The effect of structure number on the second-pass force in Fig. 12 becomes much more regular if the effect of the type of structure is taken into account. The porosity is uniform for both 5 and 8 structures but it is duplex in character for the 12 structure, where the abrasive grains are clustered in groups. Experience has shown that 12-structure wheels are likely to act about two grades harder than indicated by the letter markings. If the force levels for the 12-structure wheels are shifted two grades to the right, the forces for the I, J, and K grade wheels decrease with increasing structure number. Only the H wheels remain inconsistent, and this may be due to a variation of the hardness within accepted grade limits.

Research Associate, Research and Development Department, Norton Company, Worcester, Mass. Mem. ASME.