

EXPERIMENTAL PROCEDURE

Tests are first carried out using cement blocks. These are prepared in coin-like shape, about  $\frac{1}{8}$  inch thick and  $\frac{1}{2}$ ,  $\frac{3}{4}$  and 1 inch in diameter. Care is taken in preparation so that the block surface presents an even but not smooth appearance. Thus it may be assumed that the coefficient of friction between the block and the trough surface is equivalent to that between the sand and the trough surface. All cement blocks are kept in a curing room for three days.

By tilting the trough, the static coefficient of friction between the block and the trough is found.

While the trough is vibrating with certain amplitude, frequency and angle of inclination, the time of the block travelling for 24 inches on the trough is measured by a stopwatch. At least 20 measurements are required for an average from which the speed of the cement block can be obtained.

The frequency of the trough vibration varies from 0 to 1200 oscillations per minute with an interval of 100 oscillations per minute. At each frequency the travelling times are recorded.

Tests are carried out with the angle of inclination  $\alpha$  of 10, 20, 30, 40 and 50 degrees, each with the amplitude  $a$  of 0.025, 0.050, 0.075, 0.100, 0.125 and 0.150 inch. The adjustment of angle of inclination must be done only when the crank radius is null.

The frequency at which it is leaving the trough can be identified by the slight impact noise which is generated.

Using the theory developed above, theoretical values of velocity are calculated for the same range of conditions as used in the tests and these are compared graphically.

These calculations are very tedious in spite of the use of a calculating machine and computer facilities would be an advantage.

The theory is only true for speeds where the block is **not** leaving the trough and the calculations are only made up to this limiting speed.

For the sand tests, accurate adjustment of feed is facilitated by the use of a fine sand. It must be clean, dry, free from foreign matter and able to pass the British Standard sieve No. 50 but not No. 100. Also the specific gravity of the sand must be checked before the tests are run, usually it is about 1.3.

An angle of inclination of 30 degrees and amplitude of 0.100 inch are fixed throughout the tests. At any frequency, sand is fed to the trough through the hopper opening which can be subsequently adjusted to the same position. Sand level in the hopper is kept approximately constant all the time because the height can influence the rate of flow through the opening. The weight of sand discharged from the trough over a period of time is measured. Then measurement of sand thickness on the trough while vibrating is per-

formed at random, and an average determined. To facilitate this measurement, the trough vibration and sand feed are stopped suddenly, and hence the thickness of sand is maintained. By the application of the law of fluid flow, the travelling speed of sand is obtained. The above procedure is repeated three times.

Tests are carried out with the trough vibration of 600, 800, 1000 and 1200 oscillations per minute, each with six adjustments of hopper opening.