

Grinder-run No. 2.—The stone was sharpened in the same manner as in run No. 1, and the interval between the successive sharpenings was decreased from four hours to three. This change was due to the fact that the best pulp was produced just after dressing the stone, and that more flour was being made after the third hour. The more frequent dressing produced slivers and screenings, however, and one wheelbarrow-full of each was collected during the run. Three and a quarter cords of wood were ground. The duration of the test was 30.5 hours, and 5,210 lb. of pulp (dry basis) were produced. The log of the run is given in Table 8.

The yield of pulp in runs Nos. 1 and 2 was an average of 1,500 lb. per cord. Indications that such a low yield was being obtained were not evident until the second run was about half-completed. An investigation of the cause was immediately started, and, after some difficulty, was found due to the white-water and save-all system already described.

Grinder-run No. 3.—Grinder-run No. 3 was made to determine the yield of pulp for comparison with the results obtained at the laboratory. Since all of the clean wood had been ground in the previous tests, the third run was made with the dirty centres left from the cleaning operations. The stone was dressed, as in the previous run, at intervals of about three hours. In order to be sure that no white water was lost through the deckers, and that the overflow at the save-all would be a minimum, the run was made on Sunday, when all the other units were shut down. Wet machine No. 1 was used. A rectangular weir 10 in. long, with end contractions, was placed at the top of the inclined screen save-all. The box back of the weir was not measured, but was approximately 30 in. wide and 24 in. long. The depth of water back of the weir was 14 in. Readings and samples were taken every five minutes during the periods when the weir was overflowing. In addition to the samples of white water taken at the save-all, several samples were taken at the cylinder of the wet machine. A summary of white-water and fibre losses in grinder-run No. 3 is given in Table 9.

When the test was ended, the system was washed clean. In other words, almost ideal conditions prevailed for the operation of a perfectly closed system. The weight of pulp obtained as lapped, plus the slight determined loss in the white water, should approximate closely to the theoretical fibre-yield possible. The yield of lapped pulp (dry basis) was 3,145 lb., and the loss in the white water was 45 lb. One and a half cords of wood were ground in twelve hours, which is a yield of 2,125 lb. of pulp per cord and a production of 2.13 tons per twenty-four hours. The small amount of fibre lost at the save-all was due, of course, to the exceptional conditions under which the test was made. The comparatively high fibre content of the white water indicates the necessity for a closed white-water system in any contemplated installation. Even under the good conditions prevailing during this test, the apparent yield per cord was much lower than was secured in the laboratory runs.

Pulp-yields.

This discrepancy between laboratory and mill figures requires some analysis. All laboratory determinations were based on oven-dry pulp from oven-dry wood, and on a weight basis. For convenience of calculation, moreover, and to conform with a standard often used for such purposes, the solid-wood content of a cord was arbitrarily assumed as 100 cubic feet; whereas the average for hardwoods is nearer 75 cubic feet, which would reduce the average yield of the three laboratory runs to only 2,150 lb., corresponding closely with the yield of 2,125 lb. per cord obtained in grinder-run No. 3. Although these figures, when based on the weight of the wood, represent a yield of only 80 per cent., compared with a yield of over 90 per cent. often obtained in the grinding of spruce, the yield in pounds per cord is higher than that of spruce measured on the same basis.

The pulp from grinder-run No. 3, having been produced from discoloured and dirty heartwood, was of a deep reddish-brown colour in the grinder-pit, but as lapped on the wet machine was of a comparatively light colour. Some of the pulp from the grinder-pit was accordingly studied at the laboratory. It became darker on exposure to the air, but after washing with cold water in a Buchner funnel was materially brightened. This improvement in colour was measured by the Ives tint-photometer according to the principles laid down in Annexure IV of this report. As will be seen by reference to Table 10, the whiteness of the pulp was increased, while the tint remained about the same, indicating that the material washed out was black in colour, and in all probability came from black residue in the wood.

Physical Qualities of Tarwa Groundwood Pulps.

The quality of the pulp was judged almost entirely by visual examination, using a blue glass. No freeness-tester was available, and this record could not be made. However, samples of pulp were taken from the grinder-pit at various intervals after dressing the stone, and photomicrographs were made illustrative of changes in the fibre as the stone became dull. The sample taken at thirty minutes appeared "choppy," the millman's term for short bundles of fibre. Samples taken at 60, 105, 120, 150, and 210 minutes were successively, although slightly, more disintegrated to individual fibres. The amount of finely divided material appeared slightly increased. However, in estimating pulp-quality by this method, due allowance must be made for the difficulty of preparing slides truly representative of the pulp. Plate 6, fig. v, is illustrative of pulp produced 105 minutes after sharpening the grinder-stone.

The stone at Ladysmith seemed quite suitable for producing a well-disintegrated fibre. A coarser-grit stone would probably produce a more choppy pulp.

As in the laboratory semi-commercial tests, it was impracticable to make 100 per cent. water-leaf sheets of the groundwood, but samples containing 10 per cent. spruce sulphite were easily prepared.