USE OF THE ROD MILL IN REFINING SULPHITE SCREENINGS

By
Gardner H. Chidester[1]

During the courses in sulphite pulping given at the Forest Products Laboratory in March, 1927, demonstration runs were made in the rod mill to show its effectiveness in refining sulphite screenings. The material was furnished by a Wisconsin pulp mill and consisted of screenings, knots, and uncooked chips from hemlock wood pulped by a modified Decker process.

The experimental rod mill installed in the Laboratory is 3 feet in diameter, 5 feet long, inside measure, and rubber lined. The charge of steel rods consists of 52 rods varying from 1-1/2 to 2-1/2 inches in diameter, 4 feet, 10 inches long, and weighs 3720 pounds. The beating action results from the tumbling of the rods by the rotation of the mill. The mill is driven by a 15-horsepower motor at speeds varying from 19 to 28 r.p.m. Commercially, the mill is operated continuously. The pulp is fed into one end by a screw feeding device, the beaten pulp working out of the opposite end.

A preliminary batch run was first made to determine the rate at which the screenings were refined. The ends of the mill were closed and the mill charged with pulp through the manhole. For the first charge samples were taken out at 15, 30, and 45 minute intervals for strength and freeness tests. An equivalent of 16.7 pounds of oven-dry screenings with water added to bring the consistence to 4 per cent oven dry was used. The rotating speed was 26 r.p.m. Bursting and freeness tests on the various samples gave the following results:

Time in mill (minutes)	15	30	45
Bursting (pts./lb./rm. - Ashcroft)	0.393	0.347	0.326
Freeness	630	360	240

---

[1]Assistant Chemical Engineer, U.S. Forest Products Laboratory, Madison, Wis.

The 15-minute sample was considered satisfactory for the demonstration run. Allowing twice the beating time for a continuous run, the screenings were passed through the mill at the rate of 34 pounds of dry material per hour. The power consumption was calculated as follows:

Average power input -- 9.2 kw.-hours per hour

$$\frac{9.2 \times 24}{.746} = 296 \text{ horsepower-hours per day}$$

$$296 \div 24 = 12.3 \text{ horsepower-days}$$

$$\frac{34 \times 24}{200} = 0.408 \text{ tons per day}$$

$$\frac{12.3}{.408} = 30.2 \text{ horsepower-days per ton}$$

In refining semichemical chips, a large mill requires about one-third of the power per ton used in the small mill. The power requirement for a large mill in refining to the same degree would then be:

$$30.2 \div 3 = 10.1 \text{ horsepower-days per ton.}$$

To show the quality of the product obtained by further refining, at the end of the run the material left in the mill was refined to a freeness of 350 to approximate the 30-minute sample from the batch run. The power input on the second run was twice that of the first run or 60.4 horsepower-days per ton and for a large mill, 30.1 horsepower-days per ton.

In the demonstration run made during the second course, the screenings were refined to more nearly the same degree as in average mill practice. The screenings were put through the mill at the rate of 80 pounds dry per hour, giving a coarser product than that obtained from the first run, and the power input was consequently less. The average power input was 9.06 kilowatt-hours per hour.

The power requirement is then calculated as follows:

$$\frac{9.06 \times 24}{.746} = 292 \text{ horsepower-hours per day}$$

$$\frac{292}{24} = 12.15 \text{ horsepower-days}$$

$$\frac{80 \times 24}{2000} = 0.960 \text{ ton per day}$$

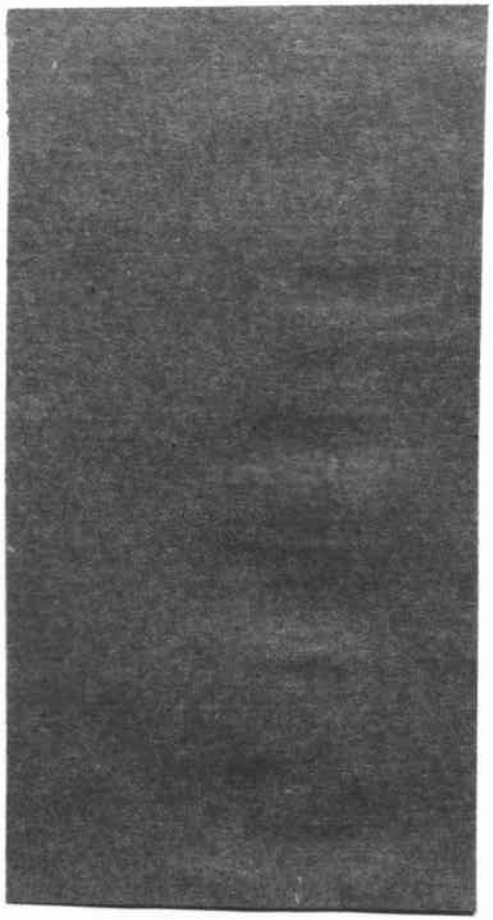
$$\frac{12.15}{.960} = 12.7 \text{ horsepower-days per ton}$$

$12.7 \div 3 = 4.2$ horsepower-days per ton for large mill.

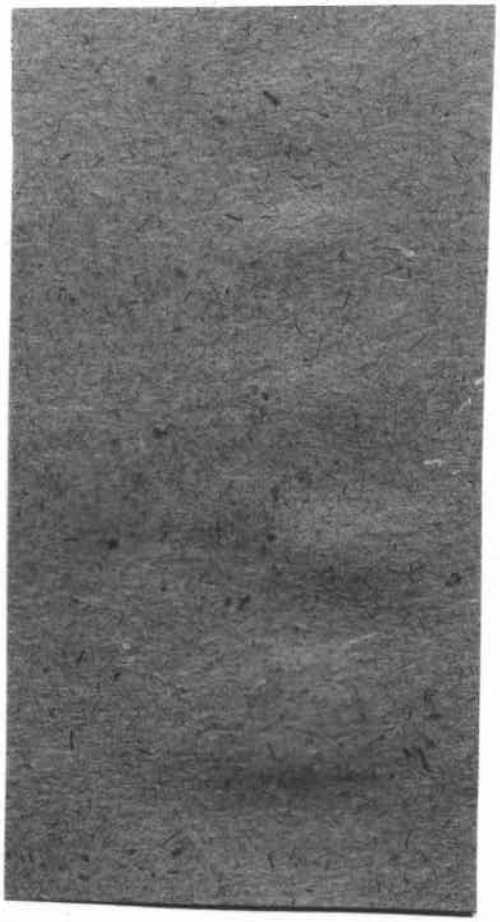
Strength tests on the three samples from the paper machine gave the following results:

Sample No.	Bursting Pts./lb.rm.	Tearing Gms./lb.rm.	Tensile brk. lgth. Meters	Double folds	Stretch Per cent
I	0.57	1.11	4449	22.5	2.04
II	.46	0.80	4060	11.5	1.93
III	.60	1.72	3745	242	3.57

Sample 1



Sample 2



Sample 3

M192447

Sulphite Screenings Sheets.