QUALITY CONTROL IN THE PULP MILL

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The Japanese Pulp and Paper Industry has progressed far on the road to recovery since the cessation of hostilities. Production is constantly increasing, and paper supplies are no longer a critical problem. The Industry has worked hard to increase production and has done well in spite of many difficulties. Now the Industry must work equally hard to improve the quality of its products and to effect efficiencies in its operations. The increasing supplies of paper available, higher labor and raw material costs, competition between mills, and competition by other countries for foreign markets are creating a demand by the consumer for better quality and greater uniformity of pulp and paper products.

“Yes”, you are probably saying to yourself, “It is easy to speak of improving the quality and uniformity of our pulp and paper products and the efficiency of our operations, but how can we do so, when the pulpwod and chemicals are nonuniform, when we are obliged to cook mixed species of wood in varying amounts depending upon our supply at any particular time, and when our equipment is not new and needs improvement?”

The answer to this lies in “Quality Control”. Quality Control is: (a) the determining of what is happening to the pulp at each stage of processing, (b) the determining of the optimum point in each stage of the processing to produce the results, desired, and (c) the maintaining of these standards. It is no more reasonable to try to operate a pulp or paper mill without quality control than it would be to operate a motor car without a steering wheel. American mills give preference to quality control laboratories over research laboratories, and many mills which do no research would not think of operating without a control laboratory. A quality control laboratory is an integral part of operation, separate from research. Its work can be evaluated directly in terms of quality, uniformity, efficiency and—very importantly—profits. Japanese pulp and paper industry does not exercise enough quality control.

Owing to long research, quality control in pulp and paper production is relatively simple and easy, requiring only the application of the standard test methods which have been distributed to you previously by your TAPPI. The equipment used is the standard pulp and paper test equipment such as the hand sheet machine, freeness tester, test beater, rod or pebble mill, and the mullen, tensile, tear, and folding endurance testers, to mention a few.

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most commonly used. Possibly, with the exception of the hand sheet machine, this equipment is available in most of the mills in Japan.

The standard method of evaluating pulp at any particular phase of an operation is to form the pulp into test sheets and make physical evaluations of the properties of the sheet by determining its tearing resistance, tensile strength, bursting strength, folding endurance, and so forth. Also by these means optimum processing time, equipment settings, and evaluation of equipment can be made.

For proper quality control it is of foremost importance to be able to form a suitable hand sheet. A machine for this purpose must able to be operated quickly and to give reliable, easily duplicable results, eliminating the human factor of the operator's skill in operation. Further, it must be possible to duplicate the results at other mills. Several such hand sheet machines are being manufactured, of which possibly the best known is the British hand sheet used as a tentative standard by American TAPPI. However, although this is an excellent machine, not many exist in Japan nor are they available at the present time. Furthermore, although the British sheet machine is a precision-made machine excellently suited for precision result, it is not so well adapted for production control. Besides, it is expensive, requires special auxiliary equipment, and considerable technique in operation.

Inasmuch as quality control cannot be practised without a hand sheet machine, it is the purpose of this article to introduce to the Industry a simple machine well suited for its use. In the accompanying drawings is the design of the hand sheet machine being used at the Forest Products Laboratory in America. It has several advantages over the British sheet machine for quality control in the pulp mill. It is easy and rapid to operate, forms sheets of suitable accuracy for operation control, and can be constructed, without patent infringement, out of scrap piping and materials available in any pulp and paper mill.

With the exception of the screen mesh dimension and size of the suction box, strict adherence to dimensions is not necessary. In special cases, other mesh dimensions can be used, if desired, for pulp board and other specialty products.

The operation is very similar to that of the British sheet machine. The globe valve "A" is opened to allow the cylinder to fill and the water rise up above the screen to about one-third the height of the deckle box, A suspension (1) of pulp is poured into the deckle box. To obtain an even distribution and from a uniform sheet, the suspension is agitated by blowing compressed air through the screen. After a few seconds, the air is shut off and the quick acting gate valve "B" is opened. The discharge of water creates a suction and filters the fiber onto the screen to form the sheet. The top of the deckle box is swung open, the wet test sheet is covered with a sheet of blotter and couched by lightly rolling back and forth with a soft rubber-covered roller of about 4 inches' diameter. The roller operation may be repeated several times, adding a fresh blotter sheet each time, until the test sheet is dry enough to be removed. For some pulp stocks two blotter sheets at a time must be used. The pulp sheet is removed, while covered by the last blotter, by raising one corner of the pulp sheet and pulling it back on itself to peel it off the screen. The deckle box is then closed and the operation is repeated until sufficient test sheets are made for whatever evaluation is desired. For ordinary evaluation only 2 sheets are required, but often a third

(1) The volume of pulp suspension depends on the weight of sheet desired. At the United States Forest Products Laboratory, usually a volume is taken to form a sheet of 55 pound basis weight (55 pounds per 500 sheets of 25 x 40 inches' dimension).
Each test sheet is clearly identified by marking the blotter sheet with an indelible pencil immediately after removal from the screen. The sheets for several tests are stacked one on top of the other with the blotter sheets between.

The stack of test sheets is covered top and bottom with smooth copper or brass plates about 1/4" x 7" x 9" in dimension and placed for ten minutes between platens of a press at a pressure of one pound per square inch surface. After pressing, the sheets are separated from each other and air-dried for 24 hours. After airdrying the blotters are removed, trimmed to 6" by 8" conditioned and tested for basis weight, tearing resistance, tensile strength, burst, folding endurance, and any other tests deemed necessary, following the test methods as specified by TAPPI.

With this apparatus an operator can sample a test beater run at ten minute intervals, making two sheets of each sample.
49 TOP VIEW OF DECKLE BOX SHEET MACHINE
SCALE: - 4

Put in compressed air line into right end of suction box 3/8 or 1/2 copper or brass tubing bent into "U" shape, end plugged drilled along top with 1/16 small holes equip air line with small pet cock for regulating air supply.