

MR. WILLIAM O. LICHTNER¹: The problem presented in this paper is extremely interesting to me as it is very similar to the one which I have been directing at the Eastern Manufacturing Company.

The problem of the proper method of beating should not be divorced from the operation of jordaning and the actual forming of the paper on the paper machine, as it is possible to determine the best method of beating to get the strongest pulp, yet when it is put through the jordan and run on to the paper machine it may show very poor strength. To endeavor to standardize the beating, jordaning, and paper machines at one operation would mean a corps of at least half a dozen thoroughly trained men, whose services probably could not be obtained, and five to ten years of solid work,—not to mention the great amount of money required to finance a proposition of this kind.

In view of these considerations, it was decided to do things on a smaller scale, so we limited the investigation to just the beating, and by means of following the stock on to the jordans and the paper machines and by taking tests off the end of the machines, it was possible to proceed with the investigation, as outlined.

What, then, is the problem? The problem is to use the Hollander beater without any change whatever in its construction, to standardize the raw materials which go into the paper, and to standardize the operations. In other words, we expect to get identical results provided we use a definite quantity of wood pulp; of a definite strength, definite quantities of alum, size, glue, gum, etc., each passing certain standard specifications, mixed with a definite quantity of water, and the whole mixture beaten in a definite way.

The difficulty in this proposition is in getting each of the ingredients going into the beater to contain the same amount of bone dry stock per unit of volume. This seems a very simple matter, but in reality is very difficult to bring about. Therefore, we who have spent some years on this problem cannot conceive how it is possible to devise a single automatic mechanical contrivance that will be a cure-all. I fear that Mr. Greene has been carried away a bit from the actual in his enthusiasm over the results which he has obtained. The following quotation from his paper seems to us conclusive evidence that the curves obtained from the "drag" must of necessity be based on average values.

"Please notice that since there is skill in following the guide, the guide is not fool-proof. Our instructions are written in precise language; our instruments are instruments of precision; yet anybody who chooses may follow all of our instructions and still spoil the job. The more a man may know

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about beating, the more thoroughly can he spoil the job and still produce a perfect record. We were aware of this from the beginning because we had tried it ourselves."

Possibly Mr. Greene's experience is the one exception that proves the rule, but I have not found a case in my experience where, if instructions are written in precise language and instruments are instruments of precision, it is possible for anybody to follow all the instructions and still spoil the job. In other words, I believe it is impossible to do all that is claimed by means of the *drag alone*, but if used in conjunction with more exact measurements of quantity of bone dry stock of known strength, then it is possible to use the drag for determining the rate of setting the beater roll.

This has been the line of attack which we have been using, and we find it is giving the desired results. Many of the troubles Mr. Greene cites, like that quoted below, will be overcome after he has standardized his beater to where it is fool-proof, and put all the beater men and men on the paper machines on a bonus, so that they all work together as a unit.

This work has already been accomplished at the Eastern Manufacturing Company. As soon as the running list of orders for the paper which is to be run during the next week, two weeks, or even a month ahead, is scheduled, we route the entire work and make out all tickets for each run of paper. The route sheet shows when to fill each beater, how long to beat, when to dump, and the time when the stock will start on the paper machine and be finished. The whole work is tied in for quantity and quality of product. Since the installation of this work according to exact methods, the quality of the product has been improved greatly, especially in respect to uniformity.

Another point to which I take exception is Mr. Greene's statement: "It will also be noticed that we have made no use of this problem of time study." How is it possible then to know how far ahead of the paper machines it is necessary to start the beating so as not to hold up the paper machines, if nothing is known about the amount of time it will require to beat the stock? By Mr. Greene's statement is meant, evidently, that detailed time studies were not taken on the moving of the stock to the beaters, on the filling or the adding of the water, etc.

In conclusion I want to say that my remarks are not to be construed to imply that Mr. Greene has not done a most creditable piece of work. I have had opportunity to know what odds he has had to meet, and that he has overcome them successfully.

I wish to say also that a large share of the credit for the remarkable results obtained at the Eastern Manufacturing Company is due to Mr. Henry J. Guild of that Company.

MR. HAYES¹: There is another method of beating paper which is used today. I understand Mr. Stobie to be one of the largest manufacturers of paper in this country, and I understand from him that there

is a method of beating paper that is absolutely scientific in its operation and control. I refer to the Stobie system, which is used only in his mill. In this beating process they determined the size of a pound of pulp and put it in the furnish at a predetermined pressure, and for a length of time that could be predetermined only by experiment and experience. Now, I have heard what the gentlemen who have spoken upon the strength of paper, etc., have said, and I would like to ask what they have found out about it in connection with the beating in the Hollander Engine, the only one described thus far.

MR. GREEN: As I have tried to point out in my paper, the object that we considered the most important, was to control the process of beating as we found it; so we have not undertaken, systematically, the development of any better way of beating stock. There undoubtedly must be a better way to do it. We have visited Mr. Stobie's mill, the Hollingsworth & Whitney plant at Winslow, Maine, have seen the process, have examined samples from the mill, and have satisfied ourselves that it is admirably suited to its use in the making of strong papers. The results are altogether dependent on two simple things, once the density has been fixed,—hydrostatic pressure, and length of time. When a suitably serrated plate has been selected and placed at the proper angle, the control is absolute, simple, and readily recorded. Whether or not it would be preferable as it stands now to our process, that is, for book papers, would be a matter for experiment which would extend over a period of time, possibly short, but very possibly, very much longer than we think, and we have not undertaken it yet. When we do undertake that problem, we shall set out to develop the best adapted process and have an open mind for the utilization of all principles which we can make apply to the problem.

MR. OUTTERSON²: I want to ask a question about standard methods. It seems to me that it is necessary for the discussion to go more into raw materials,—to make the beating more or less elastic. The pulp often varies. It seems to me that the great science of beating is in the beating of raw materials so that they will give a uniform product. I want to know how they are taken care of.

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MR. GREEN: I had not intended to bore this paper-making Society with details of paper technology, but since some are here who would be interested, I might briefly refer to this instruction card. Each

| MIN. OF RUN | 73 3/4 x 18 1/2 DRAG READINGS | | | | | | | | | | Ingot Index |
|-------------|-------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------------|
| | BEATER B-1-A DATE 10/23/16 | | | | | | | | | | |
| 40 | 250 | 255 | 260 | 265 | 270 | 275 | 280 | 285 | 290 | 295 | |
| 60 | 227 | 232 | 237 | 242 | 247 | 252 | 257 | 262 | 267 | 272 | 23 |
| 80 | 209 | 214 | 219 | 224 | 229 | 234 | 239 | 244 | 249 | 254 | 18 |
| 100 | 193 | 198 | 203 | 208 | 213 | 218 | 223 | 228 | 233 | 238 | 16 |
| 120 | 179 | 184 | 189 | 194 | 199 | 204 | 209 | 214 | 219 | 224 | 14 |
| 140 | 168 | 173 | 178 | 183 | 188 | 193 | 198 | 203 | 208 | 213 | 11 |
| 160 | | | | | | | | | | | |
| 180 | | | | | | | | | | | |
| 200 | | | | | | | | | | | |
| 220 | | | | | | | | | | | |
| 240 | | | | | | | | | | | |

RAISE ROLL AT 160 MIN. SIZE & WT. 43 1/2 x 63-156 BASIS 54
STOP ROLL AT 160 MIN. GRADE # 15 CUST. STRK

column of figures represents a curve of readings which the beater man is to follow. The columns represent parallel curves 5 points apart. You will notice that the first drag reduction called for, between the forty-minute and the sixty-minute readings, is 23 points. If the raw stock is coming hard it will require a more severe setting of the beater roll to produce this reduction of 23 points than if the raw stock is coming soft. Thus, the drag leads the beater man to compensate for these variations in raw stock in the same manner in which his experience would lead him to do, except that it is, to a measured degree in the case of the drag. This takes care of the ordinary fluctuations in quality of raw stock as we find them to occur at Cumberland Mills. The more serious fluctuations, which occur over long periods of time, are compensated for by modifying the set standard curves.

MR. M. L. COOKE³: There are two points that appeal to me. One is a point which was suggested to me by Mr. Scheel, that Mr. Green has been particularly interested in doing the work and developing the complete solution of one specific problem out of the whole field of management.

The other point is a discussion of Mr. Wolf's discussion. When I heard that he was not going to be here, I was sorry. I know the problem in his mind would be "what Mr. Green and his associates have done for the poor working man." I think Mr. Wolf is doing this Society a very great service. I feel that anyone who follows his standard and study in this industrial problem must inevitably grow towards Mr. Wolf's position.

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