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Report on Tests on One, Two, Three, and Four Strand Rolling

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15 August 1963

Bethlehem Steel Company
Sparrows Point 19
M aryland

Attention: Mr. J. M. Spencer, Chief Engineer
Mr. H. N. McCloskey, Rod Mill Engineer

Gentlemen: Est. 4273, Investigation of Loop Stabilization - No. 2 Rod Mill

We should like to express appreciation for the cooperation we received from your people while running the tests as outlined in our letter of 11 July 1963. We took sample sections from stands 1, 6, 12, 13, 14 and 20 and made the height and width measurements while at your mill. This uncovered a faulty set of samples from one stand and a correct set was taken the following day. We all agreed as to the technique of the control line sampling and it was judged that the samples were all valid finally.

The small sections that we took back with us have been measured for section area by two methods. The large sections that you shipped to us will be prepared and measured shortly. An initial conclusion that we can make from the first data is that your rod mill is distinctly tighter than an older one we evaluated similarly, where the other mill had a problem of keeping the rod product within tolerance. The following several paragraphs illustrates the matter of roll housing stiffness from our observations on your mill.

The 5/8 rod samples from your east finishing train showed remarkable uniformity. The average heights of the final product for 1, 2 and 3 lines through the mill to stand 14, all of which meant one line in the east finishing train, were within 0.0001". The height increased 0.0026" with 4 lines through the intermediates, which meant, more importantly, two lines in the given finishing train. Thus the east finishing mill is judged as acceptably stiff. The samples from the west mill have not yet been analyzed.

Chief
What is the purpose of these tests?
Our first appraisal of the sections from stands 1 and 8 indicate a fairly tight mill to that latter stand. The increments of variation of section area with number of strands rolled out of stand 8 matches very closely the variation of section height, viz., the changes of height and area when changing from 1 to 2 strands rolled are appreciably larger than the changes for 2 strands becoming 3 or for 3 becoming 4. The latter two changes are nearly equal and the fact that they are smaller than the 1 to 2 change means that the mill stand has stiffened up from its initially soft response. This follows the expected behavior of an older mill; newer roll housing designs would decrease the section variation and keep it more uniform for all changes in number of strands rolled.

The section variations out of stands 12, 13 and 14 are not as accountable as those referred to above. The samples from 12 show a slight inconsistency but those from 13 and 14 are particularly erratic. Again we believe that the location of our test samples made them perfectly valid and we feel that the unpredictable behavior at stands 13 and 14 has two real sources - 1. the stretch - load characteristics of these stands is not ordinary and 2. the interstand tensions ahead of stand 13 compound the magnitude of the variations in section.

From observations of the loops on the first repeater, it was evident that there was heavy interstand tension ahead of stand 12. Parenthetically it is noted that we sought to eliminate as many variable changes as possible for this test, wanting to keep the number of strands rolled as the only variable intentionally changed. But a major influence in your problem of successfully rolling 2-1/2" billets down to small rod sizes must be this matter of interstand tension; therefore it was definitely necessary that the sample sections include the effect of that variable too.

The analysis of the sample sections is being interrupted by vacations and completion is perhaps 3 or 4 weeks away. We wanted to let you know of our progress to date and thank you for the prompt shipment of the rod sections.

Sincerely yours

MORGAN CONSTRUCTION COMPANY

By

John A. Bjork, Research Engineer

JAB:neb

bcc:  P.M. Morgan
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     Pa. S. Morgan
     C.W. Bruce
     E.S. Murrah
     J.H. Hitchcock, A. Marsters, R. Hermes