July 2014

Lackenby- Merchant, Rod and Strip Mill Mechanical Descaling of Rods

John H. Hitchcock

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Mr. George Foster,
Sept. Rolling Mill Developments
Dorman Long (Steel) Limited
Central Eng. & Plant Construction Dept.
G. P. O. Box 11, Royal Exchange
Middlesbrough
England

Dear George,

Since acknowledging, on 11 March, your letter of 4 March
regarding mechanical descaling of rapidly cooled rods, we have secured
some information which may be of help to you.

At Bethlehem's Johnstown plant where our air-cooled reels
are in operation, all rod bundles are air-cooled while being formed. Some
of Johnstown's customers who use mechanical descaling specify "heavy
scale". Rods intended for these customers are brought to the reels at
a temperature of about 1750°F. by reducing the amount of water in the
delivery pipes and are said to be "coiled hot". Rods for other customers
are brought to the reels at 1450°F. with full cooling in the delivery pipes
leading to the reels, and these are referred to as "coiled cold". The
people at Johnstown are under the impression that rods "coiled cold" form
scale that resists mechanical removal. However, one of their customers
reports the use of mechanical descaling on Johnstown rods "coiled cold",
with satisfactory results so far as scale removal is concerned, but with
reduced die life in subsequent drawing and trouble in wire forming machines
because of modified mechanical properties.

In another rod mill in this country the outlet from one strand
has been equipped with a "water patenting" process which cools rods to
about 1000 - 1200°F. enroute to the reels. These rods have about
.25 - .30% scale. Some of these rods have been drawn experimentally
without descaling, but die life was too short to make the operation practical.
Mechanical descaling of these "water patented" rods brings the scale off in
extremely fine dust, reportedly requiring an air jet to carry the dusty scale
off the surface. In this plant mechanical descaling has also been used on
rod bundles coiled in the usual way, which have .5 - .6% scale. Subsequent
drawing revealed little difference between hot coiled and water patented rods, but in high carbon steel neither kind was found acceptable from the standpoint of drawability and mechanical properties, and no mechanical descaling is now used in this plant.

At the Worcester plant of American Steel & Wire Co. mechanical descaling is used extensively on low carbon rods of nail grade. In this mill rod coils are air-cooled in a delay station immediately after removal from the reels. Mechanical descaling is used both for air-cooled green rods direct from the mill and for rods which have been normalized subsequently. With normalized rods descaling is accomplished effectively in a three-roll descaler. Air cooled rods require a five roll descaler, and impose a sharp reduction of die life in subsequent drawing, particularly in the second die. There is no enthusiasm in this plant for fancy descaling machines employing rotating brushes, air jets, and similar refinements, which have been the subjects of extensive research. They also report that all nail wire drawn from mechanically descaled rods requires special treatment in nail machines, where it has a strong tendency to form whiskers. An incidental item of useful information is the fact that rod coils which are wet from exposure to rain or snow cannot be mechanically descaled successfully.

The effect on scale formation of cooling rates in the new air-cooled reels has been determined in preliminary fashion by observation of .218" rods at Johnstown, where the temperature at which coils were discharged from the reels was varied experimentally over a wide range by varying the amount of air cooling and the amount of water supplied to the delivery pipes. Similar observations were made also in other mills where control of temperature was limited to adjustment of water supply in the delivery pipes. The results of these observations are summarized in the following tabulation.

<table>
<thead>
<tr>
<th>Coil temperature at discharge - °F.</th>
<th>% Scale loss by weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Air Cooled Reels</td>
</tr>
<tr>
<td>1750</td>
<td>1.52</td>
</tr>
<tr>
<td>1600</td>
<td>.85</td>
</tr>
<tr>
<td>1450</td>
<td>.54</td>
</tr>
<tr>
<td>1300</td>
<td>.40</td>
</tr>
<tr>
<td>1150</td>
<td>.36</td>
</tr>
<tr>
<td>1000</td>
<td>.28</td>
</tr>
</tbody>
</table>

To summarize this information, it appears that rapidly cooled rod bundles carrying less than 0.5% scale can be descaled mechanically with suitable descaling equipment. Apparently the only handicaps resulting from
this practice are the reduction of life and the modification of mechanical properties which affects subsequent processing. The latter feature appears to be inherent in mechanically descaled rods, regardless of the rate of cooling after hot rolling.

We trust that this information will be useful to you, and that you will let us have the benefit of your comments and experience.

Very truly yours
Morgan Construction Company

By J. H. Hitchcock

JMMw

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EHF
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