July 2014

The Effects of Air and Water Cooling on Scale Formation on the New Rod Mill

R. A. Stebbins

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The Effects of Air and Water Cooling on Scale Formation on the New Rod Mill

On March 15, 1956 a test was run on C1008 - 7/32 rod under various conditions to determine the individual and combined effects of water and air on the New Morgan Laying Reels.

At the time of the test, the outside temperature was approx. 39°F and all tests were run on No. 1A reel where max. air was available. This reel had the air dampers wide open and the (40) horse power motor was drawing 42 amps against a maximum capacity of 52 amps. The rolling speed was approx. 4000' /min. and the Billet temperature leaving the furnace was 2220 to 2270. The Rayotube temperature between 3 and 4 stands was 1860 to 1930. The results are as follows.

<table>
<thead>
<tr>
<th>TEST NO.</th>
<th>CONDITIONS</th>
<th>MAX. COILING TEMP.</th>
<th>OUTSIDE APPEARANCE</th>
<th>TENSILE</th>
<th>% R.A.</th>
<th>% SCALE</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>No Water</td>
<td>1720/1770°F</td>
<td>White heat with a few black strand</td>
<td>47,900#</td>
<td>78.2</td>
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<td>2</td>
<td>No Water</td>
<td>1450/1500°F</td>
<td>50% Black</td>
<td>49,900#</td>
<td>78.0</td>
<td>0.880</td>
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<tr>
<td></td>
<td>Max. Air</td>
<td></td>
<td>50% Cherry Red</td>
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<tr>
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<td>35 sec after cooling</td>
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<td>No Water</td>
<td>1600/1650°F</td>
<td>25% Black</td>
<td>48,600#</td>
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<td>0.930</td>
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<td>Partial Air</td>
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<td>75% Cherry Red</td>
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<td></td>
<td>35 sec after cooling</td>
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<tr>
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<td>17½ sec after cooling</td>
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<tr>
<td>7</td>
<td>Max. Water</td>
<td>Substantially less than 1000°F</td>
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<td>Excess Air</td>
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<td>70 sec after cooling</td>
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R. A. Stebbins
Asst. Superintendent
Rod & Wire Division
<table>
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<tr>
<th>Stand No.</th>
<th>Section for</th>
<th>Maximum Load</th>
<th>R.P.M. Rolls</th>
<th>Separating Force - Max. Load</th>
<th>Section for Max. Load Bearing</th>
<th>Required R.P.M.</th>
<th>Maximum Torque Inch Lbs. per Stand</th>
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<td>2 Str. 1-1/8&quot;</td>
<td>53.43</td>
<td>309.8</td>
<td>172.5</td>
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<td>407</td>
<td>59.27</td>
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<tr>
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Study of Bearing Load & Power

A.S. & W. Rod Mill

23 December 1953 N.A.W. - J.H.H.

Revised 1 April 1954 - J.H.H.
### APPARENT STRESS

<table>
<thead>
<tr>
<th>Stand No.</th>
<th>Maximum Brğ. Load- Lbs./1000</th>
<th>Max. H.P.</th>
<th>R.P.M.Rolls</th>
<th>Mogoll Size</th>
<th>Bending</th>
<th>Torsion</th>
<th>Combined</th>
<th>Stress Concentration Factor</th>
<th>Actual Combined Stress</th>
<th>Apparent Stress in Roller Brğ. Necks</th>
<th>Actual Stress in Roller Bearing Necks</th>
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<tbody>
<tr>
<td>1</td>
<td>318</td>
<td>192</td>
<td>7.31</td>
<td>18-72</td>
<td>8,850</td>
<td>1,800</td>
<td>9,205</td>
<td>1.32</td>
<td>12,150</td>
<td>14,080</td>
<td>19,700</td>
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**Study of Roll Neck Stresses**

**A.S.& W. - Rod Mill**

23 December 1953 - N.A.W., J.H.H.

Revised 6 April 1954 - N.A.W.

See D106276

D106275