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APPENDIX S

ROOFBOLTER PUMP MOTOR

Typical nameplate data for the pump motor of a Roofbolter can be seen in Table S-2. The pump motor measured at both sections was a 30 kW induction motor with a full load current rating of 20 A.

Table S-1: Nameplate data of the pump motor on a CM.

<table>
<thead>
<tr>
<th></th>
<th>Roofbolter</th>
<th>Pump Motor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>30 kW</td>
<td>Voltage</td>
</tr>
<tr>
<td>Duty</td>
<td>S1</td>
<td>1000 V</td>
</tr>
<tr>
<td>Ins class</td>
<td>F</td>
<td>Current</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RPM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1460</td>
</tr>
<tr>
<td></td>
<td></td>
<td>pf</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.94</td>
</tr>
</tbody>
</table>

Table S-2: Production figures for shifts that the conveyor motor was investigated.

<table>
<thead>
<tr>
<th>Date</th>
<th>Sect 21 Morning</th>
<th>Afternoon</th>
<th>Sect 61 Morning</th>
<th>Afternoon</th>
</tr>
</thead>
<tbody>
<tr>
<td>17-May-2005</td>
<td>858</td>
<td>2145</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>18-May-2005</td>
<td>1320</td>
<td>2112</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>19-May-2005</td>
<td>1716</td>
<td>2013</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>23-May-2005</td>
<td>-</td>
<td>-</td>
<td>1740</td>
<td>2030</td>
</tr>
<tr>
<td>24-May-2005</td>
<td>-</td>
<td>-</td>
<td>1450</td>
<td>2320</td>
</tr>
<tr>
<td>25-May-2005</td>
<td>-</td>
<td>-</td>
<td>2320</td>
<td>1160</td>
</tr>
</tbody>
</table>
S.1 LOAD PROFILE

The next section focuses on the load profiles of the pump motor. Each graph shows the line voltage and the voltage limits, the load current and full load current capacity of the pump motor. The morning shifts and afternoon shifts are separated as well as the measurements made at the different sections.

S.1.1 SECTION 21

S.1.1.1 Morning shifts

Figure S.1-1: Load current and voltage for a pump motor – 17 May 2005.
Figure S.1-2: Load current and voltage for a pump motor – 18 May 2005.

Figure S.1-3: Load current and voltage for a pump motor – 19 May 2005.
Figure S.1-4: Load current and voltage for a pump motor – 19 May 2005
(30 minute period).
S.1.1.2 Afternoon shifts

Figure S.1-5: Load current and voltage for a pump motor – 17 May 2005.
Figure S.1-6: Load current and voltage for a pump motor – 18 May 2005.

Figure S.1-7: Load current and voltage for a pump motor – 19 May 2005.
Figure S.1-8: Load current and voltage for a pump motor – 19 May 2005
(30 minute period).
S.1.2 SECTION 61

S.1.2.1 Morning shifts

Figure S.1-9: Load current and voltage for a pump motor – 23 May 2005.
Figure S.1-10: Load current and voltage for a pump motor – 24 May 2005.

Figure S.1-11: Load current and voltage for a pump motor – 24 May 2005 (30 minute period).
Figure S.1-12: Load current and voltage for a pump motor – 25 May 2005.

Figure S.1-13: Load current and voltage for a pump motor – 25 May 2005 (30 minute period).
S.1.2.2 Afternoon shifts

Figure S.1-14: Load current and voltage for a pump motor – 23 May 2005.
Figure S.1-15: Load current and voltage for a pump motor – 24 May 2005.

Figure S.1-16: Load current and voltage for a pump motor – 24 May 2005 (30 minute period).
Figure S.1-17: Load current and voltage for a pump motor – 25 May 2005.

Figure S.1-18: Load current and voltage for a pump motor – 25 May 2005 (30 minute period).
S.2 HISTOGRAM

The next section focuses on the frequency with which a Roofbolters pump motor consumed a certain load current. The graphs show the number of times a certain current has been consumed. The tables give data about the tonnes produced during the shift and the percentage time of the shift that the motors were producing. The time that the motors have been over loaded or loaded within the full load rating of the motor is given as a percentage of the actual producing time. The morning shifts and afternoon shifts are separated as well as the measurements made at the different sections.
S.2.1 SECTION 21

S.2.1.1 Morning shifts

Table S-3: Data for the total consumption of a pump motor in section 21.

<table>
<thead>
<tr>
<th></th>
<th>17-May-05</th>
<th>18-May-05</th>
<th>19-May-05</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tonnes/CM/Shift</td>
<td>858</td>
<td>1320</td>
<td>1716</td>
</tr>
<tr>
<td>% Time of shift producing</td>
<td>-</td>
<td>-</td>
<td>53.73%</td>
</tr>
<tr>
<td>% of Production time underloaded</td>
<td>-</td>
<td>-</td>
<td>89.80%</td>
</tr>
<tr>
<td>% of Production time overloaded</td>
<td>-</td>
<td>-</td>
<td>10.20%</td>
</tr>
</tbody>
</table>

Figure S.2-1: Histogram for current consumed by a pump motor.
S.2.1.2 Afternoon shifts

Table S-4: Data for the total consumption of a pump motor in section 21.

<table>
<thead>
<tr>
<th></th>
<th>17-May-05</th>
<th>18-May-05</th>
<th>19-May-05</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tonnes/CM/Shift</td>
<td>2145</td>
<td>2112</td>
<td>2013</td>
</tr>
<tr>
<td>% Time of shift producing</td>
<td>-</td>
<td>-</td>
<td>80.38%</td>
</tr>
<tr>
<td>% of Production time underloaded</td>
<td>-</td>
<td>-</td>
<td>91.81%</td>
</tr>
<tr>
<td>% of Production time overloaded</td>
<td>-</td>
<td>-</td>
<td>8.19%</td>
</tr>
</tbody>
</table>

Figure S.2-2: Histogram for current consumed by a pump motor.
S.2.2 SECTION 61

S.2.2.1 Morning shifts

Table S-5: Data for the total consumption of a pump motor in section 61.

<table>
<thead>
<tr>
<th></th>
<th>23-May-05</th>
<th>24-May-05</th>
<th>25-May-05</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tonnes/CM/Shift</td>
<td>1740</td>
<td>1450</td>
<td>2320</td>
</tr>
<tr>
<td>% Time of shift producing</td>
<td>-</td>
<td>36.51%</td>
<td>71.58%</td>
</tr>
<tr>
<td>% of Production time underloaded</td>
<td>-</td>
<td>69.35%</td>
<td>95.05%</td>
</tr>
<tr>
<td>% of Production time overloaded</td>
<td>-</td>
<td>30.65%</td>
<td>4.95%</td>
</tr>
</tbody>
</table>

Figure S.2-3: Histogram for current consumed by a pump motor.
S.2.2.2 Afternoon shifts

Table S-6: Data for the total consumption of a pump motor in section 61.

<table>
<thead>
<tr>
<th></th>
<th>23-May-05</th>
<th>24-May-05</th>
<th>25-May-05</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tonnes/CM/Shift</td>
<td>2030</td>
<td>2320</td>
<td>1160</td>
</tr>
<tr>
<td>% Time of shift producing</td>
<td>-</td>
<td>30.11%</td>
<td>38.59%</td>
</tr>
<tr>
<td>% of Production time underloaded</td>
<td>-</td>
<td>72.38%</td>
<td>90.31%</td>
</tr>
<tr>
<td>% of Production time overloaded</td>
<td>-</td>
<td>27.62%</td>
<td>9.69%</td>
</tr>
</tbody>
</table>

Figure S.2-4: Histogram for current consumed by a pump motor.
S.3 THERMAL CAPACITY

The next section focuses on the temperature of the windings of the pump motor. Each graph shows the temperature of the motor, the load current and rated full load current of the motor. The morning shifts and afternoon shifts are separated as well as the measurements made at the different sections. The thermal time constant is 40 minutes.

S.3.1 SECTION 21

S.3.1.1 Morning shifts

![Figure S.3-1: Load current and motor temperature for a pump motor – 17 May 2005.](image-url)
Figure S.3-2: Load current and motor temperature for a pump motor

Figure S.3-3: Load current and motor temperature for a pump motor
– 19 May 2005.
S.3.1.2 Afternoon shifts

Figure S.3-4: Load current and motor temperature for a pump motor – 17 May 2005.
Figure S.3-5: Load current and motor temperature for a pump motor – 18 May 2005.

Figure S.3-6: Load current and motor temperature for a pump motor – 19 May 2005.
S.3.2 SECTION 61

S.3.2.1 Morning shifts

Figure S.3-7: Load current and motor temperature for a pump motor
Figure S.3-8: Load current and motor temperature for a pump motor

Figure S.3-9: Load current and motor temperature for a pump motor
S.3.2.2 Afternoon shifts

Figure S.3-10: Load current and motor temperature for a pump motor – 23 May 2005.
Figure S.3-11: Load current and motor temperature for a pump motor

Figure S.3-12: Load current and motor temperature for a pump motor