Transición energética en la 4ta revolución industrial

Universidad Tecnológica de Pereira

Universidad Nacional de Colombia
Energy Management in The Colombian Mining Industry – An approach for Energy Characterization

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More with less
Reduce operating costs with higher quality levels

1) Measure, recording and monitoring.
2) Interpret, decipher and process.
3) Predict through historical records.
4) Create strategies and plans to upgrade energy efficiency.
II. Methodology

1) Identify SEUs

2) Technology implementation

3) Data collection

4) Application of ISO 50006

Fig. 1: Overview of energy performance and its continuous assessment.
II. Methodology

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II. Methodology

\[ KPI_1 = \frac{Ton_{extra}}{kWh} \]
\[ KPI_2 = \frac{Ton_{trit}}{kWh} \]
\[ KPI_3 = \frac{kg_{oro_fundi}}{kWh} \]

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II. Methodology

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Fig. 2: Relationship between energy performance, EnPIs, EnBs and energy targets.
II. Methodology

Fig. 1: Overview of energy performance and its continuous assessment.
III. Study Case: Gold Mine

Fig. 3: Architecture of a system for monitoring electricity consumption.
III. Study Case: Gold Mine

Fig. 4: CIRCUTOR Line-EDS-Cloud

Fig. 5: Connectivity of CIRCUTOR Line-EDS-Cloud
IV. Results

Fig. 6: Gold process description example

<table>
<thead>
<tr>
<th>Electric users</th>
<th>Average power consumption [kVA]</th>
<th>Percentage of utilization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pumps</td>
<td>2.183</td>
<td>13.9 %</td>
</tr>
<tr>
<td>Gravimetric concentration</td>
<td>23</td>
<td>0.1 %</td>
</tr>
<tr>
<td>Leaching</td>
<td>508</td>
<td>3.2 %</td>
</tr>
<tr>
<td>Conveyor</td>
<td>300</td>
<td>1.9 %</td>
</tr>
<tr>
<td>Backfill</td>
<td>1.693</td>
<td>10.8 %</td>
</tr>
<tr>
<td>Mobile and fixed equipment</td>
<td>1.300</td>
<td>8.3 %</td>
</tr>
<tr>
<td>Ventilation</td>
<td>1.985</td>
<td>12.7 %</td>
</tr>
<tr>
<td>General services</td>
<td>830</td>
<td>5.3 %</td>
</tr>
<tr>
<td>Crushing</td>
<td>657</td>
<td>4.2 %</td>
</tr>
<tr>
<td>Electrowinning</td>
<td>29</td>
<td>0.2 %</td>
</tr>
<tr>
<td>Agitators</td>
<td>490</td>
<td>3.1 %</td>
</tr>
<tr>
<td>Grinding</td>
<td>4.630</td>
<td>29.5 %</td>
</tr>
<tr>
<td>Filters</td>
<td>256</td>
<td>1.6 %</td>
</tr>
<tr>
<td>Compressors</td>
<td>322</td>
<td>2.1 %</td>
</tr>
<tr>
<td>Smelting</td>
<td>70</td>
<td>0.4 %</td>
</tr>
<tr>
<td>Others</td>
<td>407</td>
<td>2.6 %</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15.684</strong></td>
<td><strong>100.0 %</strong></td>
</tr>
</tbody>
</table>

Table 1: Electrical users of the mining process grouped by their activity and their respective percentage of electrical energy consumption (plant and mine).
V. Conclusions

- The SEUs of the process are **grinding, backfill, ventilation** and **pumps**, which account for about 70% of the total energy.

- Each energy monitoring unit has a cost of US $ 2.300.

- There are many process in the industry mining which use electricity, however its important to follow the adequate processes which represents the major energetic consumption.
VI. Questions