**CONSERVATION OF RESOURCES**

**Increased service life of turbine oil through use of a VEU-F**

**INITIAL SITUATION**

- HYDAC received an emergency call from a hydro-electric power station due to acute oil problems.
- A resin-type coating had formed on a locking bolt on a turbine which is a safety-relevant component (see image below).

**OBJECTIVES**

- Prevention of unscheduled system downtime
- Longer oil service life
- Cost saving
- Environmental protection through reduced turbine oil consumption

**HYDAC SOLUTION**

The competent maintenance manager and the maintenance manager of the neighbouring power plant were informed about the varnish formation in turbine oils. Oil samples were taken in both power plants and analysed.

**Power plant 1:**

The resin formation at the bolt could not be attributed to increased varnish values in the oil, but to the lack of oil flow at the bolt in a dead space. HYDAC recommended to in future ensure for oil exchange by an additional drain line.

**Power plant 2:**

- The power plant consists of 7 turbines with separate circuits. Here, MPC values of approx. 50 could be measured. The MPC value (Membrane Patch Colorimetry) defines the varnish content in the system. From an MPC value of 30, an acute varnish problem is present, which can result in deposits and turbine failures.
- Based on the sensitisation of both operators with regard to the varnish problem, it was decided to acquire a VEU-F for the power plant 2 and to monitor the MPC value in both power plants by means of laboratory analyses. If required, a further device should be invested in. This was the case shortly thereafter.
- Both power plants are part of an energy group. The central IH planning of the group has already mentioned interest in additional devices for combating varnish.

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**Varnish Elimination Unit – Filtration (VEU-F)**

The service-friendly Varnish Elimination Units are used to prepare mineral oils. They are particularly effective at removing oil ageing products (varnish) from mineral oils. The VEU-F series of units is used in bypass flow. The removal of varnish is based on reducing the oil solubility for varnish with subsequent filtration.
RESULT

**Increased oil service life**

The experiences at reference clients show that an increased oil service life from two to eight years for Group 2 and 3 oil with use of VEU.

<table>
<thead>
<tr>
<th>Oil consumption: 4,200 l (7 x 600 l)</th>
<th>Oil service life without VEU</th>
<th>Oil service life with VEU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change interval</td>
<td>2 years</td>
<td>8 years</td>
</tr>
<tr>
<td>Oil consumption per year</td>
<td>2,100 litre</td>
<td>525 litre</td>
</tr>
</tbody>
</table>

**Reduced operating costs**

<table>
<thead>
<tr>
<th>Costs per year (€)</th>
<th>Without VEU-F</th>
<th>With VEU-F</th>
<th>Saving</th>
</tr>
</thead>
<tbody>
<tr>
<td>New oil</td>
<td>5,250 €</td>
<td>1,312 €</td>
<td>3,938 €</td>
</tr>
<tr>
<td>Disposal of old oil</td>
<td>1,050 €</td>
<td>262 €</td>
<td>788 €</td>
</tr>
<tr>
<td>Labour costs, oil change * (1day per unit)</td>
<td>1,680 €</td>
<td>420 €</td>
<td>1,260 €</td>
</tr>
<tr>
<td>Additional costs from varnish (e.g. valve replacement, tank cleaning etc.)</td>
<td>6000 €</td>
<td>0 €</td>
<td>6000 €</td>
</tr>
<tr>
<td>Element cost VEU</td>
<td>0 €</td>
<td>975 €</td>
<td>-975 €</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>13,980 €</strong></td>
<td><strong>2,969 €</strong></td>
<td><strong>11,011 €</strong></td>
</tr>
</tbody>
</table>

*) Due to the prevention of turbine downtimes and unexpected downtimes caused by varnish, the listed savings can be exceeded many times over. The customer investment is usually amortised much quicker.

**CUSTOMER BENEFITS**

- Oil shelf life increased
- System availability increased
- Without VEU downtime due to varnish would have been inevitable. This was prevented.
- Cost savings

**FURTHER APPLICATION AREAS**

- Lubrication of hydroelectric power plants
- Power plant turbines
- Steel industry
- Presses

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