Oil Purification Plants

VOP  100 lt/h  -  20’000 lt/h
**Process Description**

Standard plants for the treatment of insulating oils, oil filtering and drying of electrical equipment, such as transformers and switchgears.

The oil to be treated is fed into the VOP plant by means of a frequency controlled feeding pump and a flow-through meter. The oil is heated to the pre-selected temperature and directed into the degassing phase. An automatic level control guarantees, at pre-selected flow-through, an optimised degassing of the insulating oils. By means of a frequency controlled feeding pump, the degassed and dewatered oil is transferred back into the transformer through the fine filter column.

**Technical Characteristics**

- Single stage, air-cooled vacuum system
- Variable flow-through according to type, from 100 l/h to 20000 l/h
- Anti-Froth Control system in the degassing tank (AFC System)
- Automatic overflow safety device
- Fine filtering of the oil is carried out by means of easy to exchange fine filter cartridges with automatic control of dirtiness
- The filter elements are made of special synthetic material and are non-hygrosopic.

**General Characteristics**

Higher degassing and dewatering efficiency factor at a technical basis from the oil are not evacuated. The horizontal position and general dimensioned heating surface allow a careful heating up of the oil.

**Fueling**

The oil to be treated is heated by means of an electrically heated, PID controlled oil heater. The heating elements are placed into welded-in protection tubes, separated from the oil. The horizontal position and gene-

**Diagrams**

See the attached diagrams for a visual representation of the process description and technical characteristics.

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**Substantial Plant Characteristics**

**Online Oil Measuring**

A new measuring instrument for the determination of the dielectric strength of the oil. The plant guarantees an optimised treatment function. Data is continuously registered on a 6-channel recorder.

**Degassing System**

The degassing system has been optimised and expanded with an automatic level control, dependent on the adjusted flow-through rate. Excellent degassing values and constant oil quality are guaranteed.

**Technical Characteristics**

- Single stage, air-cooled vacuum system
- Variable flow-through according to type, from 100 l/h to 20000 l/h
- Anti-Froth Control system in the degassing tank (AFC System)
- Automatic overflow safety device
- Fine filtering of the oil is carried out by means of easy to exchange fine filter cartridges with automatic control of dirtiness
- The filter elements are made of special synthetic material and are non-hygrosopic.

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**Supplements**

A large selection of supplements can be ordered together with the VOP plant. Supplements ordered at a later stage can be easily installed into the plant without retifing.

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**Further Accessories**

- Z9 Water & gas content measuring device VZ 212 A
- Z10 Vacuum pumps with motor
- Z11 Signal device to mobile phone (GSM modem)
- Z15 Roadworthy trailer with box
- Z17 Roadworthy trailer with box

### Optional Accessories

- Z1 Optional vacuum pump (extended suction capacity)
- Z2 Oil feed pump
- Z3 Flexible hose with coupling
- Z4 Extern heating pump
- Z5 Additional fine filter
- Z6 By-pass system for heating and/or filtration
- Z7 Flow-through meter
- Z8 Safety level probe
- Z9 Water & gas content measuring device VZ 212 A
- Z10 Vacuum pumps with motor
- Z11 Signal device to mobile phone (GSM modem)
- Z15 Roadworthy trailer with box
- Z20 Spare parts for many years of plant operation
Process Description

Standard plants for the treatment of insulating oils, oil filtering and drying of electrical equipment, such as transformers and switchgears.

The oil to be treated is fed into the VOP plant by means of a frequency controlled feeding pump. The oil is heated to the pre-selected temperature and directed into the degassing phase. An automatic level control guarantees, at pre-selected flow-through, an optimised degassing of the insulating oils.

By means of a frequency controlled feeding pump, the degassed and dewatered oil is transferred back into the transformer through the fine filter column.

Technical Characteristics

• Single stage, air-cooled vacuum system
• Variable flow-through according to type, from 100 lt/h to 20000 lt/h
• Anti-Froth Control system in the degassing tank (AFC-System)
• PID-regulated Thyristor heating system
• Vacuum pump for transformer evacuation
• 6-channel recorder.
• Automatic overflow safety device
• Automatic indication for filter changes
• Online treatment on energized transformer
• Various control systems (Internet, enlargeable, at any time, without additional modifications).

Filtration

Higher degassing and dewatering efficiency factor as a protective heating process. After treatment, the oil characteristics are vastly kept (light fractions, as well as chemical basis from the oil are not evacuated).

A new measuring instrument for the determination of the carbon residue is standard equipment.

A new measuring instrument for the determination of the moisture content is standard equipment.

A new measuring instrument for the determination of the viscosity content is standard equipment.

A new measuring instrument for the determination of the gas content is standard equipment. Oil Feeding

The oil fed into the plant is heated by means of an electrically heated, PID controlled oil heater, which is set to a pre-selected temperature. The heating elements are placed into welded-in protection tubes, separated from the oil. The horizontal position and generally dimensioned heating surface allow a careful heating-up of the oil.

Filtration

A built-in pre-filter at the inlet of the VOP plant protects the plant against coarse contamination. Fine filtering of the oil is carried out by means of easy to exchange filter cartridges with automatic controle d control. The filter elements are made of special synthetic material and are non-hygroscopic.

Online Oil Measuring

A new measuring instrument for the determination of the carbon residue is standard equipment.

A new measuring instrument for the determination of the moisture content is standard equipment.

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The oil fed into the plant is heated by means of an electrically heated, PID controlled oil heater, which is set to a pre-selected temperature. The heating elements are placed into welded-in protection tubes, separated from the oil. The horizontal position and generally dimensioned heating surface allow a careful heating-up of the oil.

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Filtration

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Online Oil Measuring

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Oil Purification Plant

Process Description
Standard plants for the treatment of insulating oils, oil filling and drying of electrical equipment, such as transformers and switchgears.

Technical Characteristics
- Single axle, air-cooled vacuum system
- Variable flow-through according to type, from 100 lt/h to 20000 lt/h
- Anti-Froth Control system in the degassing tank
- Special synthetic material and are anti-hygroscopic.
- New measuring instrument for continuous and automatic indication for filter changes
- 6-channel recorder.

General Characteristics
- Higher degassing and dewatering efficiency factor at a chemical basis from the oil are not evacuated.
- Higher degassing and dewatering efficiency factor at a chemical basis from the oil are not evacuated.
- Lower guarantee values only the degassing system has been optimised and expanded with an automatic level control, dependent on the adjusted flow-through rate. Excellent degassing values and expert oil quality are guaranteed.
- A large selection of supplements can be ordered together with the VOP plant. Supplements ordered at a later stage can be easily installed into the plant without refitting.

Substantial Plant Characteristics
- A new measuring instrument for the temperature of the oil at the inlet and outlet of the degassing phase. A photo electronical level surveillance is installed into the degassing tank. During the treatment phase a special automatic process prevents an overflooding of the vacuum pumps with insulating oil.
- A new measuring instrument for continuous and automatic indication for filter changes.
- New is also the automatic froth control. New is also the automatic froth control. New is also the automatic froth control.
- A frequency controlled feeding pump allows for variable oil flow-throughs. A special automatic process prevents an overflooding of the vacuum pumps with insulating oil.
- The oil to be treated is fed into the VOP plant by means of differential pressure.
- The degassing system has been optimised and expanded with an automatic level control, dependent on the adjusted flow-through rate. Excellent degassing values and expert oil quality are guaranteed.
- The degassing system has been optimised and expanded with an automatic level control, dependent on the adjusted flow-through rate. Excellent degassing values and expert oil quality are guaranteed.

Online Oil Measuring
- A new measuring instrument for the temperature of the oil at the inlet and outlet of the degassing phase.
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Degassing System
- The oil feeding pump is increased.
- The oil feeding pump is increased.
- The oil feeding pump is increased.
- The oil feeding pump is increased.
- The oil feeding pump is increased.

Special Plants
- Regeneration/Fuller plants
- Codex oil treatment plants
- Silicone oil treatment plants
- General oil treatment plants
- Oil spray plants
- Online oil treatment on energized transformer

Further Accessories
- Water & gas content measuring device VZ 212 A
- By-pass system for heating and/or filtration
- Oil sampler connection piece
- Vacuum pump for transformer evacuation
- Signal device to mobile phone (GSM Modem)
- Roadworthy trailer with transport box
- Spare parts for many years of plant operation

Supplements
- Donut house with coupling
- Roadworthy trailer with transport box
- Flow-through meter
Online treatment on energized transformers with Z?

Values prior to treating:
- Water content: 50 ppm
- Air content: 10 Vol%
- Temperature: 20°C

Measuring Equipment

Mobile measuring equipment for a manifold of applications are used for estimating the insulating oil quality. The measuring equipment can be used for commonly known insulating oils. The simple and over years reliable and proven concept makes these installations maintenance and operational friendly.

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Oil Purification Plants

- VOP 10 (Z1)
- VOP 30 (Z1)
- VOP 60 (Z1)
- VOP 90 (Z1)
- VOP 120 (Z1)

- VOP 03
- VOP 160
- VOP 250

- VOP RS 03
- VOP RS 30
- VOP RS 60
- VOP RS 90
- VOP RS 120

- CRP 312-750
- CRP 312-1500
- CRP 312-4500

Guaranteed end values in reference to flow-through *

<table>
<thead>
<tr>
<th>Plant type</th>
<th>Type description</th>
<th>Flow-through [l/h]</th>
<th>Guaranteed end values [ppm/Vol%]</th>
<th>Oil content in transformer [lt]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Oil Purification Plants</td>
<td>VOP 10</td>
<td>300 - 1000</td>
<td>&lt; 9 / &lt; 0.09</td>
<td>&lt; 5 / &lt; 0.06</td>
</tr>
<tr>
<td></td>
<td>VOP 30</td>
<td>1000 - 3000</td>
<td>&lt; 9 / &lt; 0.09</td>
<td>&lt; 5 / &lt; 0.06</td>
</tr>
<tr>
<td></td>
<td>VOP 60</td>
<td>2000 - 4000</td>
<td>&lt; 9 / &lt; 0.09</td>
<td>&lt; 5 / &lt; 0.06</td>
</tr>
<tr>
<td></td>
<td>VOP 90</td>
<td>3000 - 6000</td>
<td>&lt; 9 / &lt; 0.09</td>
<td>&lt; 5 / &lt; 0.06</td>
</tr>
<tr>
<td></td>
<td>VOP 120</td>
<td>4000 - 12000</td>
<td>&lt; 9 / &lt; 0.09</td>
<td>&lt; 5 / &lt; 0.06</td>
</tr>
</tbody>
</table>

Oil Purification Plants with extended suction capacity for best treatment values *

- VOP 10 (Z1) | 300 - 1000 | < 9 / < 0.09 | < 5 / < 0.06 | < 4 / < 0.05 |
- VOP 30 (Z1) | 1000 - 3000 | < 9 / < 0.09 | < 5 / < 0.06 | < 4 / < 0.05 |
- VOP 60 (Z1) | 2000 - 4000 | < 9 / < 0.09 | < 5 / < 0.06 | < 4 / < 0.05 |
- VOP 90 (Z1) | 3000 - 6000 | < 9 / < 0.09 | < 5 / < 0.06 | < 4 / < 0.05 |
- VOP 120 (Z1) | 4000 - 12000 | < 9 / < 0.09 | < 5 / < 0.06 | < 4 / < 0.05 |

Special plants

- VOP 03 | 100 / 300 | < 9 / < 0.09 | < 5 / < 0.06 | < 4 / < 0.05 |
- VOP 160 | 4000 / 16000 | < 9 / < 0.09 | < 5 / < 0.06 | < 4 / < 0.05 |
- VOP 250 | 6000 / 20000 | < 9 / < 0.09 | < 5 / < 0.06 | < 4 / < 0.05 |

Maintenance of transformer (oil spray)

- VOP RS 03 | 2000 - 4000 | < 9 / < 0.09 | < 5 / < 0.06 | < 4 / < 0.05 |
- VOP RS 30 | 3000 - 6000 | < 9 / < 0.09 | < 5 / < 0.06 | < 4 / < 0.05 |
- VOP RS 60 | 4000 - 12000 | < 9 / < 0.09 | < 5 / < 0.06 | < 4 / < 0.05 |

Oil regeneration with extract unit

- CRP 312-750 | 750 | < 9 / < 0.09 | < 5 / < 0.06 | < 4 / < 0.05 |
- CRP 312-1500 | 1500 | < 9 / < 0.09 | < 5 / < 0.06 | < 4 / < 0.05 |
- CRP 312-4500 | 4500 | < 9 / < 0.09 | < 5 / < 0.06 | < 4 / < 0.05 |

* Online treatment on energized transformers at 75°C.

** Values prior to drying; water content: 50 ppm; oil content: 10 Vol%; temperature: 20°C.

Remarks

These guarantee values are valid for the treatment of naphthenic based insulating oils with normal froth behaviour, under consideration of no additional an acceptance after treatment.

Approx. value of oil content in the transformers: 1/2 lt insulating oil per 1 kVA

For unattended operation additional safety equipments needed.

Water and Gas Content Measuring Unit VZ 212 A

This measuring unit serves as a continuous automatic measuring of the water and gas content at the inlet and outlet of the oil plant. The measuring unit can be used together with all oil plant. The evaluation of the gas blanket pressure in the measuring cell can be carried out manually by means of a break-even chart or automatically via a 6-channel digital recorder.

Measuring range:
- Water content: 0.5 - 7 ppm
- Gas content: 0.01 - 0.09 Vol%.

VZ 220 A Tan Delta

- Resistance measuring unit to determine the tan δ value
- Online resistance measuring unit to determine the tan δ value

Measuring range:
- Water content: 0.5 - 50 ppm
- Gas content: 0.01 - 2 Vol%.

New VZ (Micavac)

- Exact measuring of the specific water drainage (g/h t) during the transformer drying in production and in the field. This measuring unit is independent and easy to operate.

Further Measuring Units

- Water content measuring unit in accordance to Karl Fischer
- Break-down voltage measuring unit up to 75 kV
- Break-down voltage measuring unit up to 100 kV
- Online particle measuring unit; 2 µm to 25 µm particle size

Oil Purification System

VOP

- 100 lt/h - 20000 lt/h
Type Outline and Selection Assistance

Mobile measuring equipment for a manifold of applications are used for estimating the insulating oil quality. The measuring equipment can be used for commonly known insulating oils. The simple and over years reliable and proven concept makes these installations maintenance and operational friendly.

Measuring Equipment

Water and Gas Content Measuring Unit VZ 212 A
This measuring unit serves as a continuous automatic measuring of the water and gas content at the inlet and outlet of the oil plant. The measuring unit can be used together with any oil plant. The evaluation of the gas blanket pressure in the measuring cell can be carried out manually by means of a balance-over-chart or automatically via 6-channel digital recorder.

Measuring range: water content 0.5-7 ppm / gas content 0.01-0.09 Vol%.

VZ 220 A Tan Delta
• Resistance measuring unit to determinate the tan δ value
• Online resistance measuring unit to determinate the tan δ value

Measuring range: water content 0.5-50 ppm / gas content 0.01-2 Vol%.

New VZ (Micavac)
Exact measuring of the specific water drainage (g/h/t) during the transformer drying in production and in the field. This measuring unit is independent and easy to operate.

Further Measuring Units
• Water content measuring unit in accordance to Karl Fischer
• Break-down voltage measuring unit up to 75 kV
• Break-down voltage measuring unit up to 100 kV
• Online particle measuring unit; 2 to 50 µ particle size

Oil Purification Plants

VOP
100 lt/h – 20000 lt/h

Oil purification system

Guaranteed end values in reference to flow-through *

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<tr>
<td></td>
<td></td>
<td>[lt/h]</td>
<td>[ppm / Vol%]</td>
</tr>
<tr>
<td>Standard Oil Purification Plants</td>
<td>VOP 10</td>
<td>300 - 1000</td>
<td>&lt;8 / 0.09</td>
</tr>
<tr>
<td></td>
<td>VOP 30</td>
<td>1000 - 3000</td>
<td>&lt;8 / 0.09</td>
</tr>
<tr>
<td></td>
<td>VOP 60</td>
<td>2000 - 4000</td>
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</tr>
<tr>
<td></td>
<td>VOP 90</td>
<td>3000 - 6000</td>
<td>&lt;8 / 0.09</td>
</tr>
<tr>
<td></td>
<td>VOP 120</td>
<td>4000 - 12000</td>
<td>&lt;8 / 0.09</td>
</tr>
<tr>
<td>Oil Purification Plants with extended suction capacity for best treatment value *</td>
<td>VOP 10 L2J</td>
<td>300 - 1000</td>
<td>&lt;4 / 0.05</td>
</tr>
<tr>
<td></td>
<td>VOP 30 L2J</td>
<td>1000 - 3000</td>
<td>&lt;4 / 0.05</td>
</tr>
<tr>
<td></td>
<td>VOP 60 L2J</td>
<td>2000 - 4000</td>
<td>&lt;4 / 0.05</td>
</tr>
<tr>
<td></td>
<td>VOP 90 L2J</td>
<td>3000 - 6000</td>
<td>&lt;4 / 0.05</td>
</tr>
<tr>
<td></td>
<td>VOP 120 L2J</td>
<td>4000 - 12000</td>
<td>&lt;4 / 0.05</td>
</tr>
<tr>
<td>Special plants</td>
<td>VOP 03</td>
<td>100 / 300</td>
<td>&lt;4 / 0.05</td>
</tr>
<tr>
<td></td>
<td>VOP 160</td>
<td>4000 / 16000</td>
<td>&lt;4 / 0.05</td>
</tr>
<tr>
<td></td>
<td>VOP 250</td>
<td>6000 / 20000</td>
<td>&lt;4 / 0.05</td>
</tr>
<tr>
<td>Maintenance of transformers (oil spray)</td>
<td>VOP 45 RS</td>
<td>2000 - 4000</td>
<td>&lt;4 / 0.05</td>
</tr>
<tr>
<td></td>
<td>VOP 90 RS</td>
<td>3000 - 6000</td>
<td>&lt;4 / 0.05</td>
</tr>
<tr>
<td></td>
<td>VOP 120 RS</td>
<td>4000 - 12000</td>
<td>&lt;4 / 0.05</td>
</tr>
<tr>
<td>Oil regeneration with oil regeneration unit</td>
<td>CRP 312-750</td>
<td>750</td>
<td>&lt;4 / 0.05</td>
</tr>
<tr>
<td></td>
<td>CRP 312-1500</td>
<td>1500</td>
<td>&lt;4 / 0.05</td>
</tr>
<tr>
<td></td>
<td>CRP 312-4500</td>
<td>4500</td>
<td>&lt;4 / 0.05</td>
</tr>
</tbody>
</table>

* Online treatment on energized transformers with Z
* Values prior to treating: water content 50 ppm, air content 10 Vol%, temperature 20°C.

Remarks
These guarantee values are valid for the treatment of naphthenic based insulating oils with normal froth behaviour, under consideration of no additional air acceptance after oil treatment.

Approx. value of oil content in transformers: 1/2 lt insulating oil per 1 kVA

For unattended operation additional safety equipments needed.