

CJC® Varnish Removal Unit, VRU

CJC® Fine Filter for Gas & Steam Turbines

APPLICATION

The CJC® Varnish Removal Unit, VRU has an unheard high efficiency in removing soft contaminants from oil-dissolved and suspended – even from hot operating gas and steam turbines.

Oxidation and varnish are known to cause problems in many industries, resulting in very costly production stops, turbine trips, loss in revenue etc.

BENEFITS

- Less varnish related turbine trips
- Lower maintenance costs
- Extends the lifetime of both oil and components
- No need for system flushing and tank cleaning
- Avoid temperature increase
– no varnish in the cooling system

TURBINE SIZES

Designed for efficient removal of soluble varnish from any size turbine:

- Gas and steam turbines with combined or separate lube and control oil system
- Base or peak loaded gas or steam turbines operating at low, medium or high oil temperatures
- Also for highly stressed and high temperature oil systems in general.

FUNCTION

The VRU is designed to remove dissolved and suspended soft contaminants by polar attraction in the optimized cellulose based Varnish Removal inserts, VRi. It does this without any additional power, chemicals or beads which may be harmful to the oil's additive package.

The warm system oil is drawn from the bottom of the tank to the VRU by its own transfer pump. The oil is being treated and filtered in the VRU before sent back to the system tank as varnish free oil.

The varnish free oil will start cleaning all system components in contact with oil, ultimately resulting in a complete varnish free system. The varnish level in the oil will typically be cut in half within a few weeks of operating the VRU.

The VRU is prepared for online data logging via CJC® Trender Tool.



The CJC® Varnish Removal Unit
VRU 27/108

TECHNICAL DATA

| | | VRU 27/108 |
|---|--------------|--|
| Varnish Removal Unit | | 380 - 420V @ 50 Hz & 440 - 480V @ 60 Hz |
| Pump inlet pressure, max. | bar/psi | 0.5/7 |
| Power consumption, aver. | kW | 2 |
| Full load current, max. | A | 4 |
| Filter Insert VRi 27/27 | pcs. | 4 |
| Oil reservoir volume, max. *) | ltr/gal | 45,000/11,900 |
| Oil viscosity **) | | ≤ISO VG68 |
| Oil temperature, max *) | °C/°F | 105/221 |
| Varnish holding capacity, up to | kg/lb | 8/18 |
| Total weight | kg/lb | 290/640 |
| Design pressure, filter | bar/psi | 7/101 |
| Dimensions LxWxH incl. + free height | mm inches | 1600x650x1598+575 63x25.6x62.9+22.6 |

*) For more than 45,000 L or higher temperatures, please contact us

**) For viscosities higher than ISO VG68, please contact us

APPLICABLE FILTER INSERTS

| Type | Application for |
|-----------------------------|---|
| Varnish Removal insert, VRi | Gas and steam turbines, large compressors and hydraulic oil systems |



The CJC® Varnish Removal Unit, VRU 27/108 is only functional, if used in conjunction with the CJC® VRi 27/27 Filter Insert.

(Please ask for Product Sheet ID nr. PSFI3214)

CJC® Filter Insert, type VRi

Specially designed for removal of dissolved varnish in hydraulic and turbine oils

CJC® VRi FILTER INSERTS

The CJC® Varnish Removal insert, VRi 27/27, is used in the CJC® Varnish Removal Unit, VRU. The VRU contains 4 x VRi 27/27 Filter Inserts, which are specially designed for efficient removal of dissolved and suspended soft contaminants from turbine lube and hydraulic oils that operate at continuously high temperatures.

Used for the maintenance of the below applications:

- Gas turbines
- Steam turbines
- Compressors
- Hydraulic systems
- Generators
- Gearboxes



CJC® Filter Insert VRi 27/27



The CJC® Filter Insert VRi 27/27 is only functional when used in conjunction with the CJC® Varnish Removal Unit, VRU 27/108. Only the distinctive oil treatment and flow characteristic of the CJC® VRU ensures precipitation and polymerisation of dissolved varnish in the oil.

CONTAMINATION CAPACITY

Based on field experience we have observed that the total Dirt Holding Capacity (DHC) is dependent on the shape and density of particles and other variables within an oil system.


| Contamination Capacities | Size |
|--------------------------|----------|
| | 27/27 |
| Solids, kg (lb) | 4 (8.8) |
| Water, ltr (gal) | 2 (0.53) |
| Varnish, kg (lb) | 4 (8.8) |

Documented cases have shown the removal of 4 kg (4,000 g)/8 lb of solid contaminants and oil degradation products per filter insert with one VRU Filter Insert change (4 x VRi 27/27 16 kg/32 lb). Single-pass efficiency for varnish removal and MPC reduction of up to 99 percent. An Ultra-Centrifuge test can also be used to detect varnish.

88% MPC reduction

Typical single pass efficiency for varnish removal and MPC reduction from MPC ΔE 66 to MPC ΔE 7.7.

COMPONENTS

CJC® Filter Inserts consist of cellulose bonded discs  made of 100% natural cellulose fibres from sustainable resources; no plastic, no metal, no chemicals.

DISPOSAL OF USED CJC® FILTER INSERTS

CJC® Oil Filters are green solutions, and at C.C.JENSEN one of our objectives is caring for the environment. Therefore, please arrange for proper disposal of used filter inserts in accordance with your own local legislation.

IDENTIFICATION

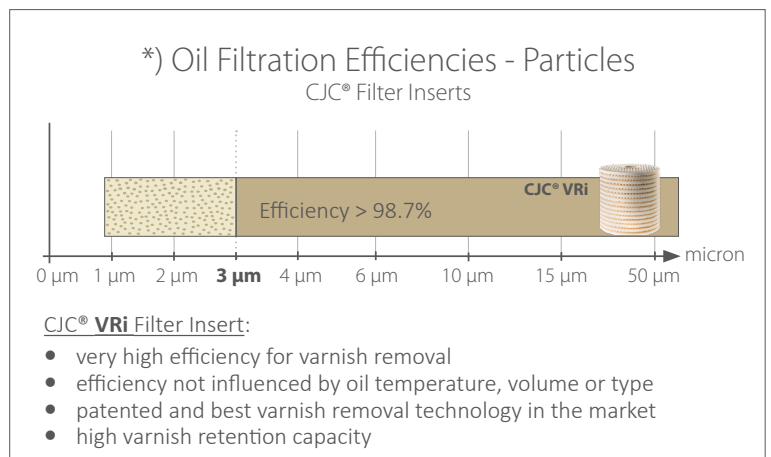
To order the VRi Filter Inserts, please use:

Article No.:

- 1 x VRi 27/27: PA5601370

FILTRATION TECHNOLOGIES

- ▶ **Oxidation and oil degradation products**
The CJC® Filter Insert VRi removes all phases of oil degradation; oxidation/resin/sludge/varnish, which are retained by the special cellulose material using adsorption and absorption forces.
- ▶ **Oil filtration degree**
*Particles can be removed as shown in the illustration below *)*
For offline oil filtration, the dirt holding capacity is paramount because the offline process will have time to remove contaminants, unlike in-line filtration. Our focus is on removing the smallest and most harmful particles.
- ▶ **Water removal**
VRi Filter Inserts will typically be able to keep the water in oil below saturation point (mineral/synthetic oils). All three phases of water (dissolved, emulsions and free) will be absorbed by the cellulose fibres.
- ▶ **Acidity stabilisation**
Acidity is a natural part of the oil degradation process and will be retained by the CJC® Filter Insert using absorption technology. The VRi 27/27 Filter Insert is documented not to affect the functional phenolic and amine anti-oxidant additive package of the oil. (Please request the CJC® VRU Product Sheet, ID no. PSST1109).



BENEFITS in general

C.C.JENSEN DEPTH FILTER EFFICIENCY TEST

CJC® Filter Inserts are designed to last for one year, therefore testing of a high density depth filter for a few hours does not make sense. The C.C.JENSEN test is inspired by a modified ISO 16889, using finer test dust (UFTD), which resembles real dust and wear particles better than the coarse MTD test dust used in the standard Multi-pass test - designed for thin pleated filter media. The test modification also includes a much longer test time to get close to a real-life application scenario. The main advantage of CJC® Filter Inserts is the huge surface area, which distributes the oil flow and particles evenly and ensures stable low velocity for optimum retention of contamination. The large filter mass makes this unmatched high dirt holding capacity possible.

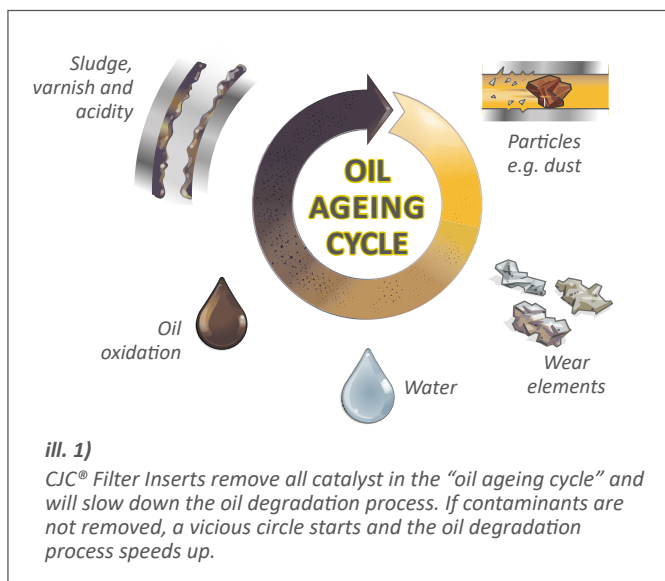
DIRT HOLDING CAPACITY CREATES VALUE

Competitive Filter Insert costs divided by dirt holding in kg:

| 3-micron filtration | Example 1 | Example 2 |
|-----------------------------------|----------------------------|----------------------------|
| Filter Insert type | Competitive pleated filter | CJC® cellulose depth media |
| Cost of element vs. Filter Insert | 1 x € | 4 x € |
| Dirt holding capacity | 0.100 kg | 4 kg |
| Cost per kg removed contamination | 10 x € per kg | 1 x € per kg |

SLOW DOWN OIL AGEING

By removing all four contamination types (particles, water, acidity, and varnish), the CJC® Filter Inserts can slow down the oil ageing process and prolong the oil lifetime (see ill. 1). CJC® often results in 2-5 times longer oil lifetime, leading to considerable savings and reduction of CO₂ emissions. Field experiences show that removing particles of 3 µm and below with CJC® Filter Inserts has a significant effect on oil and component lifetime.



YOUR BENEFITS WITH CJC®

CJC® Filter Inserts have the highest dirt holding capacity on the market due to special cellulose-based material. Furthermore, the unique construction of the bonded discs, creates a large filtration area (see ill. 2) resulting in reduced costs of ownership. The CJC® Filter Inserts are a modular design, which allows them to fit any applications and requirements.

1. The CJC® Filter Insert features:

- a. Depth media of moulded cellulose.
- b. Highest Dirt Holding Capacities (DHC).
- c. **100% natural cellulose fibres from sustainable resources; no plastic, no metal, no chemicals.**



2. Removal of contaminants, 4-in-1:

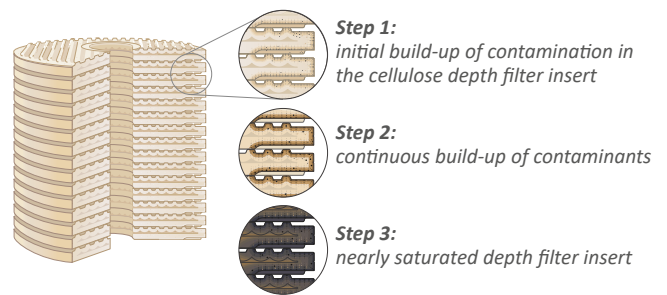
- a. **Particles:**
Lifetime of both oil and component are increased considerably.
- b. **Oil degradation products:**
Avoid sticking valves, lacquering, and varnish on metal surfaces.
- c. **Water:**
Reduce the risk of micro-pitting, bacterial growth, sludge etc.
- d. **Acidity/TAN:**
Reduce oil ageing and wear on equipment.

3. OEM requirements

Experience and application knowledge of C.C.JENSEN ensure that CJC® solutions can meet specifications from OEMs on oil cleanliness.

All helping to minimise further degradation of the oil.

CJC® DEPTH FILTRATION EFFICIENCY



ill. 2)

This graphic describes the technology and the efficiency of depth Filter Inserts removing contaminants by adsorption & absorption.

MAINTENANCE RECOMMENDATIONS

To achieve the highest possible oil cleanliness level, the CJC® Filter Inserts need to be changed at least once a year. Because of accumulated oil degradation products (oxidation, acids, and varnish) no matter what the pressure gauge indicates the used Filter Inserts should be replaced annually. Leaving filter media in service for longer than one year will result in decreased oil filtration efficiency and increased risk of breakdowns and component wear.

