



# Varnish Removal Unit

Solution for removal of dissolved and suspended soft contaminants from oil in

Gas & Steam Turbines



Avoid varnish related turbine trips and expensive oil changes



# Your Challenges

turbine trips | oil aging | valve sticking | inline filter blocking



- send us your oil sample  
- contact your nearest CJC Distributor

When varnish strikes, the costs associated with a production outage are often very high. The precursors to varnish, the so-called soft contaminants, are created in the hot spots in the oil system, e.g. bearings, pumps and high flow in-line filters. Recent studies have found that the soft contaminants exist in both dissolved and suspended phases and should be removed in order to avoid varnish formation. Once formed, varnish can seize and clog valves, filters and other small passages and reduce the oil life considerably.

When soft contaminants are dissolved in oil, typically at temperatures above 40°C (100 °F), they cannot be removed through standard mechanical filters or electrostatic filters. The soft contaminants are polar in nature and adsorb onto dipolar, colder metallic surfaces in “cold spots”, e.g. valves and coolers. They will also settle out when the oil temperature decreases during outages. The soft contaminants also have lower thermal stability than the oil so they are more likely to bake onto cold and hot surfaces, e.g. journal bearings.



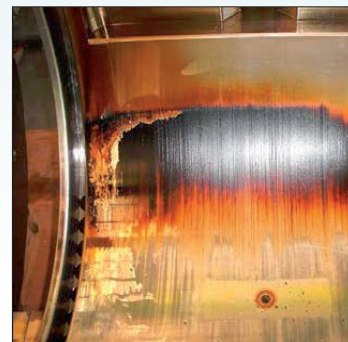
Varnish coated in-line filter of IGV servo valve hydraulics



Varnish on plate heat exchanger



Varnish on valve spool



Varnish on journal bearing, gas turbine

## FACTS

### Consequences of Varnish

- Valve sticking ▶ loss of control, which results in turbine trips or fail-to-start
- Filter blockage ▶ restriction of oil flow, which increases oil temperature and wear
- Sandpaper surface ▶ increases component wear
- Ineffective heat exchangers ▶ increases oil temperature
- Lacquer baked onto bearings ▶ flow restriction, increased wear and temperature
- Frequent oil changes and system flushing

# Our Solution

high efficiency | low maintenance | reliable | easy to install

## 3 in 1 Solution

use the CJC™ VRU and remove  
Varnish, Particles & Water - in one single pass

C.C.JENSEN A/S introduces the CJC™ Varnish Removal Unit with a revolutionary high efficiency for removing soft contaminants from oil – dissolved and suspended – even from hot operating gas and steam turbines.

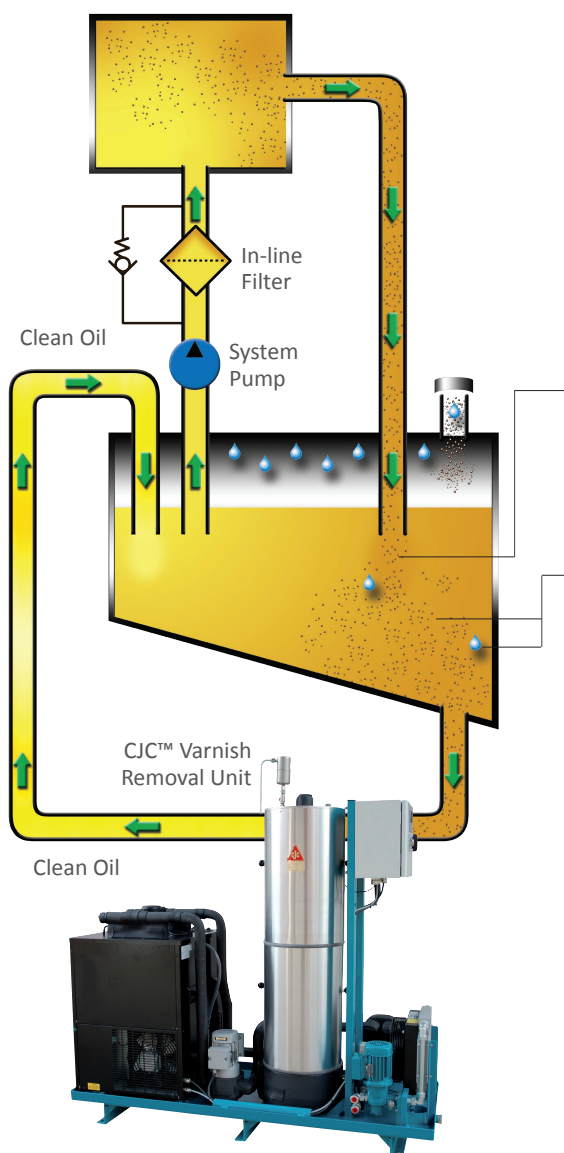
The CJC™ VRU is designed to remove dissolved and suspended soft contaminants by polar attraction in the optimized, cellulose based CJC™ Varnish Removal inserts, VRi. It does this without any additional power, chemicals or beads which may be harmful to the oil's additive package.

The hot oil is drawn from the lowest point of the system tank to the CJC™ Varnish Removal Unit by means of the transfer pump on the unit. The process inside the unit includes passing the oil through the efficient CJC™ Varnish Removal insert, VRi 27/27 specially designed for varnish removal in combination with the CJC™ Varnish Removal Unit. After cleaning, the oil is returned to your system.

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

### Oil System

- Turbine lube and control oil
- Hydraulic oil
- Compressor oil



### Contamination

now under Control!

### 3 in 1 Solution

The optimized filtration and treatment in the CJC™ VRU captures the soft contaminants, which can then be removed from the system completely by replacing the CJC™ Varnish Removal insert, VRi

### Varnish

Oil degradation products – dissolved and suspended – are removed from the oil and system components.

### Particles & Water

Not only varnish is removed, also particles and water is retained in the inserts and removed from the oil.

## FACTS

The specially designed CJC™ Varnish Removal inserts VRi, used in the CJC™ Varnish Removal Unit make it possible to remove oil degradation products from oil in gas and steam turbines, up to 45,000 L (11,900 gal) – dissolved and in suspension

– even from high temperature operating turbines!

# Our Result

no turbine trips | no oil aging | no valve sticking | no inline filter blocking

## Before and After installation of CJC™ VRU

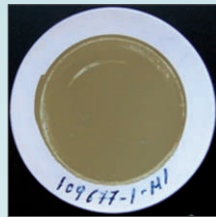
Turbine oil BEFORE filtration with the VRU



Turbine oil AFTER just a few weeks of filtration with the VRU



Millipore membrane MPC>50



Millipore membrane AFTER filtration with the VRU, MPC <10



Ultra Centrifuge test, initial sample before the VRU (inlet)



Ultra Centrifuge test, sample after a single pass through the VRU (outlet)



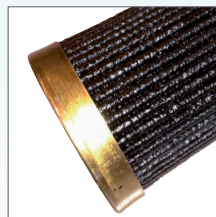
Clearly visible varnish at the metal surface BEFORE startup the VRU



No more varnish at the metal surface AFTER startup the VRU



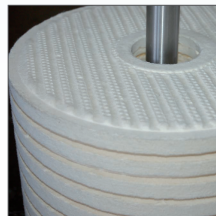
6 months WITHOUT VRU: Varnish on the inline filter



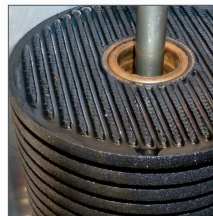
6 months WITH VRU: No varnish on the inline filter



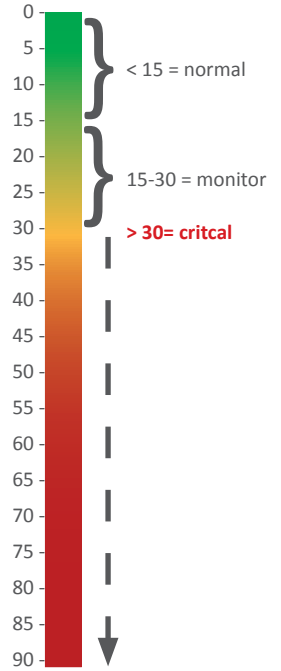
Varnish Removal insert, VRi before startup



Varnish Removal insert, VRi, after filtration



### MPC Safe Level



## CASE

### Customer

A 95 MW Combined Cycle Power Plant in Spain. Two base loaded gas turbines each containing 6,500 L (1,700 gal) of Mobil DTE 832 oil. Varnish level measured with Membrane Patch Colorimetric was reduced from MPC 55 to MPC 15 within two weeks of operating the CJC™ VRU. By using the CJC™ VRU, a pending oil change and flushing were not necessary anymore, and turbine trips due to varnish were avoided!

The savings obtained from reduced oil purchases, flushing and oil handling, add up to approximately

**\$ 35,000**  
per gas turbine.

# Your Benefits

no expensive turbine trips | no uncontrolled shut downs

## Benefits

- Increased system reliability and availability
- No turbine trips or sticking valves due to varnish
- Prevent uncontrolled shut downs and reduces maintenance costs
- Extends the lifetime of both oil, additives and components, e.g. bearings, valves, seals etc.
- No need for system flushing and tank cleaning
- MPC values at extreme low levels
- Improved lifting oil pressure
- More stable bearing temperature



## Savings (average)

**Avoiding a turbine trip and prolonging oil life can result in huge savings – a real example:**

- \$ 40,000 saved by avoiding a turbine trip (not including lost revenue)
  - \$ 35,000 saved on oil, flushing and disposal costs
  - \$ 4,600 per hour penalty for not supplying energy
- Total cost for a turbine trip can easily exceed \$ 100,000 including down-time penalties

## Environment

- With the CJC™ VRU the oil life time can be extended to **10-20 years** in operation without compromising its properties
- Extend the lifetime of components
- Prolonged oil and additive lifetime
- No use of ion exchange resin

## Less Maintenance

- No need for system flushing and tank cleaning
- Avoid malfunction of hydraulic valves e.g. inlet guide vane valves
- Reduced consumption of in-line filters
- Avoid sludge and varnish build-up in heat exchangers
- Minimal maintenance and supervision of the CJC™ VRU
- Maintenance of the CJC™ VRU does not require shutting down the main oil system
- Less vibrations due to varnish in bearings



# C.C.JENSEN - contact us today!



## Manufacturing & headquarters

### C.C.JENSEN A/S

Løvholmen 13 | DK - 5700 Svendborg | Denmark  
Tel. +45 6321 2014 | Fax: +45 6222 4615  
sales@cjc.dk | www.cjc.dk

## C.C.JENSEN subsidiaries and sales offices

### Belgium

C.C.JENSEN Belgium  
Tel.: +32 484 25 36 96  
ccjensen.be@cjc.dk  
www.ccjensen.dk

### Benelux

C.C.JENSEN Benelux B.V.  
Tel.: +31 182 37 90 29  
ccjensen.nl@cjc.dk  
www.ccjensen.nl

### Chile

C.C.JENSEN S.L. Limitada  
Tel.: +56 2 739 2910  
ccjensen.cl@cjc.dk  
www.ccjensen.cl

### China

C.C.JENSEN Filtration  
Equipment (Tianjin) Co. Ltd.  
Tel.: +86 10 6436 4838  
ccjensen.cn@cjc.dk  
www.ccjensen.cn

### Denmark

C.C.JENSEN Danmark  
Tel.: +45 7228 2222  
ccjensen.dk@cjc.dk  
www.cjc.dk

### France

C.C.JENSEN France  
Tel.: +33 3 59 56 16 58  
ccjensen.fr@cjc.dk  
www.ccjensen.fr

### Germany

KARBERG & HENNEMANN  
GmbH & Co. KG  
Tel.: +49 (0)40 855 04 79 0  
kontakt@cjc.de  
www.cjc.de

### Greece

C.C.JENSEN Greece Ltd.  
Tel.: +30 210 42 81 260  
ccjensen.gr@cjc.dk  
www.ccjensen.gr

### India

C.C.JENSEN India  
Tel.: +91 4426241364  
ccjensen.in@cjc.dk  
www.ccjensen.in

### Ireland

C.C.JENSEN Ireland  
Tel.: +353 86 82 71 508  
ccjensen.ie@cjc.dk  
www.ccjensen.ie

### Italy

KARBERG & HENNEMANN srl  
Tel.: +39 059 29 29 498  
info@cjc.it  
www.cjc.it

### Poland

C.C.JENSEN Polska Sp. z o.o.  
Tel.: +48 22 648 83 43  
ccjensen@ccjensen.com.pl  
www.ccjensen.pl

### Spain

C.C.JENSEN Ibérica, S. L.  
Tel.: +34 93 590 63 31  
ccjensen.es@cjc.dk  
www.cjc.dk

### Sweden

C.C.JENSEN AB  
Tel.: +46 8 755 4411  
sales@ccjensen.se  
www.ccjensen.se

### United Arab Emirates

C.C.JENSEN Middle East  
Tel.: +971 4 447 2886  
ccjensen.uae@cjc.dk  
www.cjc.ae

### United Kingdom

C.C.JENSEN Ltd.  
Tel.: +44 1 388 420 721  
filtration@cjcuk.co.uk  
www.ccjensen.co.uk

### USA

C.C.JENSEN Inc.  
Tel.: +1 770 692 6001  
ccjensen@ccjensen.com  
www.ccjensen.com



Scan the QR code and find  
your nearest distributors  
at [www.cjc.dk/contact](http://www.cjc.dk/contact)

- or give us a call!

Your local C.C.JENSEN Distributor

## Clean Oil - Bright Ideas

C.C.JENSEN A/S | [www.cjc.dk](http://www.cjc.dk)

