CJC™ Offline Oil Filtration for the

Power sector

Removal of oil degradation products, acidity, particles and water from hydraulic fluids, lubrication oils and diesel fuel

Reliable power supply starts with clean oil

Do not change

FACT: The condition of oil will

C.C.JENSEN

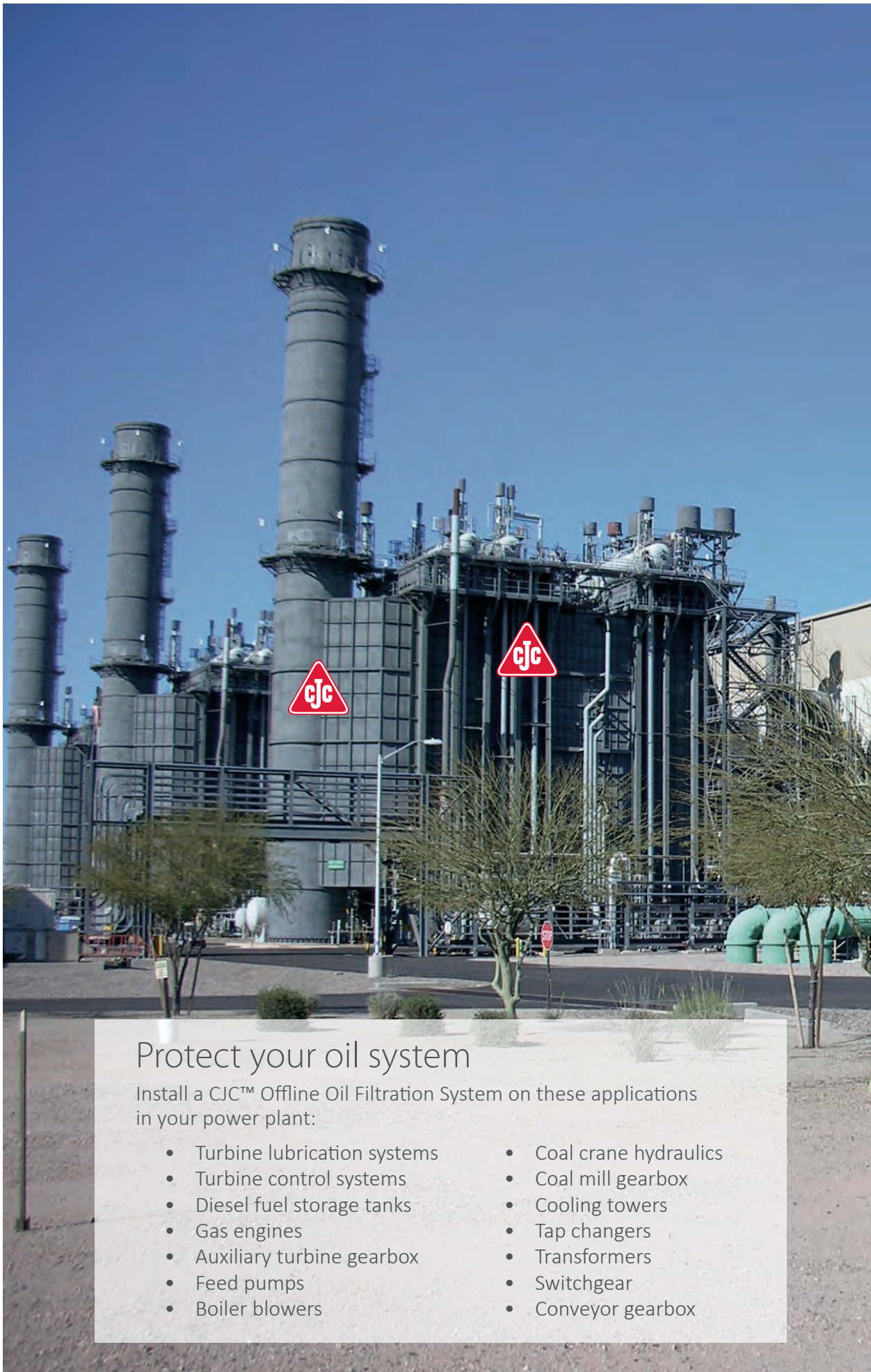
Cleaning oil for more than 60 years.

Oil can be cleaned:

Most people change oil not because the properties of the oil are lost, but because the oil is dirty and contaminated! Oil can be cleaned and kept clean - while in operation!

What do we do differently than other filtration systems?

- We clean oil, tanks, gearboxes and systems while they are in operation
- We remove both suspended and dissolved varnish, particles, water and acidity
- We filter down to 0.8 µm nominal / 3 µm absolute
- Our filters have the industries highest dirt holding capacity
- Our filter inserts are produced of 100% natural cellulose fibers from sustainable resources



Protect your oil system

Install a CJC™ Offline Oil Filtration System on these applications in your power plant:

- Turbine lubrication systems
- Turbine control systems
- Diesel fuel storage tanks
- Gas engines
- Auxiliary turbine gearbox
- Feed pumps
- Boiler blowers
- Coal crane hydraulics
- Coal mill gearbox
- Cooling towers
- Tap changers
- Transformers
- Switchgear
- Conveyor gearbox

oil - **clean it!**

determine uptime and life of machinery!

Have you ever experienced..?

- Oil analyses exceeding condemning limits?
- Oil contaminated with water?
- Unforeseen breakdowns?
- Excessive wear on components?
- Sticking valves due to oil oxidation?

- all can be avoided by installing CJC™ Offline Oil Filtration Systems!

Most common benefits:

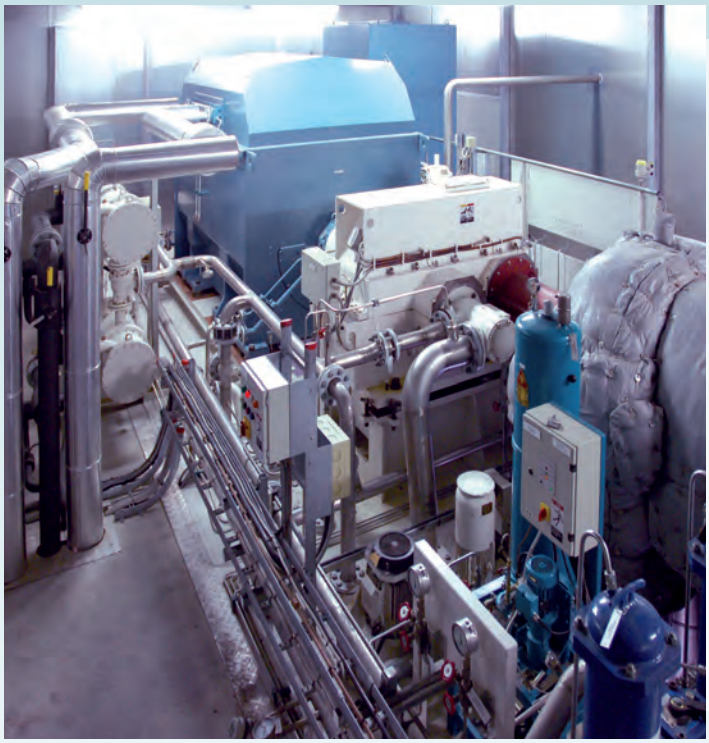
- Reduced downtime – less planned as well as unscheduled shutdowns
- Industries lowest cost per kilo dirt removed per insert
- Short pay-back time
- Reduced maintenance costs
- Reduced wear on pumps, cylinders, bearings, etc.
- Avoid diesel bugs
- Increased oil and component lifetime

Risk of failure on your

Each application performs specific tasks - and

The main cause for equipment breakdown

Oil systems in the power plant have a hard time dealing with high levels of contaminants from the environment. Some applications face a high level of solid particles, some of humid air and water, some of developing varnish-like deposits, and most face a mix of all three contaminants in various degrees. CJC™Offline Oil Filters are designed to deal with all of them.



Steam turbine lube systems

Water is the greatest threat to the lube oil system in a steam turbine. Owing to the construction of a turbine, with steam and oil working on each side of the labyrinth seal, moisture will enter into the oil. The leading suppliers of turbines specify maximum water content in the oil of 300 ppm.

For turbine lube oils we recommend the use of a CJC™ Offline Filter Separator, type PTU3 or the CJC™ Varnish Removal Unit.

PTU3 27/81

PTU3 2x27/108

Varnish Removal Unit

Gas turbine lube systems

Due to high operating temperatures the oil in a gas turbine will suffer from an oxidation process which produces among others “varnish”-like substances in the oil system. If not removed, this will lead to malfunctioning of the system.

For gas turbines we recommend the use of CJC™ Varnish Removal Unit.

Varnish Removal Unit

power equipment

high performance depends on optimum oil cleanliness

80% of all oil related failures and breakdowns are related to contaminated oil

Oil care is important since 80% of all oil related machinery repair and maintenance costs can be tracked back to contaminated system oils and fluids. This has been substainciated by several independant analyses.
The main cause is wear induced by contamination through solid particles, water, acidity and oil degradation products - which are not retained effectively by most in-line filters.

Coal mill gears

Typically the main problem for oil in a coal mill gear is the high content of small particles as well as varnish caused by high temperatures.

The result is that some of the smallest coal dust particles (approx. 2 micron) will enter the bearing and gears and cause wear. This again leads to further particles and reduced lifetime of the oil.

To solve the contamination problem we recommend the use of the CJC™ Offline Fine Filter series

HDU 27/54

HDU 27/108

Hydraulic control systems

The power transmitting fluid in a hydraulic control system can either be mineral oil or phosphate ester.

Mineral oil

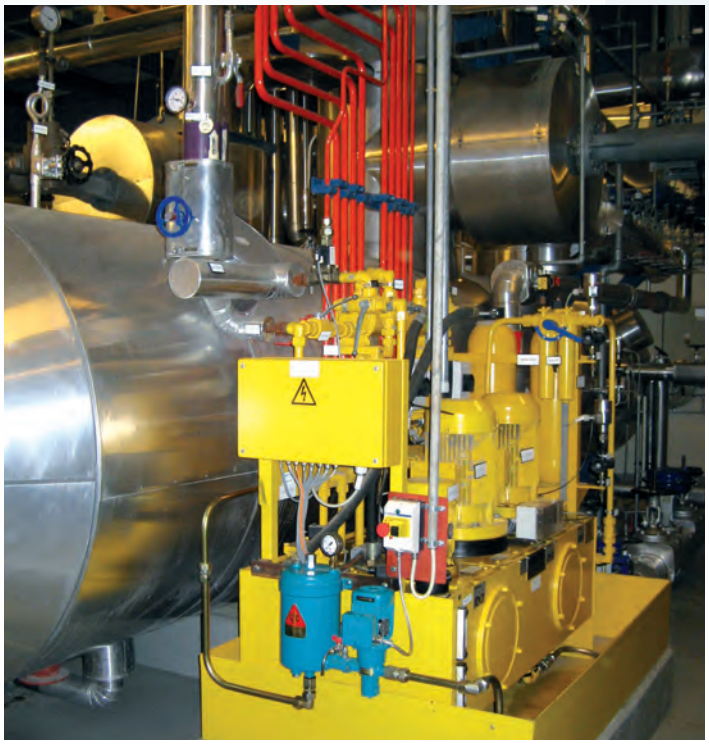
Mineral oil will often show a high content of wear particles as well as oil degradation products. To remove the contamination we recommend the use of CJC™ Offline Fine Filter series

Phosphate ester

Ester-based fluids are produced by the chemical reaction between acidity and alcohol (esterification).
Unfortunately this reaction is reversible when ester is exposed to water. As little as 300 ppm water is enough to start a reaction (hydrolysis) were ester fluid degrades and acidity compounds are generated.
To remove water and acidity from ester-based fluids we recommend the use of a CJC™ Ion Exchange/Acidity Removal Filter

HDU 27/27

Ion Exchange/Acidity Removal Filter



Vattenfall A/S

Application:
Steam Turbine

A CJC™ Filter Separator operating at Vattenfall A/S, Helsingør Kraftvarmeværk, Denmark

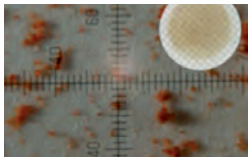
Mr. Bjarne Karlsen, Operation Manager at Vattenfall A/S:

"After installation of the CJC™ Fine Filters and the CJC™ Filter Separator on our lubrication oil systems, we quickly solved the problem of unacceptably high water content on the steam turbine's lubrication oil. An HDU Fine Filter installation on our gas turbine's lubrication oil tank was also a great success"

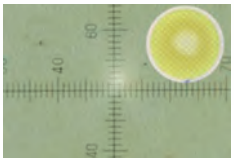
Problem

Oil samples from all oil systems at the combined heat and power plant were submitted for oil analyses. The oil samples from the steam turbine revealed a very high water content as well as high particle contamination, rust and oil degradation products.

Oil sample ***before*** *filtration*



- and ***after*** *filtration*



Solution

A CJC™ Filter Separator was installed on the steam turbine and CJC™ Fine Filters were installed on the gas turbine and the hydraulic power unit at the same time.

Prior to installation, the oil sample showed a water content of 31,400 ppm and a particle content corresponding to ISO code 20/19/14.

One month after the installation of CJC™ Filter Separator, water content was reduced to 60 ppm and the ISO code was reduced to 16/14/10. After an additional two months of filtration, water content was reduced to 24 ppm and the ISO code to 13/11/6.

Helsingør Kraftvarmeværk is a combined heat- and power plant

customers

are keywords in the power industry

Energyworks Cartagena

Application:
Gas Turbine

Energyworks Cartagena, Iberdrola, Spain

Mr. Juan Alberto Martinez, Maintenance Manager, Iberdrola Energyworks Cartagena:

"The VRU system has removed our varnish problems, completely"

Problem

First varnish problems caused turbine trip due to malfunction of IGV servo valve hydraulics.
High MPC (Membrane Patch Colorimetric) value of 55 ΔE indicating risk of varnish problems as result of turbine oil degradation.

Solution

A CJC™ Varnish Removal Unit, VRU with CJC™ Varnish Removal Insert, VRi 27/27 was installed. The MPC value dropped from 55 to 15 within 30 days. No varnish contaminants on the inline filters after the filtration with the CJC™ VRU.

The CJC™ VRU avoided not only the oil change but also possible turbine trips. In a cogeneration power plant the gas turbines form part of a complex energy production supply chain and any downtime will immediately result in very high costs.

Elsam A/S

Application:
Coal Mill Gear

Elsam A/S, Studstrupværket, Denmark

Mr. Jørgen Brix Andersen Elsam A/S:

"As the oil analyses show, we have achieved cleaner oil, after we have installed CJC™ Oil Filters on our 8 coal mills. The need for oil changes is gone, and the risk of breakdown in the bearings has been extremely reduced".

Problem

Oil analyses showed a high content of metal particles and varnish, indicating wear on the components. The very small particles entered the bearings and caused damage.

Solution

A CJC™ Fine Filter was installed and after a test period of three months the results were clear. The first sample taken had an ISO code 21/17/13.
After one month with the CJC™ Oil Filter installed, the ISO code was reduced to 16/15/12. After three months, the cleanliness level was further reduced to an ISO code 15/13/7.

1,304,472 of > 2 microns particles were reduced to 18,195, meaning the CJC™ Oil Filter had removed 98% of those particles. Furthermore, the varnish was totally removed.

Rimakot

Application:
Tap Changer

Rafmagnsveitur Ríkisins RARIK, Iceland

Financial benefits
The benefits are mainly characterised as trouble free operation and less wear, which in turn lead to less frequent unit overhauls and generally reduced maintenance costs.

Environmental benefits
Increased oil life time.

Problem

Every time the tap changer switches position, particles are created by sparks, that burn and oxidize the oil. The particles cause wear on the moving parts of the tap changer, and they may block for switching or destroy the contact areas, when they adhere.

Solution

CJC™ Fine Filter HDU 15/25 PV, using a CJC™ Filter Insert BGK 15/25. The CJC™ Filter was installed and an oil sample was taken. One week later the next sample was taken. Afterwards, samples were taken with varying intervals to monitor the cleanliness of the oil.

The test results show that the filter does an excellent job in cleaning the oil. The test also proved that when oxidation residues are present, it is necessary to use oil sampling and trend analyses to predict CJC™ Filter Insert change. It is not sufficient to rely only on the pressure drop over the filter as an indication of when to change the CJC™ Filter Insert. In the present case, CJC™ Filter Insert replacement was required every 7-9 months.

Your challenges

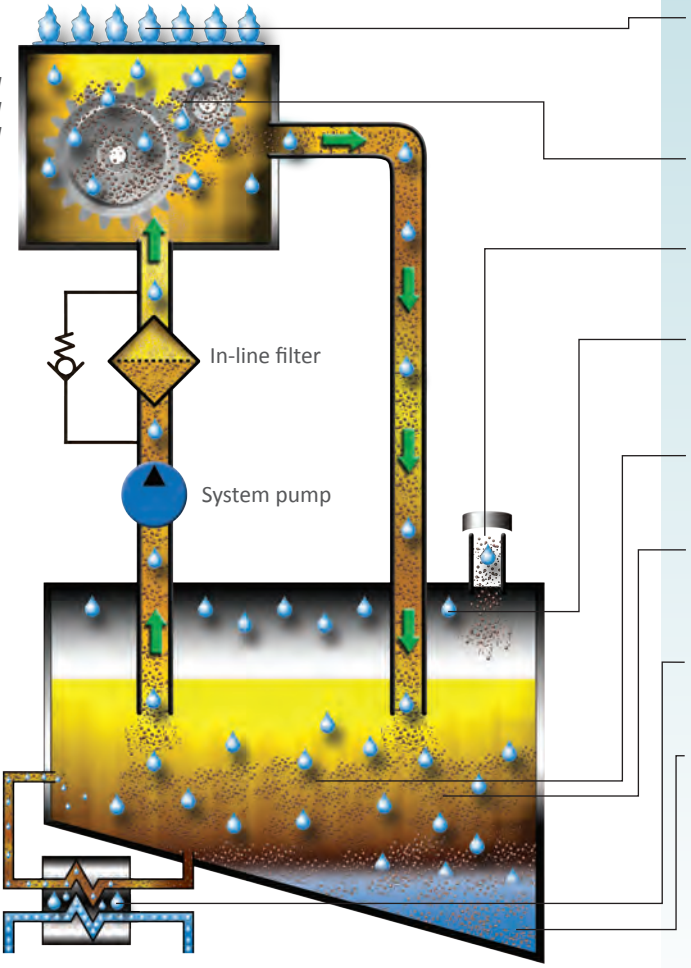
In most applications the in-line filter alone, cannot keep an oil system clean

Millipore membrane
- sample taken
before
installation of CJC™ Offline Oil Filter

Optimum oil cleanliness can rarely be achieved only by in-line filtration

Contamination of an oil system leads to various problems which can result in machine downtime, frequent repairs of equipment and reduced oil lifetime. All of which means inefficient production and unnecessary expenses spent on repair and oil change.

A contaminated oil system with only in-line filtration
without CJC™ Oil Filter



*Principle drawing of an in-line filtration system. A **contaminated** oil system.*

Contamination

External environment
Water from the external environment is ingressing into the system via the seals, high-pressure water blasting, wash down, etc.

Wear particles
Wear particles are generated inside the oil system.

Air vent
Particles and water is ingressing through the air vent.

Internal environment
Water condensation in the oil reservoir, due to temperature variations.

Acidity produced by oxidation
High temperature + contaminated oil = acidity and varnish.

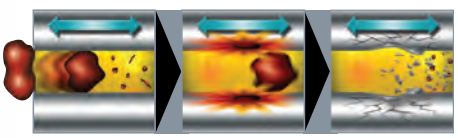
Rust/corrosion
Water initiates the formation of rust particles which are very hard and abrasive particles.

Cooler leaking water
A leaking cooler results in water ingress to the oil reservoir.

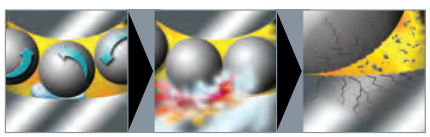
Varnish/sludge
Oil degradation products, micro particles and water are accumulated in the bottom of the oil reservoir.

Most common types of contamination

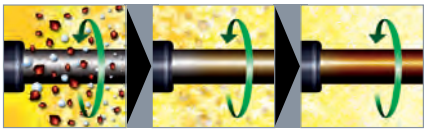
Particles (abrasive wear / grinding)
When clearance sized hard particles are wedged between movable metal parts, they destroy the metal surface further and can result in additional wear.



Water (cavitation & pitting)
Occurs in areas where water is present and oil is compressed; the water implodes, causing the metal surfaces to crack and release more particles.



Oil degradation
Wear metal, water and high temperatures lead to oil degradation, which is the precursor of varnish. This results in sticky varnish that deposits on metal surfaces.



Acidity
Acidity can be found in oil as by-products of oil degradation, combustion of gas or fuel, hydrolysis of Ester-based fluids etc. The amount of acidity in oil should be limited, since acidity will cause chemical corrosion of machine components and shorten the lifetime of the oil, just to mention a few of the unwanted effects.

Your solution

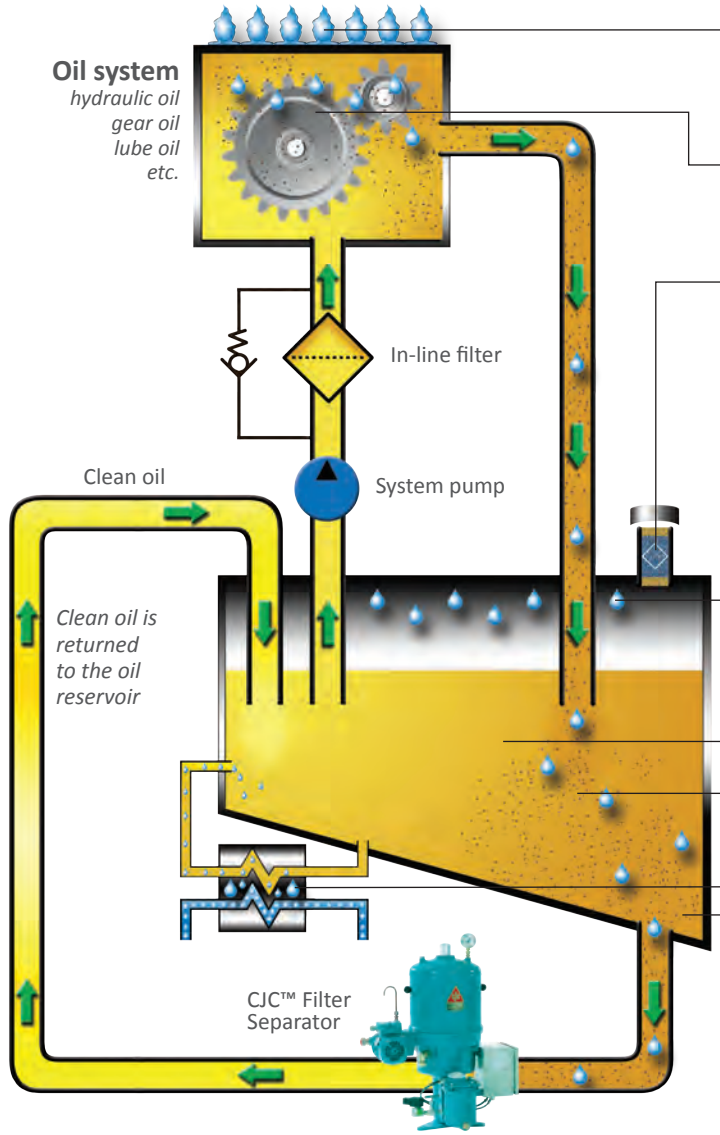
Round-the-clock removal of particles, water, acidity and oil degradation products, all in the same operation

1 Filter - 4 Solutions

CJC™ Filter Inserts have a 3 µm absolute filtration ratio and will remove particles, water and oil degradation products in one and the same operation. The CJC™ Filter Insert has a very large dirt holding capacity. The CJC™ products are almost maintenance free and have a very low cost of operation.

Millipore membrane - sample taken ***after*** installation of CJC™ Offline Oil Filter

A clean oil system
with CJC™ Offline Oil Filter



*Principle drawing of an Offline Filtration system. A **clean** oil system.*

Contamination - now under control

External environment
Water ingress from the environment is continuously removed from the system with CJC™ Oil Filters.

Wear particles
Wear particles are still being created, but are removed by the CJC™ Oil Filter.

Air vent
Ingress of contamination can be reduced by installing a breather with fine filtration and water absorbing media (silica gel).

Internal environment
Water still condensates in the oil reservoir, but with the CJC™ Oil Filters installed, the water is removed before it reaches critical system components.

Acidity produced by oxidation
The risk of developing acidity and oxidation by-products has been considerably reduced.

Rust/corrosion
Contamination is still being created but is removed by the CJC™ Oil Filter.

Cooler leaking water
The leaking cooler can be repaired at scheduled overhauls as the CJC™ Filter Separator continuously remove water in large volumes.

Varnish/sludge
Oil degradation products and micro particles have now practically disappeared from the bottom of the oil reservoir.

Power supply depends upon
maximum machinery performance,
which depends upon clean oil

Our

All CJC™ Oil Filter series are of simple design,

Optimum oil performance
with CJC™ Offline Oil Filters

CJC™ HDU series

The CJC™ Fine Filters remove particles, water, and oil degradation products from hydraulic, gear and lubrication oils and have flow rates from 45 to 20,000 L/h.

CJC™ PTU series

The CJC™ Filter Separators combine depth filtration with water separation and are used for water contaminated diesel, hydraulic and steam turbine lube oils.

The CJC™ PTU Series continuously removes water from oil in large volumes.

The CJC™ Filter Insert system

All CJC™ Filter Inserts have a 3 µm absolute filtration ratio and will remove particles, water, oil degradation products and acidity. The CJC™ Filter Inserts are produced of **100% natural cellulose fibres** from sustainable resources.

- **Particles** down to 0.8 µm are retained in the unique CJC™ depth filter media (cellulose).
- **Water** is removed either by absorption or separation according to oil system requirements.
- **Oil degradation products** are removed by the attraction to the polar fibers.
- **Acidity** can be neutralized with ion exchange resin media.

Modular build-up

The modular build-up of the CJC™ Filter Inserts means that a CJC™ Fine Filter can be designed to fit any applications and requirements

products

easy to install and almost maintenance free

CJC™ Varnish Removal Unit

The CJC™ Varnish Removal Unit has 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.

CJC™ Ion Exchange/Acidity Removal Filter

Problems with phosphate esters are often associated with acidity coming from hydrolysis of the fluid.

CJC™ Ion Exchange/Acidity Removal Filter neutralize and absorb the acidity from the fluid - along with sludge, particles and moisture.

The Ion Exchange/Acidity Removal Filter consists of acidity/ion neutralizing inserts combined with standard 3 µm absolute Fine Filter Inserts with a very high dirt holding capacity.

The filter is particularly useful for turbine control systems and for regeneration of transformer oils, lowering acidity levels and removing particles, reducing tan delta and improving the surface tension.

Molecular Sieve type inserts are also available to dry the fluid.

C.C.JENSEN
- contact us today!

1953-2016
63
Over 63 years of Innovation & Market Leadership

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.be

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 6321 2014
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

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www.cjc.dk