CJC™ in the Power Sector

Clean Oil - Bright Ideas

Power Plant Applications

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

Have You Ever Experienced..?

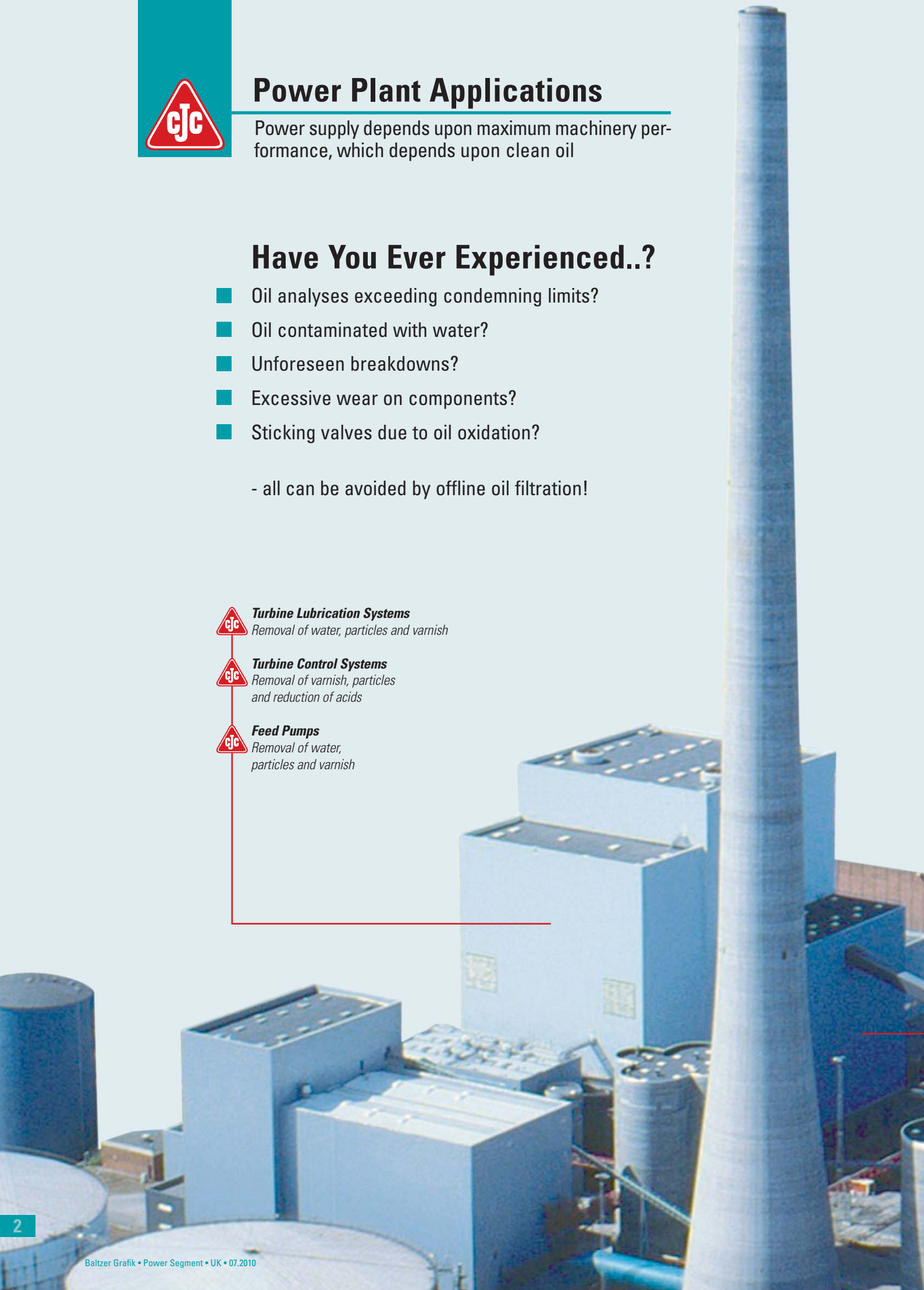
- Oil analyses exceeding condemning limits?
- Oil contaminated with water?
- Unforeseen breakdowns?
- Excessive wear on components?
- Sticking valves due to oil oxidation?

- all can be avoided by offline oil filtration!

Turbine Lubrication Systems
Removal of water, particles and varnish

Turbine Control Systems
Removal of varnish, particles and reduction of acids

Feed Pumps
Removal of water, particles and varnish



Baltzer Grafik • Power Segment • UK • 07.2010

Reliable Power Supply Starts with Clean Oil

Coal Mill Gear Boxes
Removal of varnish and particles

Boiler Blowers
Removal of water, varnish and particles

Crane Hydraulic Systems
Removal of particles, water and varnish

Further Applications in Power Plants

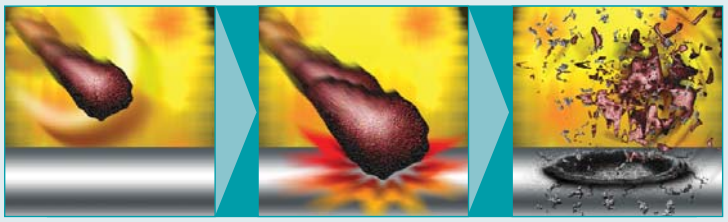
- *Cooling towers*
- *Tap changers*
- *Conveyor belts*

The Most Common Types of Wear

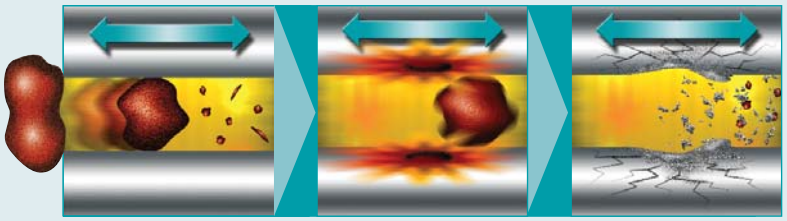
80% of all machinery repair and maintenance costs are related to contaminated oil

Oil care is a must because up to 80% of all machinery repair and maintenance costs can be traced back to contaminated system oils and fluids. This has been substanciated by several independant analyses. The main cause is wear induced by contamination through solid particles, water and oil degradation products - which are not retained effectively by most inline filters.

Particles

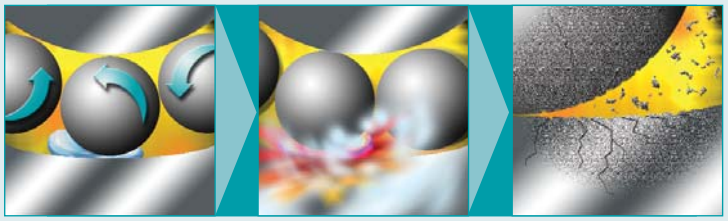


"Sandblasting"
When particles are transported with the oil flow, the particles collide with metal parts, destroying the metal surface and forming new particles.

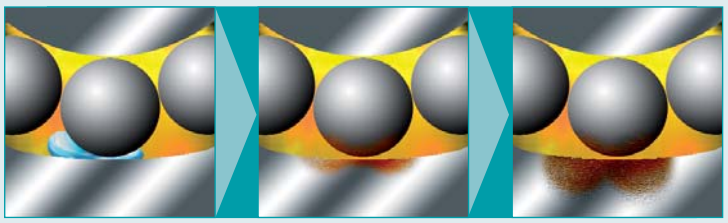


Grinding
When clearance sized hard particles are wedged between movable metal parts, they destroy the metal surface further and can result in additional wear.

Water

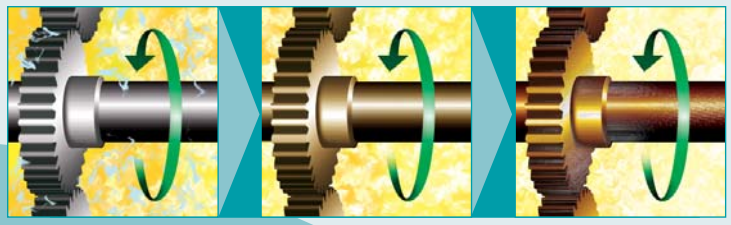


Cavitation
Cavitation occurs in areas where water is present and oil is compressed. The water implodes and blows particles off the metal surface, which then cracks.



Corrosion
Water or chemical contaminents in the oil cause rust or chemical reactions, which deteriorate the component surfaces.

Varnish/ resin



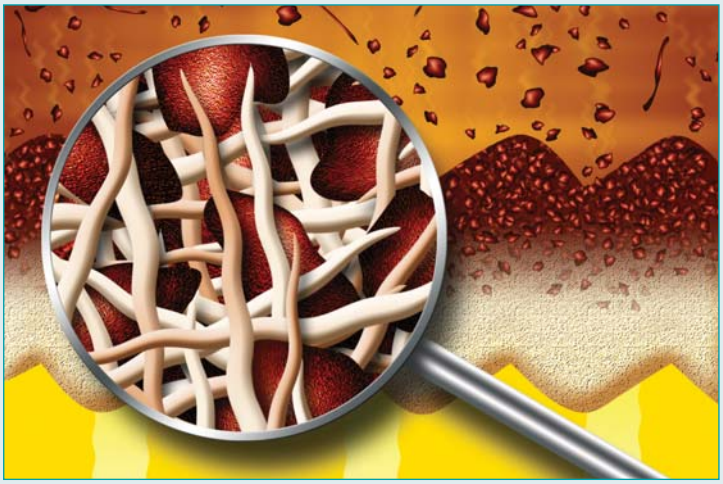
Oil Degradation
Oxygen, water and high temperature lead to oil degradation which is the precursor of varnish/resin. The result of these deposits is a "sandpaper-like" surface on machine parts.

One Filter - Three Solutions

CJC™ Offline Filters remove particles, absorb water and retain oil degradation products round-the-clock

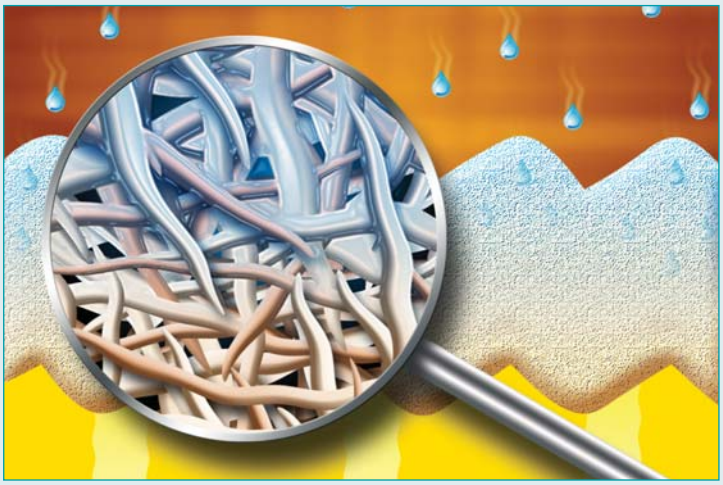
CJC™ Offline Filters do not only remove solid particles and water. They also retain oil degradation products - "soft contaminants" - which are the precursors to the sticky varnish, that deposits on metal surfaces. Varnish cannot be removed by traditional filtration, but with the CJC™ Filter Insert, it can.

Particles



Removal of Particles
Particles down to 0.8 µm are retained in the unique CJC™ Filter Insert.

Water



Removal of Water
The CJC™ Filters can either absorb or separate the water according to oil system requirements.

Varnish/ resin

Removal of Degradation Products
Resin in the oil will be attracted to the polar fibres in the CJC™ Filter Inserts.

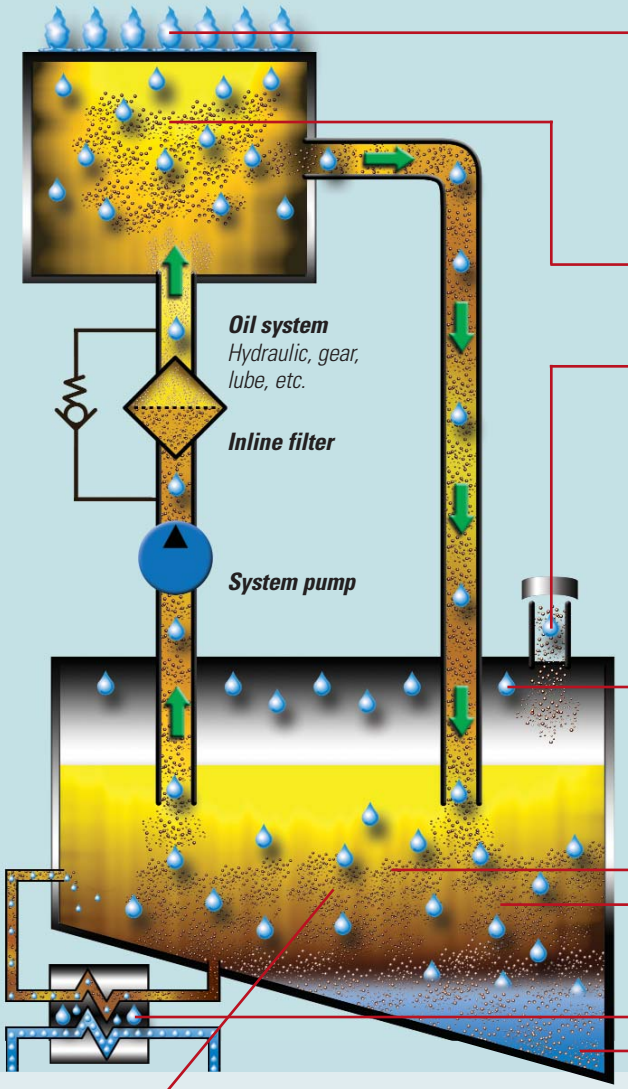
Traditional Inline Filtration

In most applications the inline filter alone, cannot keep an oil system clean

Inline filters are usually of very compact design but must still cope with high flow rates. This affects their minimum pore size, and consequently, the optimum oil cleanliness can rarely be achieved. Oil degradation products, water and microparticles will accumulate in the oil.

Inline Filtration

Principle drawing of inline filtration



Contamination Sources:

External Environment
Water from the external environment enters the system via the surroundings, high-pressure water cleaner, washing etc.

Wear Particles
Wear particles are generated inside the oil system.

Air Vent
Particles and water enter through the air vent.

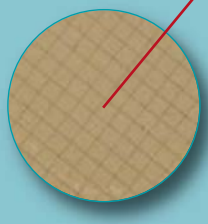
Internal Environment
Water condensation in the oil reservoir, due to temperature variations.

Acid Produced by Oxidation
High temperature + contaminated oil = acid and resin.

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/Resin
Oil degradation products, microparticles and water are accumulated in the bottom of the oil reservoir.



Millipore membrane

*Sample taken **before** installation of CJC™ Offline Filter*

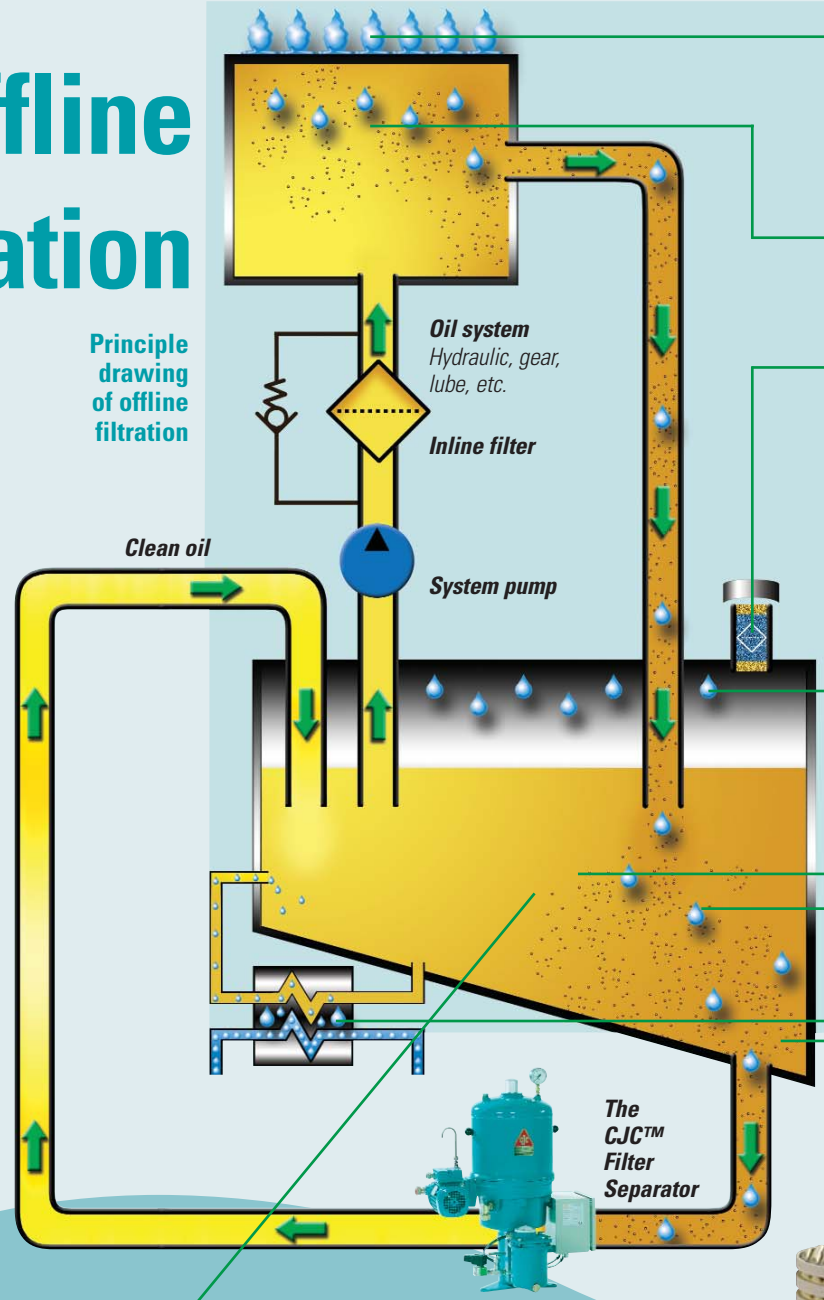
The CJC™ Offline Solution

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

CJC™ Offline Filters are easy to install and the depth filter insert has a very large dirt holding capacity. CJC™ Filters have low operation costs and are almost maintenance free. All CJC™ Fine Filter Inserts have a 3 µm absolute filtration ratio and will remove particles, water, and oil degradation products, all in the same operation.

Offline Filtration

Principle drawing of offline filtration



Contamination Sources are now under Control:

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

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

Air Vent
Contamination can be reduced by adding an airborne silica gel filter.

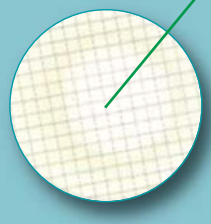
Internal Environment
Water still condensates in the oil reservoir, but with the CJC™ Filters installed, the water is removed before it reaches the oil system.

Acid Produced by Oxidation
The risk of developing acids and oxidation by-products has been considerably reduced.

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

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

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



Millipore membrane

*Sample taken **after** installation of CJC™ Offline Filter*

CJC™ Filter Insert before use

CJC™ Filter Insert after use

The Power of CJC™ Oil Filtration

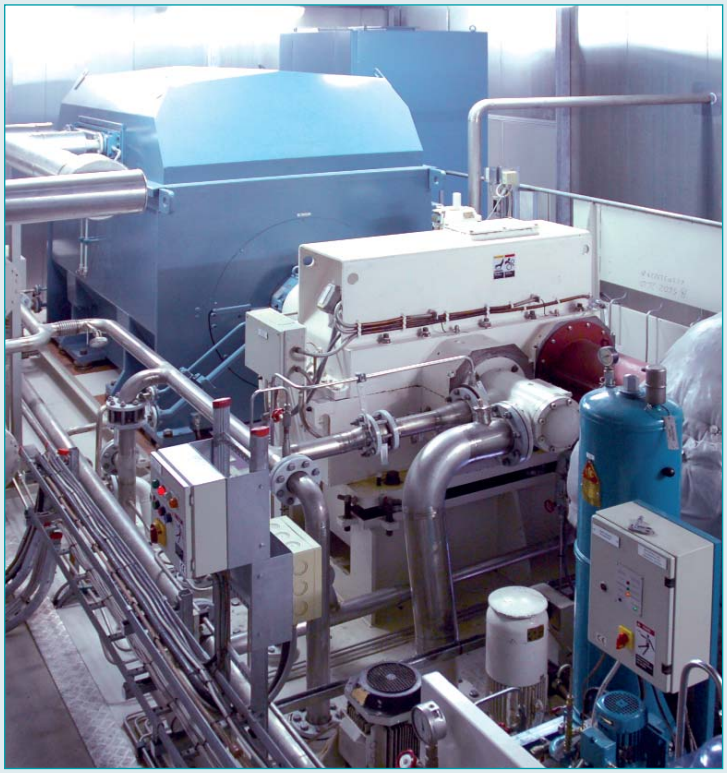
Each application performs specific tasks - so do CJC™ Offline filters in order to ensure high oil cleanliness

The most effective and economical way to maintain oil in the many systems found in power plants is the use of CJC™ Products. Equipment reliability and lifetime can be dramatically increased by installing a CJC™ Oil Filtration System.

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 enters into the oil is a constant threat. 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.



CJC™ PTU3 27/081

CJC™ PTU3 2x27/108

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 "resin"-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 the CJC™ Offline Fine Filter (HDU series) .

CJC™ HDU 27/54

CJC™ HDU 2x27/108

CJC™ Offline Filters for All Power Plant Applications

Coal Mill Gears

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

The result is that some of the smallest particles (approx. 2 micron) will enter the bearing and gears and cause damage. This again leads to further particles and wear on all components.

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

CJC™ HDU 27/54

CJC™ HDU 27/108

Hydraulic Control Systems

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

Hydraulic Oil

Hydraulic 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 (HDU Series)

Phosphate Ester

Ester-based fluids are produced by the chemical reaction between acid and alcohol (esterification).
Unfortunately this reaction is reversible when ester is exposed to water. As little as 100 ppm water is enough to start a reaction (hydrolysis) were ester fluid degrades and acid compounds are generated.
To remove water and acids from ester-based fluids we recommend the use of a CJC™ Ion Exchange / Acid Removal Filter

CJC™ HDU 27/27

CJC™ Ion Exchange / Acid Removal Filter

CJC™ Series of Solutions

All CJC™ Series are of uncomplicated design, easy to install and almost maintenance free

Using CJC™ Offline Filters will have a positive effect on your maintenance budget and will increase your productivity and reduce your energy consumption - all advantages in terms of total economy!

HDU Series

CJC™ HDU Series

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

CJC™ Filter Inserts before use and after use, showing the large dirt holding capacity.

PTU Series

CJC™ PTU Series

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

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

Clean Oil - Bright Ideas

Optimal Oil Performance With CJC™ Offline Filters

Acidity Removal

CJC™ Ion Exchange / Acid Removal Filter

Problems with phosphate esters are often associated with development of oxidation caused by acidity

CJC™ Filter Units neutralize and absorb the acid from the fluid - along with sludge, particles and moisture

Filter Inserts

The CJC™ Filter Insert System

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

Furthermore, they can be equipped with a neutralizing media for removal of acids from oil.

Cases and Statements from Our Customers in Power

Problem solving and preventive maintenance are key words in the power sector

Vattenfall A/S

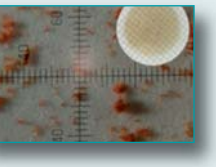
Application: Steam Turbine

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

Helsingør Kraftvarmeværk is a combined heat- and power station

Bjarne Karlsen, Operations 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"



Oil sample before filtration

- and after filtration

Problem

Oil samples from all oil systems at the combined heat and power station 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.

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.

Prioer 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 the filters, 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.

Niedzica S.A.

Application:
Water Turbine Control System

Hydro Power Plants Group Niedzica S.A, Poland

Mr. Eugeniusz Kiełtyka
Mechanical Department Manager:

"The CJC™ Filter Separator is not only very simple to operate, but it also allows us to fully eliminate the usage of a centrifuge. Moreover I am very satisfied with the results."

Problem
Mechanical contamination of oil, oil degradation products, risk of excessive water content, the necessity of periodical cleaning and drying the oil with a centrifuge.

Solution
A CJC™ Filter Separator was installed in order to solve the problems with particles and oil degradation products. Additionally, the CJC™ Filter Separator removes the free water from the system.

During the test period of three months the contamination level was reduced from 15/13/8 to 13/12/7 according to ISO standard, while at the same time water content was maintained on a stable, low level.

A significant prolongation of the oil life time was achieved.

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™ 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 resin, 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™ 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™ Filter had removed 98% of those particles. Furthermore, the resin was totally removed.

North American Electric Power Plant

Application:
Gas Turbine

Major Electric Power Plant, USA

Acc. to the Maintenance Manager:

"Finally got a dispatch of several of our filters. Unit 3 (the one the CJC™ Filter is on) worked beautifully. When we checked Unit 3 the IGV servo looked completely free of varnish and the last change of filter inserts had absolutely no evidence of varnishing."

Problem
Excessive varnish formation causing sticking valves. Varnish contamination leads to unit trips that cost from $ 25,000 to $ 250,000 in lost production, downtime, and repairs.

Solution
A CJC™ Fine Filter was installed in the test period from December through May, operating 9 hours a day. The minimal run time allowed the CJC™ Fine Filter to clean the oil in the reservoir many times over, polishing the oil. During the month of June the turbine run time increased by 250 hours, allowing the ultra clean oil in the reservoir to circulate through the turbine lube oil system.
As a result, the varnish level was reduced and the entire lube system was cleaned. More importantly, a reduction in unit trips was observed and recorded.

Clean Oil - Bright Ideas

At C.C.JENSEN, our mission is unmistakable - CO_2 emissions must be reduced to help the global environment.

The company contributes to this target through the development of **BRIGHT IDEAS** and by making them accessible to the rest of the world.

We are fully aware of the importance of **CLEAN OIL,** both for the environment and the economy. Offering our customers **CLEAN OIL** is the aim of all initiatives and development programmes within the company.

C.C.JENSEN is respected as a company that offers values such as quality, traditions, reliability, credibility and stability. C.C.JENSEN is actively working together with customers, promoting "green" solutions to benefit for the global environment.

At C.C.JENSEN, we are firmly committed to assisting in the global target to reduce emissions, and this is why we believe that **CLEAN OIL - BRIGHT IDEAS** makes sense.

Clean Oil - Bright Ideas

- Bright Ideas

CJC™ Filter Inserts are made of 100% organic material

C.C.JENSEN All Over the World

The CJC™ Offline Filters are distributed by our own international sales organisations and designated distributors

Manufacturer & Headquarters

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