# CJC™ in the Power Sector

Clean Oil - Bright Ideas

# Power Plant Applications

Power supply can depend upon maximum machinery performance - and they depend upon clean oil

## Have You Ever Experienced..?

- Oil analysis 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 lubricating systems***
  *Removal of free water, particles and varnish*
- ***Turbine control systems***
  *Removal of varnish, particles and reduction of acids*
- ***Feed pumps***
  *Removal of condensed water and particles*

# Reliable Power Supply Starts with Clean Oil

***Coal mill gear box***
*Removal of varnish and particles*

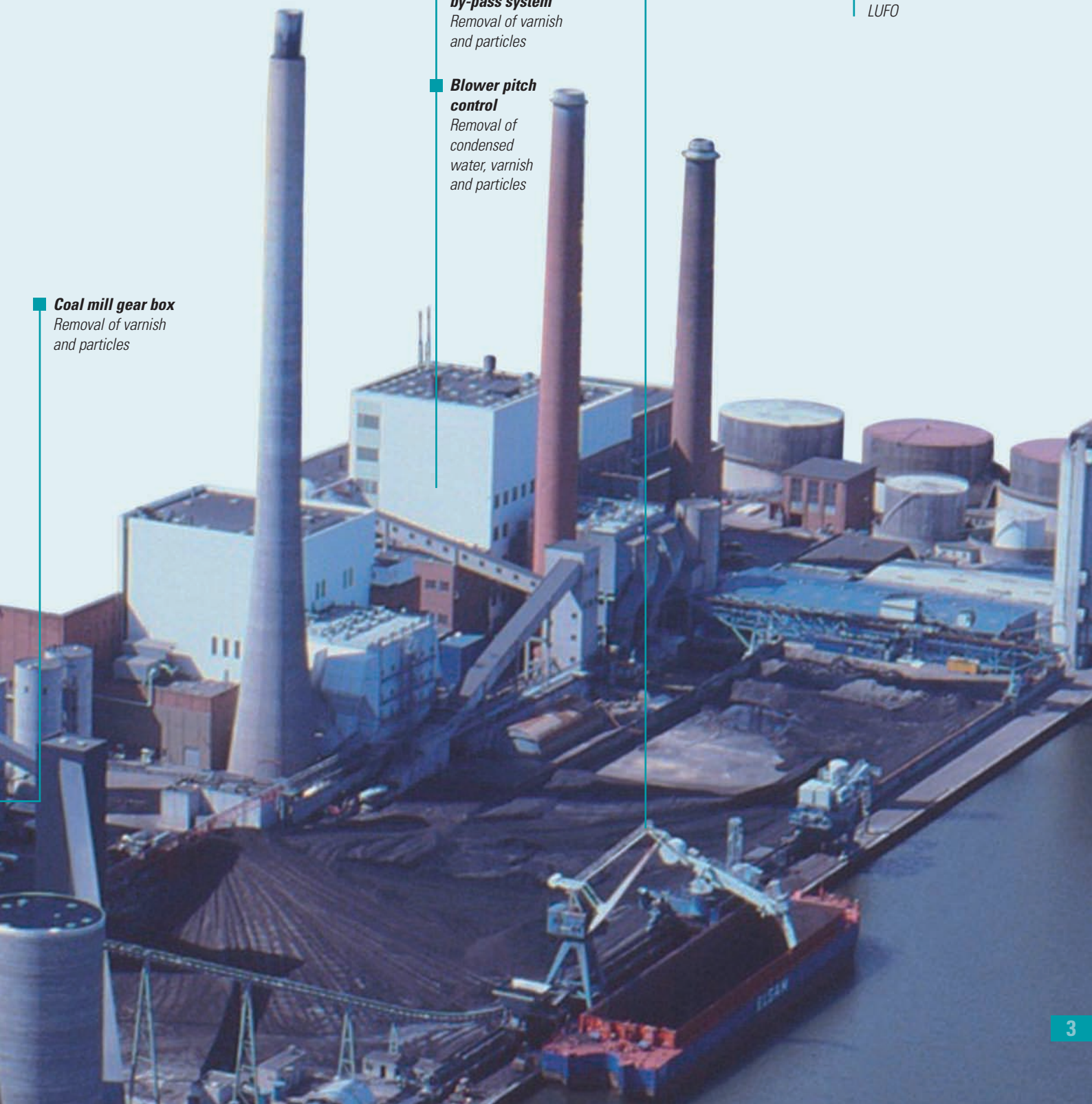
***High pressure by-pass system***
*Removal of varnish and particles*

***Low pressure by-pass system***
*Removal of varnish and particles*

***Blower pitch control***
*Removal of condensed water, varnish and particles*

***Coal crane hydraulic system***
*Removal of particles and condensed water*

***Further applications on power plants***
*Cooling towers*
*Tap charges*
*Conveyor belts*
*LUFO*

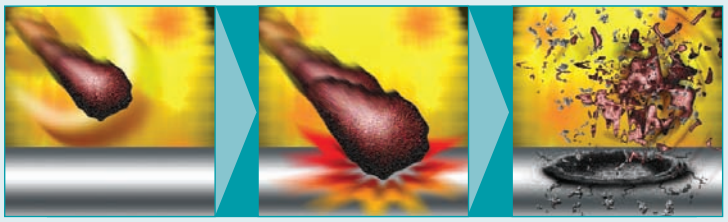


# The Most Common Types of Wear

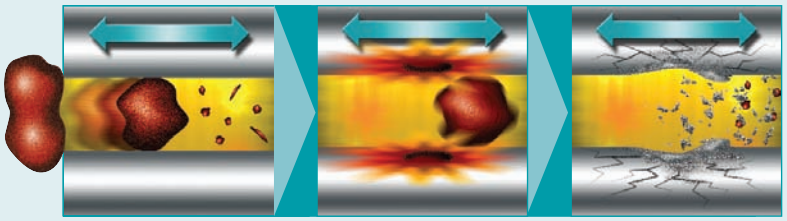
80% of all machinery repair and maintenance costs are related to contaminated oil

Oil care is a must because up to 80% of all machinery repair and maintenance costs can be traced back to contaminated system 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 intercepted effectively by most inline filters.

## Particles

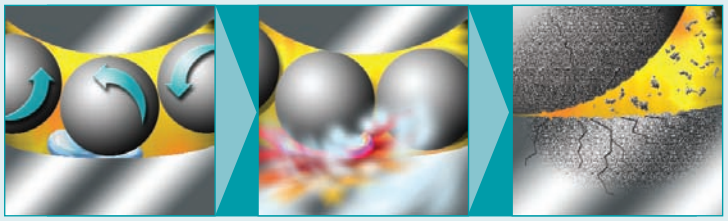


***"Sandblasting"***
*When particles are transported with the oil flow, the particles collide with metal parts, destroying the metal surface and forming new particles.*

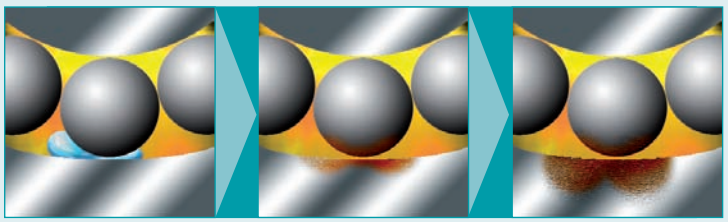


***Grinding***
*When clearance sized hard particles are wedged between movable metal parts, it destroys the metal surface further and can result in additional wear.*

## Water

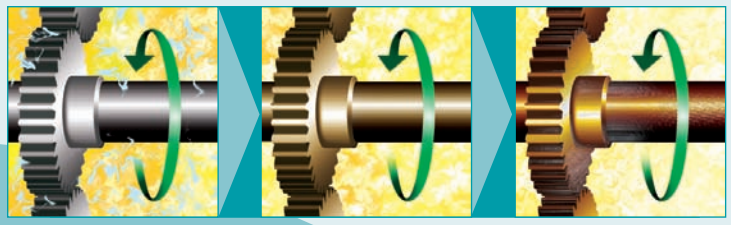


***Cavitation***
*Cavitation occurs in areas where water is present and oil is compressed; the water implodes and blows particles off the metal surface, which cracks.*



***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 leads to oil degradation which is the precursor of varnish/resin deposits.*
*The result of varnish/resin is a "sandpaper-like" surface on machine parts.*

# One Filter - Three Solutions

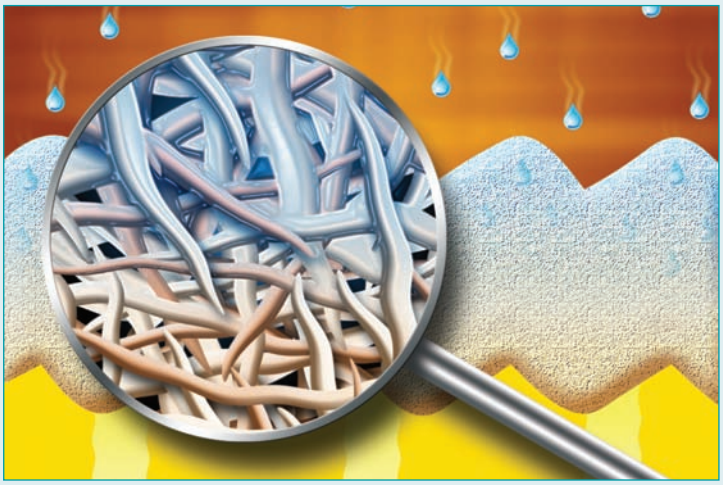
CJC™ Offline Filters remove particles, absorb water and adsorb oil degradation products round-the-clock

CJC™ Offline Filters do not only retain solid particles and water. They also remove oil degradation by-products - "soft contaminents" - which are the precursors to the sticky varnish that deposits on metal surfaces. It cannot be removed by traditional filtration as it behave like a fluid within a fluid.

## Particles

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

## Water



***Absorption of water***
*The cellulose fibres in the CJC™ Filter Insert mass absorb the water*

## Varnish/ resin

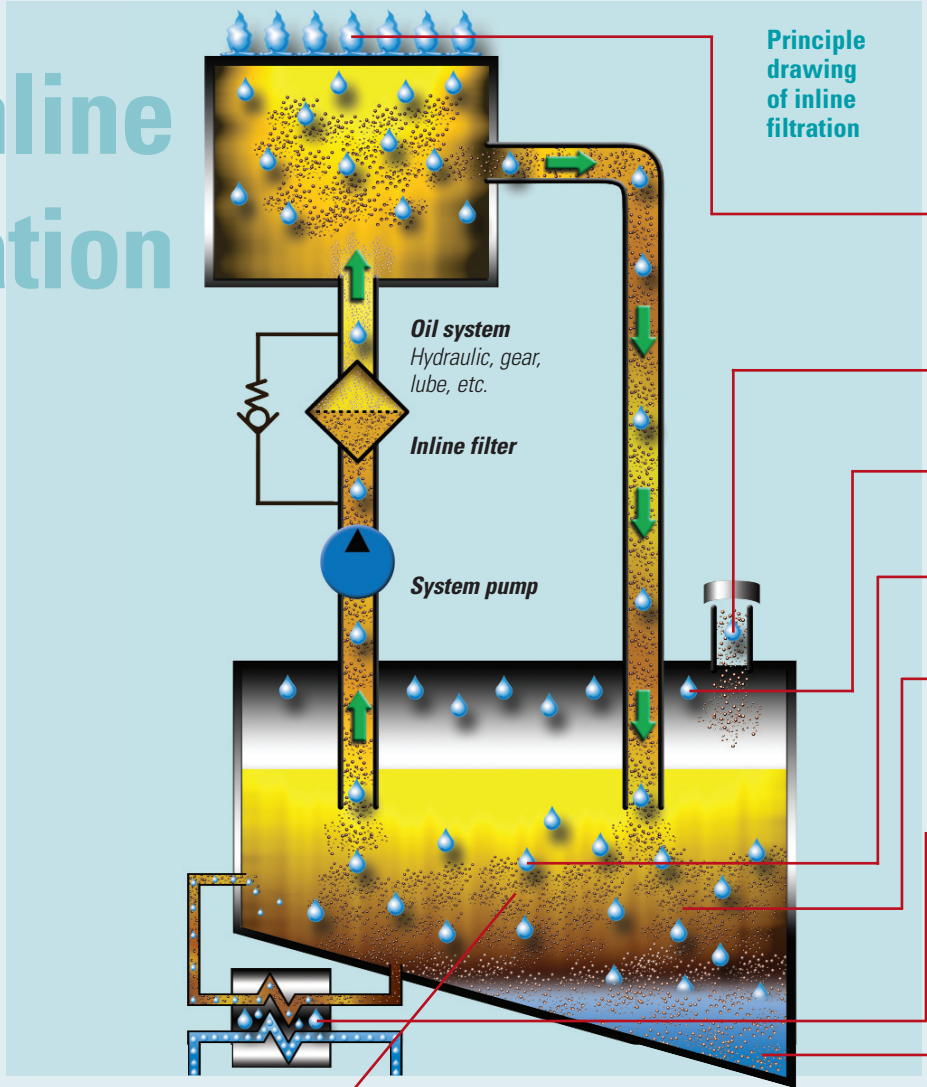
***Adsorption of oil degradation products (varnish/resin)***
*Resin in the oil attracts to the polar fibres in the CJC™ Filter Insert mass and are being retained*

# Traditional Inline Filtration

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

Inline filters are ususally 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 only seldomly be achieved. Oil degradation products, water and micro particles will accumulate in the oil.

## Inline Filtration




***Contamination sources:***

***External environment***
*Water from the external environment is ingressing the system via the elements, high-pressure water blasting, washing etc.*

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

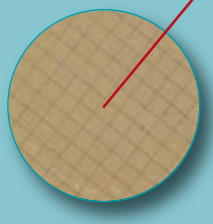
***Internal environment***
*Water condensate in the oil reservoir*

***Water produced by oxidation***
*High temperature + dirty oil = acid, water and resin*

***Rust/corrosion***
*Water instigates the formation of rust particles which with resin and particles are accumulated in the oil reservoir*

***Cooler leaking water***
*A leaking cooler results in water entering the oil reservoir*

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



*Millipore membrane*

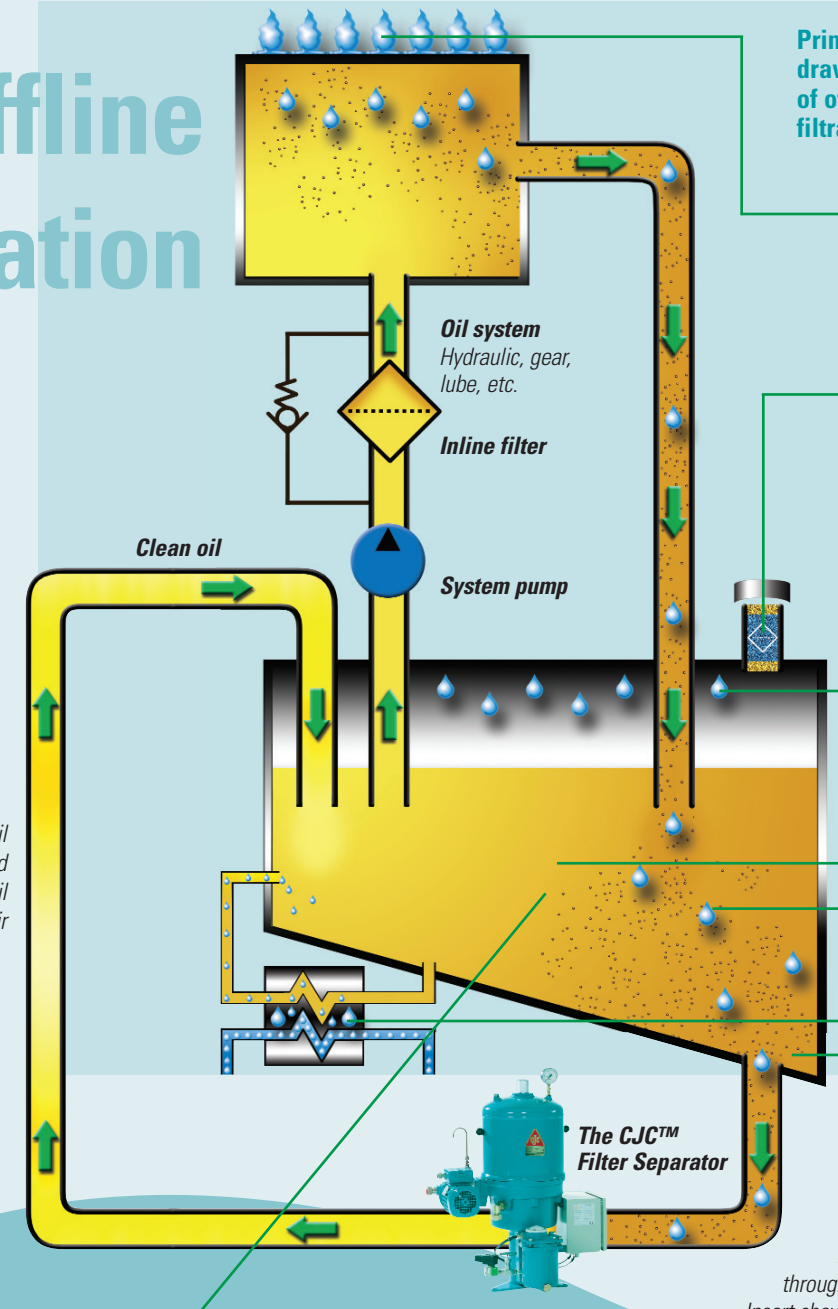
*Sample taken **before** offline filtration*

# The CJC™ Offline Solution

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

## Offline Filtration




### *Contamination sources are now under control:*

***External environment***
*Water from the external environment is still ingressing into the system but with the CJC™ Filter Separator installed it is continously removed*

***Air vent***
*Contamination can be reduced by adding an Air/Silica Gel Filter*

***Internal environment***
*Water still condensates in the oil reservoir but with the CJC™ Filter Separator installed it is removed before it reaches the oil system*

***Water produced by oxidation***
*The risk of developing water, acids, and oxidation by-products has been considerably reduced*

***Rust/corrosion***
*Contamination is still being created but is removed by the CJC™ Filter Insert*

***Cooler leaking water***
*The leaking cooler can be repaired at scheduled overhauls as the CJC™ Filter Separator 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*

*A used sliced through CJC™ Filter Insert showing the large dirt holding capacity*

# The Power of CJC™ Oil Filtration

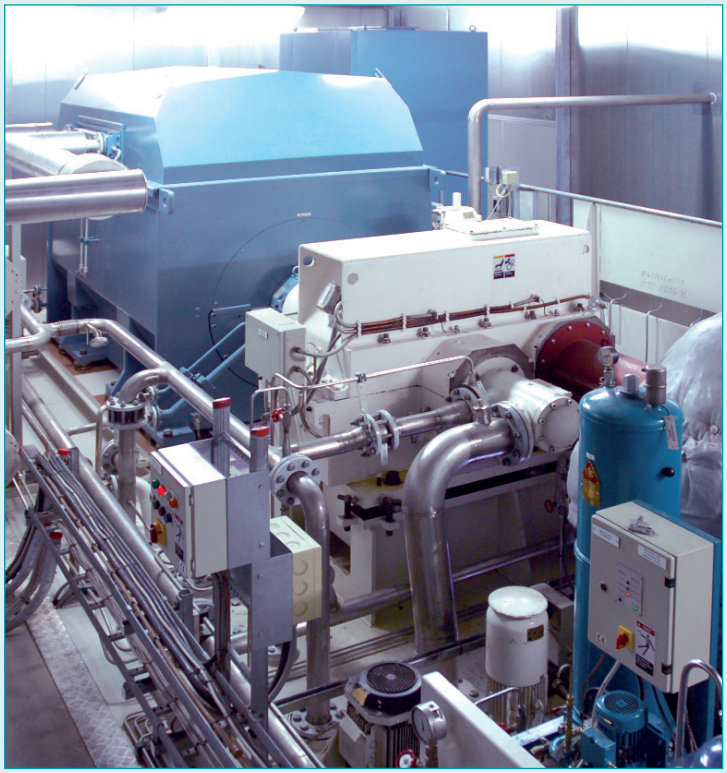
## Each application performs specific tasks - so do CJC™ Offline filters in order to ensure high oil cleanliness

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 introducing an 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 ingress 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 inside 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 instead of the oil, and cause damage. This again leads to further particles and wear on all lubricated 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 phosphor ester.*

***Hydraulic Oil***

*Hydraulic oil will often show a high content of wear and tear particles as well as oil degradation products. To remove the contamination we recommend the use of CJC™ Offline Fine Filter (HDU Series)*

***Phosphor 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™ Acidity Removal filter.*

***CJC™ HDU 27/27***

***CJC™ HDU MultiFilter***

# CJC™ Series of Solutions

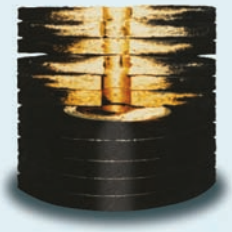
All CJC™ Series are of uncomplicated design, easy to install and almost maintenance free

Using CJC™ Offline Filters will have a positive effect on your maintenance budget as well as increase your productivity and reduce your energy consumption - all advantages to the total economy!

## HDU Series

***CJC™ HDU Series***
*The CJC™ Fine Filter removes particles, water and oxidation by-products for hydraulic and lubricating oils and have flow rates from 45 to 20.000 L/h*

*A used CJC™ Filter Insert (sliced half way down) 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 lubricating oils.*

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

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# Optimal Oil Performance With CJC™ Offline Filters

## Acidity Removal

***CJC™ Acidity Removal***
*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 and qualified to fit any applications and requirements*

*Further they can be equipped with a neutralizing media for removal of acids*

# Some Cases and Statements from Our Customers in Power

Problem-solving has almost become a trademark for C.C.JENSEN - can we assist you?

## Vattenfall A/S

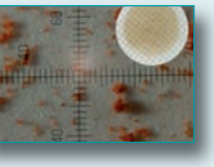
**Application: Steam Turbine**

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

*Helsingør Kraftvarmeværk is a combined heat- and power station*

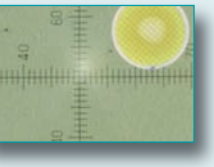
Bjarne Karlsen, Operations Manager at Vattenfall A/S:

***"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 in the steam turbine's lubrication oil.***
***An HDU Fine Filter installation in 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 tests at the Filtrex analysis company. The oil samples from the steam turbine revealed a very high water content as well as high particle contamination, rust and oxidation by-products.

### Solution

A CJC™ Filter Separator was installed 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.

After one month with fhe filter, 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.

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## Niedzica S.A.

**Application:**
**Water Turbine Control System**

*Water 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 oxidation by-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 arrest the problems with particles and oxidation by-products. Additionally, the automatic dehydration unit 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.
The expected prolongation of the oil life time as well as the increased durability of hydraulic elements were 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 analysis showed a high content of metal particles and resin, indicating wear on the components. The very small particles entered the bearings instead of the oil 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 units. 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 insert had absolutely no evidence of varnishing."*

**Problem**
Excessive varnish formation causing sticky 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 throughout 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

Clean Oil – Bright Ideas is the mission of C.C.JENSEN that is being adhered to by all of our international offices and cooperation partners.

At C.C.JENSEN - nowadays mainly referred to by its brand name CJC™ - the mission is unmistakeable - the $CO_2$ outlet must be reduced and the global environment made cleaner. The company contributes to this goal by making room and space for the development of **Bright Ideas** and for making them accessible to the rest of the world.

Ever since the founder of CJC™ became aware of the importance of **Clean Oil** to the environment as well as to the economy of individual production units, **Clean Oil** has been the focal point and the aim of all initiatives and development processes in the company – and successfully.

Throughout all the years, CJC™ has chosen the opposite direction of the general trend in society where rules and regulations continue to govern all activities and initiatives. Instead, already from the very beginning in 1953, it was decided to focus on the free initiative and freedom with responsibility as the basis for a work environment where professional challenges, a positive corporate culture and employee commitment contribute to nurturing **Bright Ideas** and to maintaining CJC™'s position on the market.

This is why, today, CJC™ is respected as a company that worships values like quality, traditions, reliability, credibility and stability – and, at the same time, in front when it comes to responsibility for the future and a joint effort concerning environmental problems and "green" solutions to the benefit of the global environment.

At CJC™ we believe that only in an open atmosphere based upon security, mutual trust and a belief in the future is it possible to create and realize ideas – and this is why at CJC™ **Clean Oil – Bright Ideas** makes sense.

*CJC™ Filter Inserts are made of 100% organic material*

Clean Oil - Bright Ideas

# Bright Ideas

# C.C.JENSEN All Over the World

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

*CJC™ stands for reliable supply all over the world*

## Manufacturer

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*Your local CJC™ distributor*

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