



The Synonym for Oil Maintenance

in hardening plants



WITHOUT filtration **WITH** filtration



WITHOUT filtration **WITH** filtration



WITHOUT filtration **WITH** filtration



Fine Filter Systems for Applications in Heat Treatment Processes





Contaminations in Quenching Oils

Contamination types , causes and consequences

Oil ageing due to oxidation and thermal strain

Degradation of base oil and additives changes the performance of quenching oils and leads to the formation of cracking products (asphaltenes), sludge and organic acids.

Particles and cover pastes

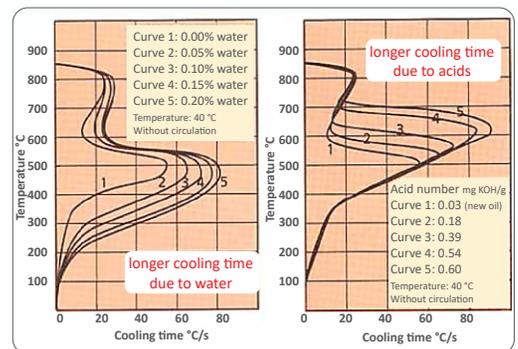
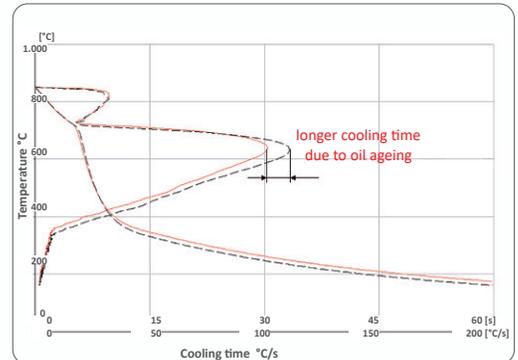
It is impossible to avoid particle contamination during the quenching process. Carbon, cinder, metal particles and, when indicated, residues from cover pastes enter the quenching oil. If the bath is not hermetically separated from the surrounding environment the oil can additionally be loaded with dust particles.

Water

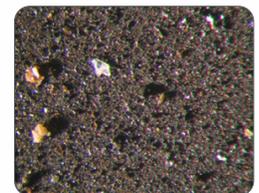
Ingress of water must be avoided in any circumstances. Condensation, leakages (coolers, pipes etc.), sprinklers and unsuitable stocking are possible sources.

CONSEQUENCES

- ▶ Influence on quenching characteristics (cooling time, vapour phase etc.) and quenching results with regard to material quality (hardness, deformation, cracks etc.)
- ▶ Black deposits and sludge formation on hardened parts, coolers, circulating systems and in tanks lead to
 - Loss in cooling efficiency
 - Irregularities during the quenching process
 - Heavily loaded washing baths and additional cleaning
 - Extensive after-treatment (blasting and grinding processes)
 - Higher amount of defective goods
- ▶ Change in viscosity
- ▶ Foam formation during the quenching process
- ▶ Increased risk of splashing
- ▶ Changed flashpoint and increased risk of fire / explosion



Formation of sludge in pipes



Oil sample - test membrane 100-fold magnification

SOLUTION: CJC™ FINE FILTER SYSTEMS

- ▶ Quenching results with consistent quality
- ▶ Reduce black deposits and sludge accumulation on hardened parts, coolers, circulating systems and in tanks
- ▶ Avoid after-treatment and additional cleaning
- ▶ Minimise amount of defective goods (scraps)
- ▶ Ensure constant cooling efficiency
- ▶ Prolong lifetime of system filter
- ▶ Protect washing baths and prolong lifetime of wash water
- ▶ Continuous filtration independent from cooling circuit and operation of the quench system (24/7)
- ▶ Filter material made of 100 % renewable raw material protects the environment and allows for easy disposal

REDUCE COSTS | INCREASE PRODUCTIVITY | ENSURE QUALITY | PROTECT THE ENVIRONMENT



CJC™ Depth Filter made of Cellulose

simultaneous removal of particles, water and asphaltenes



Particles

Solid particles are permanently retained between the cellulose fibres. 75 % of the insert volume forms a structure of cavities. Each insert has a filtration degree of 3 µm absolute and 1 µm nominal.

Capacity: several kilogrammes



Water

Cellulose fibres absorb water by capillary attraction. Even if only a few ppm of water are in the oil, the fibres dry the oil.

When using aqueous quench fluids, please contact us!

Capacity: several litres



Oil ageing products

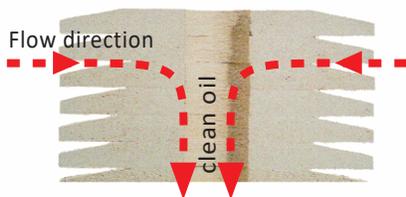
Cracking products (asphaltenes) and sludge residues deposit permanently, with a combination of adsorption and absorption, on the polar sites of the cellulose fibres. Cellulose fibres have an inner surface of 120 to 150 m² per 1 gram.

Capacity: several kilogrammes



Depth filtration for an extremely high dirt holding capacity

CJC™ Fine Filter inserts are depth filters, i.e. compared to surface filters contaminants are retained in the depth of the filter material. This implies an enormously high dirt holding capacity. Due to the slow pace of the oil flow – only possible in an own circuit (offline filtration) – and the extremely long filter paths of a depth filter, CJC™ Fine Filter inserts are particularly effective. **The longer the fluid has contact with the filter material, the more effective is the fine filtration.** The filter efficiency is basically a function of the fluid's contact with the filter material.



Cross-section of a CJC™ Depth Filter insert - The oil flows through the CJC™ Depth Filter insert radially from the outside to the inside



Cross-section of a used CJC™ Depth Filter insert

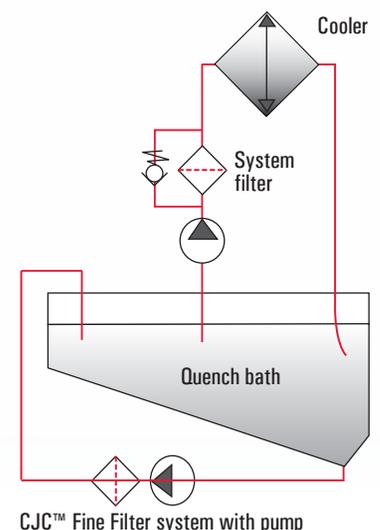


Filter insert replacement - clearly visible the extremely high dirt holding capacity

Function principle

The CJC™ Fine Filter system is directly connected to the quench bath in a separate circuit. Fluid that is heavily contaminated by the quenching process is drawn from the quench bath and returned to the bath dry and clean after passing through the CJC™ Fine Filter insert. Independently from the quenching process, the content of the quench bath is filtered continuously.

Slowly and with a constant flow rate the oil flows radially from the outside to the inside through the depth filter insert. Due to the slow pace and the extremely long filter paths of the CJC™ Depth Filter insert the filter efficiency is particularly high. The longer the fluid has contact with the filter material, the more effective is the fine filtration.

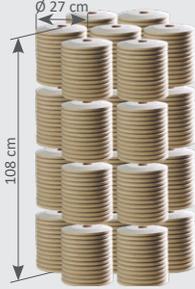


CJC™ Fine Filter system with pump



Quenching Oil

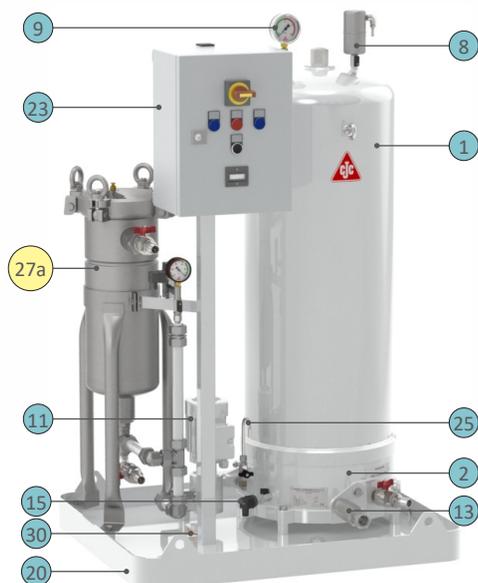
CJC™ Fine Filter units for highest possible oil cleanliness

CJC™ Fine Filter unit	38/100	427/108	727/108
			
CJC™ Fine Filter insert			
Width x Depth x Height	90 x 75 x 138.6 cm	120 x 85 x 159.7 cm	140 x 110 x 161.6 cm
Dirt holding capacity, approx. *	15 kg <i>when using quenching oil up to 85 kg depends on type of contaminations</i>	32 kg <i>when using quenching oil up to 160 kg depends on type of contaminations</i>	56 kg <i>when using quenching oil up to 280 kg depends on type of contaminations</i>
Water absorption capacity, approx.	> 7.2 l	> 16 l	> 28 l
Oil volume, max.**	5,000 l	9,000 l	15,000 l
Equipment	<u>Standard</u> <ul style="list-style-type: none"> • Prefilter <ul style="list-style-type: none"> a) Sieve basket filter (large particles) or b) Magnetic and sieve filter (magnetic particles) 	<ul style="list-style-type: none"> • Sampling point • Pressure switch • Automatic bleeding and venting valve • Non-return valve • Leakage sensor 	<ul style="list-style-type: none"> • Electrical control (incl. motor protection switch and shunt) • Base plate

Subject to technical changes.

* Test dirt: spherical ferrous oxide with prevailing size of 0.5 µm

** Guideline for closed quenching baths



Item	Description
1	Filter dome
2	Filter base
8	Automatic bleeding and venting valve
9	Pressure gauge
11	Pump with motor
13	Non-return valve
15	Pressure switch
20	Base plate
23	Electrical control
25	Sampling point
27a	Sieve basket filter
27b	Magnetic and sieve filter
30	Leakage sensor



CJC™ Filter Separator

Fine and depth filtration in combination with a coalescer-filter for removal of larger amounts of free water from oil

Principle

The coalescing principle is ideal for the separation of free water from mineral and synthetic oils with a good demulsification time (< 20 minutes). For optimal coalescer efficiency the solid and soft contaminants contained in the oil (particles and oil ageing products) have to be removed by fine filtration before the coalescing process starts. Contaminations negatively influence the demulsification capability, clog the coalescer and reduce the coalescer efficiency.

In a subsequent coalescer filter, the water droplets are carried by the laminar oil flow through the coalescing element and attach to the coalescer fibres due to the larger adhesion forces. The flow pushes them along the coalescer fibres and lets them coalesce with other droplets at the intersections. Finally, due to gravity and the higher density, the larger droplets are released and separated in a discharge area.



CJC™ Desorber with upstream CJC™ Fine Filter unit

Fine and depth filtration in combination with desorption for removal of larger amounts of dissolved water from oil

Principle

With desorption it is possible to separate both free water and dissolved water from the oil unaffected by additive packages and viscosity. Mineral and synthetic fluids with a poor demulsification time (> 20 minutes) and stable emulsions can be dried – even with very high water content - up to 30 % (300.000 ppm).

The desorption process is based on the principle that heated air can effectively hold large quantities of water. In the Desorber, the warm oil is met by a counter flow of cold, dry air. The air, heated very quickly by the warm oil, absorbs any water present until saturation is reached. During the subsequent air cooling process the water condenses and the dry air is used again for drying of the following oil flow.

Desorption removes only H₂O. However, as a result of the quenching process, the quenching oil is also contaminated with particles and oil ageing products so that a CJC™ Fine Filter unit is connected upstream of the CJC™ Desorber.





Application Examples

Maintenance of quenching oils

Chamber and continuous furnaces

8 IPSEN chamber furnaces each with an oil volume of 6,000 litres
 4 AICHELIN continuous furnaces each with an oil volume of 14,000 litres

- Improved cooling characteristics .
- Increased cooler efficiency.
- Number of black deposits on hardened parts is significantly reduced which **minimises cleaning processes** (after-treatment).
- The installed centrifuge could not remove the contaminations contained in the oil and was replaced by a CJC™ Fine Filter unit.

	Centrifuge	CJC™ Fine Filter
ISO Code 4406 *)	>24/>24/>24	21/19/15
Dirt content (5 µm), %m/m	0.177	0.008

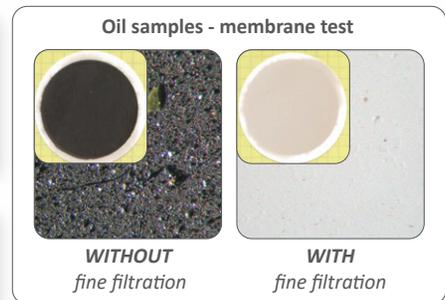
*) Further information on cleanliness classes are available on request.

Chamber furnaces

2 IPSEN atmospheric chamber furnaces each with an oil volume of 2,000 litres

- After less than 2 weeks of continuous filtration, basic contamination had been substantially reduced and the oil can still be used (no oil change necessary).
- The amount of sludge to be disposed of **decreased from 1,200 to 200 litres/year**.
- Improvement of surface quality.

Operating head hardening plant: „At first I was impressed which amount of dirt the CJC Fine Filter inserts can absorb. **The filter elements now have a lifetime of up to four months.** The oil samples are classified as new by our oil supplier. [...]”

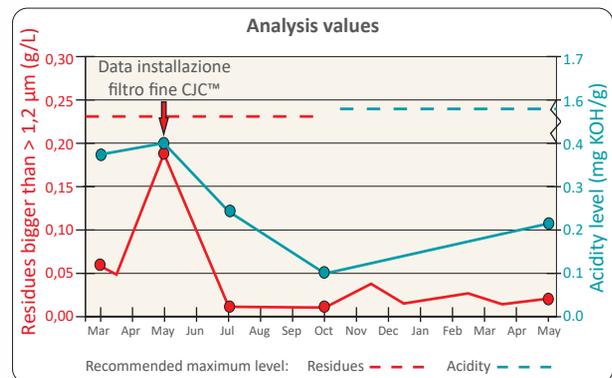


Conveyor Furnace

Holcroft conveyor furnace TT137 with an oil volume of 16,000 litres

- 2 months after installation of the CJC™ Fine Filter unit the residues which caused the biggest problems were removed.
- At the same, time the oil acidity decreased by half and continued decrease in the following 3 months.
- Result:
 - ▶ No deposits on hardened parts
 - ▶ No daily filter insert replacement on system filter
 - ▶ No oil change necessary - in total 16,000 litres were saved

Laboratory Manager: „When we installed the CJC filtering equipment we thought it would be necessary to replace all the oil in our quench bath in a short time owing to the levels of residues and acidity it would reach. [...] At present (a year and a half later) we are still using the same oil and our deterioration indicators are showing no signs of having to change it.”



	BEFORE	AFTER 2 months	AFTER 5 months	AFTER 1 year
Residues, g/L	0.158	0.010	0.010	0.018
Acidity, KOH/g	0.40	0.24	0.12	0.23
Membrane colour (level of oxidation residues)	Dark brown	White	White	White

Application Examples

Reconditioning of skimmed oils and wash water

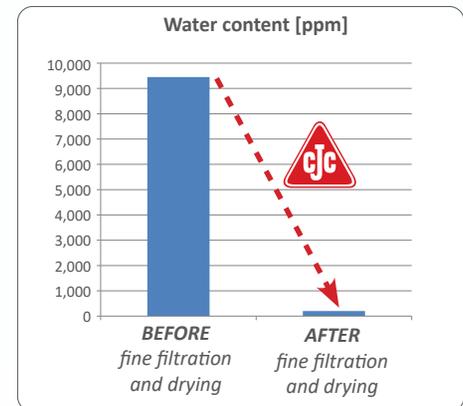


Washing baths: skimmed oil - Reconditioning with CJC™ Desorber

Wash baths each with a volume of 1,000 litres

- **Approx. 4,000 litres oil per month are reused by reconditioning.**
 - ▶ Water content dropped from > 9,451 ppm to < 200 ppm.
- **Savings > 72,000 EUR/year**
 - ▶ Disposal costs for oil-water-mixture
 - ▶ Purchasing costs for new oil (drag losses)
- **Amortisation time: < 6 months**

Responsible for maintenance: „The recovery of oil allows us to save on costs and also protect the environment from large amounts of oil. The investment is paid off in a few months after commissioning the desorber.”



Washing baths: skimmed oil - Reconditioning with CJC™ Filter Separator

4 washing baths each with a volume of 1,000 litres

- Especially small quenched parts carry a lot of oil into the wash water during the cleaning process (high drag losses).
- As a consequence of reconditioning skimmed oil, the company achieves **substantial annual savings (> 70,000 EUR/year)**.
- **Per month, approx. 3,000 litres of oil can be treated** with clearly noticeable effects on disposal and purchasing costs.

Manager heat treatment: „We already filter our quench baths with a CJC Fine Filters. Therefore, we decided to run this test with the skimmed oil. By using the CJC Filter Separator we can annually save up to approximately EUR 70,000.”



CJC™ Filter Separator installed at intermediate bulk container

Washing bath: wash water

Washing bath with a volume of 400 - 500 litres

- After only a few fluid circulationc the main part of the contaminations were removed.
 - ▶ **> 30 kg of dirt within 6 weeks of filtration**
- Deposits on hardened parts caused by contaminations in the wash water considerably reduced.
- **Lifetime of wash water prolonged many times over.**



First filter insert replacement at the CJC™ Fine Filter unit: dirt holding capacity > 30 kg



- worldwide



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History

Founded in 1928 and located in Hamburg, we develop and manufacture CJC™ Fine Filter technology since 1951. With substantial know-how and in-house analysis and test facilities we are experts when it comes to the maintenance of oils and fuels.



Quality

Competent advice and individual solutions, even for the most difficult filtration problems of our customers - that is our daily claim. The certification of our company according to DIN EN ISO 9001:2015 provides us with assurance and motivation.

CJC™ worldwide

CJC™ Fine Filter systems are available worldwide through subsidiaries and distributors. Find your nearest distributor on our website www.cjc.de - or give us a call!

