



CJC™ Fine Filter Technology

Cleaning of thermal oil systems



Applications:

*food industry
raffineries
timber and paper industry
coating industry
rubber and plastics industry
etc.*

Maintenance of thermal oil in heat transfer systems

Synonym for oil maintenance



Karberg & Hennemann



Typical Problems:

- *Deposits in the Tube System*
- *Contaminated Coolers*
- *Instable Processes*
- *Increasing Energy Consumption*



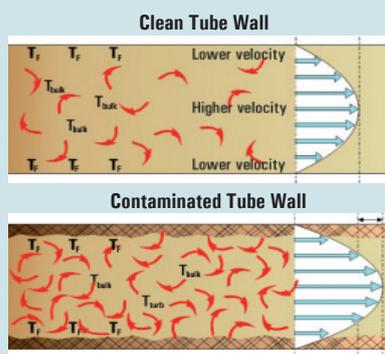
Oil degradation products are the major cause of these problems which can be avoided with a continuous fine filtration of the thermal oil.

Different Applications - Same Problems

Thermal oil is used in many industrial sectors. In heat transfer systems with operating temperatures of 140 - 310 °C these special oils substitute water or steam as transfer medium, for example in the petrochemistry, electrical industry, paper and timber industry, in rubber and plastics processing, in the shipping sector and not least in the food industry.

High Thermal Stress - Accelerated Oil Degradation Process

Thermal degradation activated by the high temperatures as well as oxidation processes stress the thermal oil. As a consequence, oil degradation products are generated and transported throughout the whole system by the oil so that they deposit at the tube walls and in the heat exchangers.



T_f = Film temperature
 T_{bulk} = Bulk temperature

Deposits on the inner tube walls of a thermal oil system reduce the flow-cross section of the tubes. The rough surfaces increase the internal resistance and lead to a loss of energy. At restart after an operating stop the warm-up phase is prolonged, energy consumption increases and reaction times on control signals are much longer.

This extended reaction times lead to variations in temperature during the production. In order to compensate these delays the thermal oil has to be exposed to even more heat which further accelerates the oil degradation process.

Especially in the heat exchangers, significantly more oil degradation products are deposited due to the temperature gradients. The characteristics of the heat transfer deteriorate, the energy efficiency decreases and the process parameters need to be adjusted frequently.

Productions Stops = Breakdown Costs

Processes with thermal oil are normally designed for continuous operation.

Especially here, downtime leads to considerable costs.



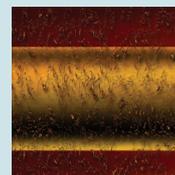
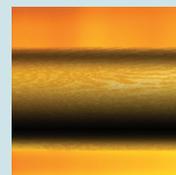
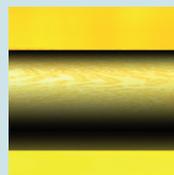
CJC™ Fine Filter Inserts

Continuous removal of oil degradation products



Carbonization / Oil degradation products

Oil degradation products due to oil ageing are generated in every thermal oil system. Main reason is pyrolysis (thermal degradation at high temperatures). Oil degradation products like oxidation residuals, resin / sludge and varnish deposit on metal surfaces in the system, reduce the free flow-cross section and deteriorate the heat transfer.



Removal of oil degradation products

Oil degradation products can be removed with CJC™ Fine Filter units before they deteriorate further and sediment as sludge or resins.

CJC™ Fine Filter inserts are depth filters made of cellulose with an immense inner surface area. Since filtration efficiency generally depends on the contact time of the fluid with the filter material, CJC™ Fine Filter inserts are designed so the fluid has to pass the large volume of the insert.



Oil degradation products deposit at the cellulose fibres (combination of adsorption and absorption)



The CJC™ Fine Filter Insert purifying the oil until the cellulose fibres are completely saturated.

The degradation products are removed from the oil by a combination of adsorption and absorption processes. The degradation products deposit at the cellulose fibres and are absorbed into them.

- **Coke number:**
Removing oil degradation products leads to a reduction of the coke number (important indicator for the residual oil life time).
- **TAN (Total Acid Number):**
Existing acid components can also be neutralized and removed from the oil, the acid number (TAN) decreases.

Material: Cellulose



Because of their structure CJC™ Fine Filter inserts are comparable with a labyrinth-like, extremely close-meshed volume sieve with finest, countless branched channels. The total volume of cavities of the filter insert amounts to 75% which explains the particularly high dirt holding capacity.



Used CJC™ Fine Filter inserts can be disposed off according to waste code 150202 (EWC, version January 2002). They exclusively consist of natural ingredients so that they have not to be separated by material types. For that reason they fulfill also the requirements of DIN EN ISO 14001:2005 „environmental management systems“ and the German Life-Cycle Resource Management Act.



Sectional view of a used CJC™ Depth Filter insert

Up to 56 kg dirt

Depending on the size CJC™ Fine Filter Units absorb up to 56 kg of dirt, before the fine filter insert have to be replaced.



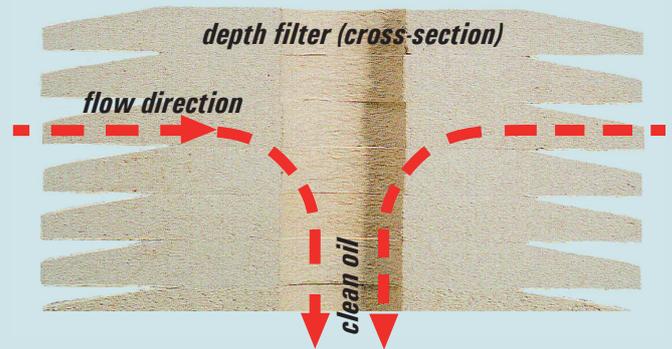


Functional Principle and Installation

Large Amount of Space for Contaminants

While crossing the filter insert microfine particles and cracking products are retained in the depth of the filter material. Depending on type and volume of the particles each filter element can absorb up to several kilograms of dirt until the element is saturated.

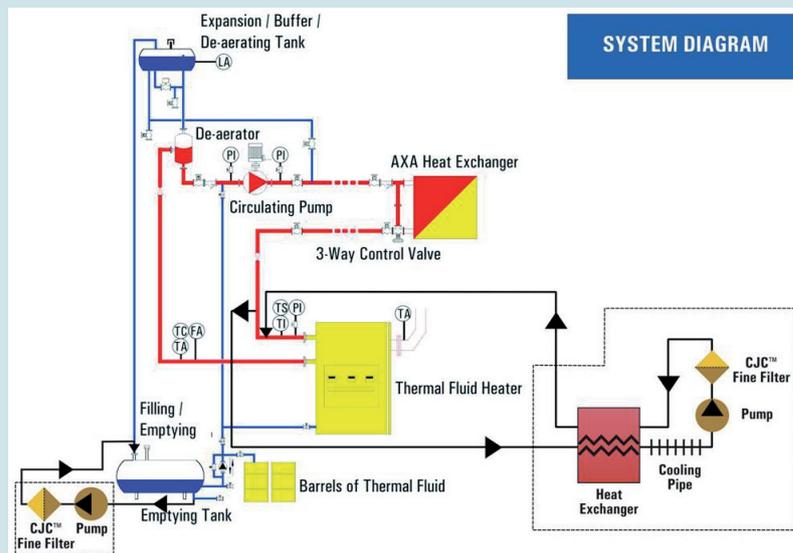
The filter insert also removes water from the oil.



It should be noted that during installation of the CJC™ Fine Filter unit, the CJC™ Fine Filter insert may not come in contact with oil of a temperature exceeding 150 °C. That implies a maximum inlet temperature of 300 °C before it enters the heat exchanger of the filter system.

The fluid pressure in the CJC™ Fine Filter unit should be kept as low as possible.

In order to keep the heat loss low the filtered thermal oil is, before it is reverted to the system, reheated in the heat exchanger by the oil that has to be filtered.



Installation

Ideal installation of the CJC™ Fine Filter system is at the point in the system with the lowest pressure and temperature conditions. If necessary the temperature can be lowered with a heat exchanger and a cooler to a level that complies with the filter requirements.

Best conditions for installation are to be found at the upstream side of the main or booster pump.

If an installation is not possible at this point the oil can also be drawn from the discharge or expansion tank.

Another option is an installation in a secondary circuit (with low temperature) or at the tube to the expansion tank with oil return into the heating circuit.



Whenever oil is exposed to high temperatures it generates problematic oil degradation products.



CJC™ Fine Filter units - Advantages

Cleaning Thermal Oil Systems with Clean Oil

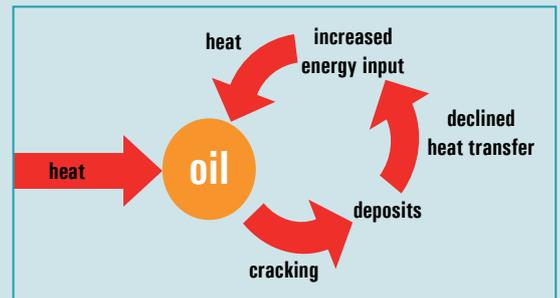
A continuous fine filtration not only removes the circulating oil degradation products from the oil system. The cleaned oil that can hold a certain quantity of oil degradation products in solution redissolves already deposited oil degradation products and keeps them in suspension until they are filtered out.

Thus, it is possible to also clean a thermal oil system already heavily charged with deposits.

Without Filtration:

As a result of the increasing deposits, the heat transfer degrades.

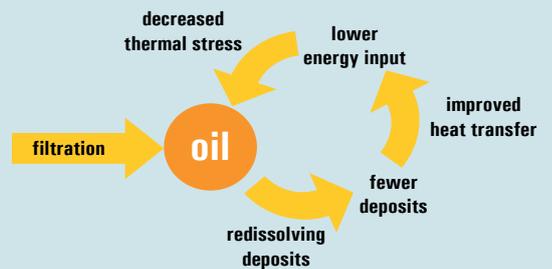
Consequence: The oil has to be heated up even more, oil degradation accelerates.



With Filtration:

The cleaned oil redissolves solid deposits and transports them out of the system.

Consequence: The heat transfer is improved, the oil gets less thermally stressed, oil degradation decelerates.



Advantages of a Fine Filtration at a Glance:

- *prevents the clogging of tubes and heat exchangers*
- *prolongs the oil life time*
- *stabilizes the process via constant heat transfer*
- *reduces deposits in the heating circuit*
- *saves energy*
- *lowers the coke number*
- *reduces the total acid number (TAN)*
- *reduces maintenance and downtime costs*

The degradation process is catalysed by:

Oxygen



High temperatures



Water



Wear particles Cu, Fe, Al



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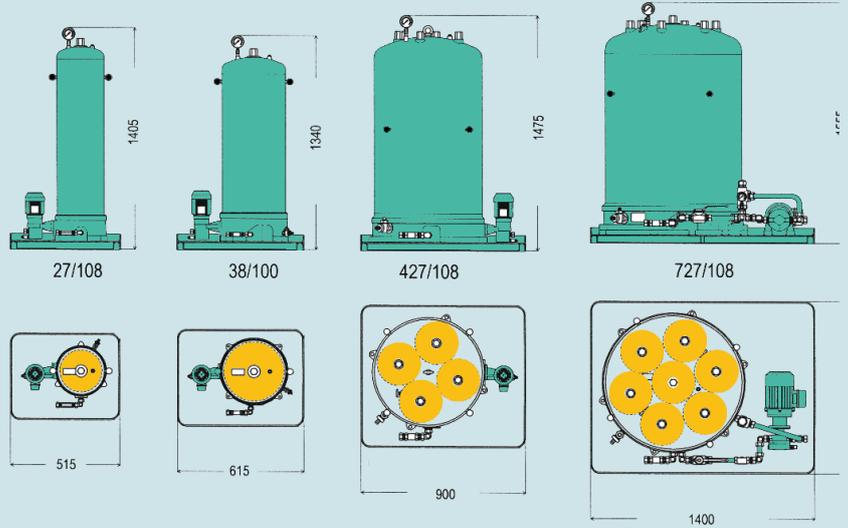


Dimensioning

CJC™ Fine Filter units

Dimensioning the optimum size of the filter unit mainly depends on the oil volume and the amount of contaminants in the system.

The modular design allows a precise dimensioning of the unit adapted to the respective application.



Optional accessories

For filtration of thermal oil with an operating temperature > 150 °C a version with heat exchanger and cooler is recommended.

Further obtainable accessories are for example tanks, base plates, leakage sensors, pressure switches and temperature monitors. Signals and reports can be transmitted externally.



Dimensioning								
Oil volume max. [L]	CJC™ Fine Filter Type	CJC™ Fine Filter Insert		Holding capacity		Content [L]	Pump flow [L/min]	Power consumption motor [kW]
		Volume [L]	Surface [m²]	Dirt [kg]	Water [L]			
3,000	27/27	12	1.13	2.0	1.2	18	1.5 - 4.5	0.12 - 0.18
6,000	27/54	24	2.26	4.0	2.4	35	3.0 - 6.0	0.18 - 0.25
9,000	27/81	36	3.39	6.0	3.6	60	4.5 - 9.0	0.18 - 0.25
12,000	27/108	48	4.52	8.0	4.8	80	6.0 - 13.0	0.25 - 0.37
25,000	2 x 27/108	96	9.04	16.0	9.6	160	13.0 - 24.0	0.37 - 0.55
50,000	3 x 27/108	144	13.56	24.0	14.4	240	24.0 - 32.0	0.55
80,000	427/108	192	18.08	32.0	19.2	385	32.0 - 65.0	0.55 - 1.1
200,000	727/108	336	31.64	56.0	33.6	621	65.0	1.1

Please, contact us!

We will be pleased to help you dimensioning.



CJC™ Fine Filter Technology

Automatic separation of water /
Removal of particles and oil degradation products
CJC™ Filter Separators



Removal of particles and oil degradation products,
Absorption of water
CJC™ Fine Filter Units



Neutralizing acids, Reducing TAN
CJC™ Oil Maintenance Unit



Removal of large amounts of water from
emulsified oils
CJC™ Desorber



Removal of particles and oil degradation products,
absorption of water
CJC™ Fine Filter Units



Automatic separation of water /
Removal of particles and oil degradation products
CJC™ Filter Separators / Thruster Units



For cleanliness analysis
CJC™ Fine Filter Units



For every application a suitable solution!

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Our Energy for Your Oil

Whether at the maintenance of gear, lubrication or hydraulic oil or whether in wind power plants, plastic or metal processing, quenching plants, at test benches, turbines, transformers or combined heat and power stations, in nearly all industrial and maritime sectors we have firmly established ourselves as a competent partner for oil treatment and maintenance of oils.

Today our CJC™ Fine Filters, CJC™ Filter Separators and CJC™ Maintenance Units are used in various industrial sectors.

Karberg & Hennemann GmbH & Co. KG

Founded in 1928 in Hamburg, where we have developed and produced fine filter technology since 1953. With our substantiated know-how and our own in-house analysing and testing equipment we are today experts for the treatment of oils and fuels.



Karberg & Hennemann srl

Because of the constantly increasing success of our CJC™ Fine Filter Units in the Italian market we have founded a subsidiary in Modena in the year 2000. **Karberg & Hennemann srl** services our Italian customers, assisted by regional distributors.



Quality

Competent advice and individual solutions for our customers even for difficult filtration problems - that is our daily work, based on our experience and our products: Fine Filter systems of highest longevity and a filtration degree down to $< 1 \mu\text{m}$. The Certification of our company according to DIN EN ISO 9001:2008 is both a confirmation and a motivation for us.



CJC™ world wide

All over the world CJC™ Offline Fine Filter Units are available via our subsidiaries and local sales partners. To reach an optimum oil cleanliness for an individual application, our sales partners and the whole global intranet are at your disposal.

Synonym for offline oil maintenance all over the world

Karberg & Hennemann GmbH & Co. KG

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