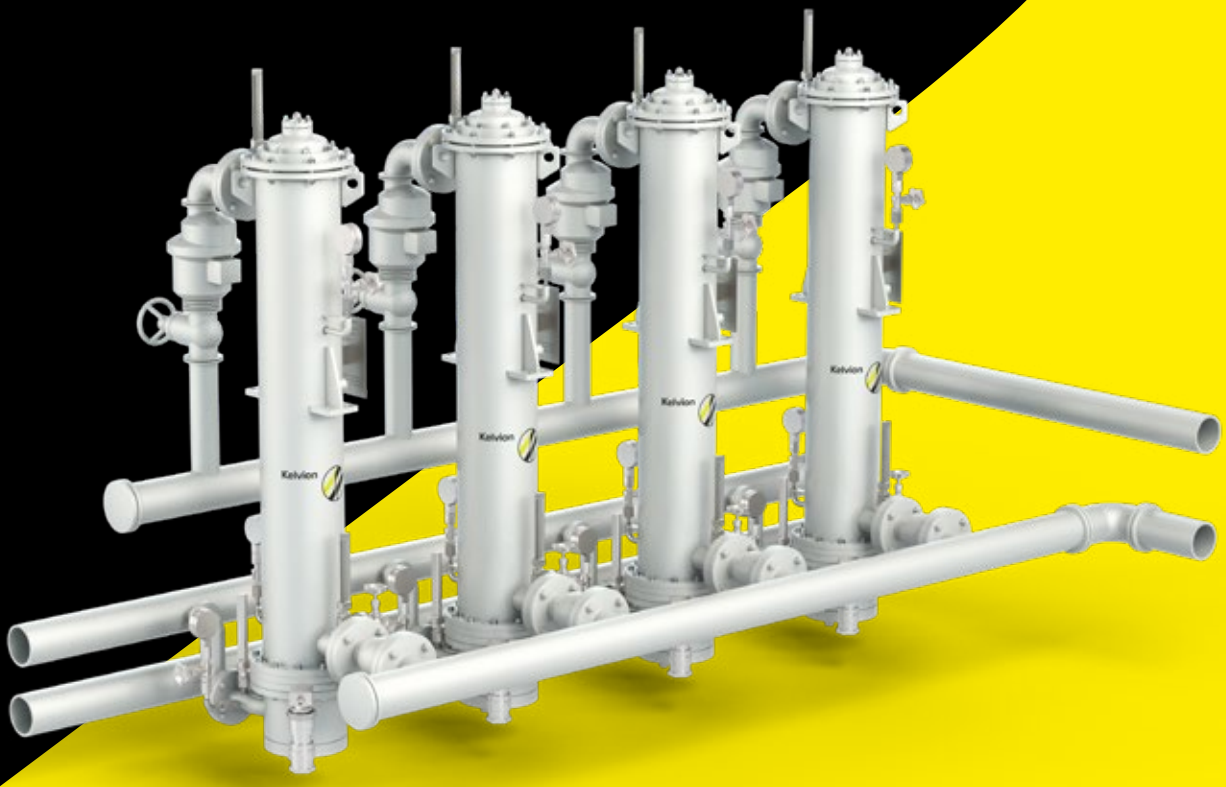
Kelvion

Product Line: Transformer Cooling Systems

FACE INCREASED ENERGY DEMAND WITH COOLNESS



Kelvion

EXPERTS IN HEAT EXCHANGE – SINCE 1920

Welcome to Kelvion. Heat exchange is our business. Worldwide. As a market leader in the technology sector, we have been producing heat exchangers for virtually every conceivable industrial application since the 1920s, including tailor-made solutions suited for the most complex environmental conditions – as of 2015 under the name of Kelvion.

With one of the most comprehensive ranges of heat exchangers in the world, which includes compact finned-tube heat exchangers, plate heat exchangers, single tube heat exchangers, shell and tube heat exchangers, transformer cooling systems and wet cooling towers, we are a sought after partner in a wide variety of industries, such as: the energy industry, the oil and gas industry, the chemical industry, the shipbuilding sector, the food and beverage industry, the heavy industry, the sugar industry, the transport sector, as well as building and refrigeration technology.

Many years of experience and in-depth expert knowledge make us specialists in this field.
Our heat exchangers are designed for the requirements of the respective process, thereby ensuring optimum energy efficiency and reliability for all market segments. This provides our customers with a technological advantage that reduces operating costs and has a lasting effect.

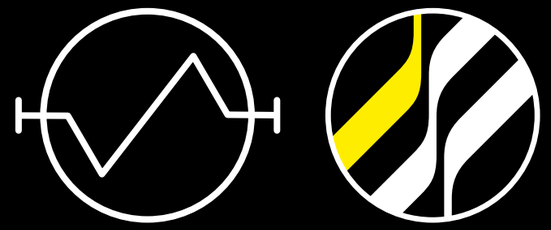
A reliable after-sales service is essential with regard to customer loyalty and retention. We have a worldwide service network at our disposal. Our engineers are thereby able to carry out maintenance work and complete repairs on-site at a customer's premises. This prevents unnecessary downtime – because we are highly committed to earning your trust.

Kelvion – Experts in Heat Exchange.

KELVION – A TRIBUTE TO LORD KELVIN (1824 - 1907)

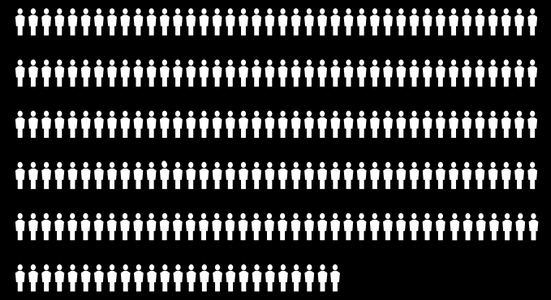
Lord Kelvin formulated the laws of thermodynamics and absolute units of temperature are stated in kelvin, in his honor.

OUR LOGO – INSPIRED FROM THE SCHEMATIC FOR HEAT EXCHANGER



67 BRANCHES AND SALES PARTNERS WORLDWIDE

4,500 EMPLOYEES WORLDWIDE



YOUR MARKETS ARE OUR MARKETS

- Chemicals
- Food & Beverages
- Heavy Industry
- HVAC
- Refrigeration
- Marine
- Oil & Gas
- Power
- Sugar
- Transportation

KELVION HAS A LONG HISTORY

2015 With the new name, the former GEA Heat Exchangers is writing its own history as Kelvion.

2014 GEA sells the Heat Exchangers Segment to Triton.

2010 Reorganization of GEA's 9 Divisions into technologically distinct Segments. The largest segment is the Heat Exchangers Segment.

1999 In April 1999, GEA was acquired by mg technologies AG

1920 Foundation of GEA in Bochum by Otto Happel sen. (Born 1882)

Optimum heat exchange

INNOVATIVE COOLING SYSTEMS FOR CHALLENGING TASKS

Oil-emerged transformers depend upon high-performance cooling systems to maintain their operational integrity over a long life cycle. With decades of experience in providing innovative heat exchange technology, combined with a global service network, Kelvion can provide the right solution for the most challenging tasks.

Our cooling systems are purpose-built to suit the application, ensuring that the transformer oil is cooled safely, sustainably and efficiently. They can be found at offshore and nuclear facilities, conventional power plants, hydro-power plants, substations and railways, as well as on furnace and rectifier transformers.

To determine the best cooling system for the application we first consider the environment in which it will be installed (corrosive, dusty, sandy etc), the operating temperatures and the available space. Based on this information, our expert engineers will design the best configuration to suit your requirements.

WHY CHOOSE KELVION TRANSFORMER COOLING SYSTEMS?

- Innovative and proven technology
- Sustainability
- Reliable and safe performance
- Individually-designed for the toughest of tasks

TAILORED SOLUTIONS FOR THE TOUGHEST TASKS

Air or water cooling
During operation, the transformer oil absorbs the heat generated in the transformer core and needs to be cooled down. Our specialty are cooling systems with an outstanding small footprint, high thermal and economic efficiency. Kelvion offers two type of coolers for the task: Transformer Oil Air Coolers (TOACs) and Transformer Oil Water Coolers (TOWCs).

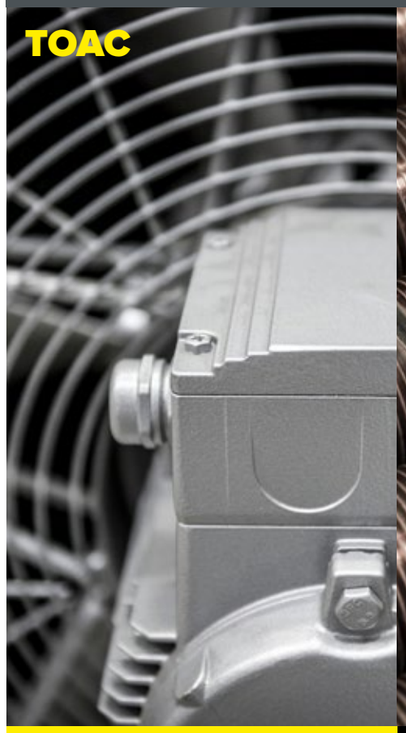
Air as a non-corrosive cooling medium is virtually accessible at no cost in unlimited quanitities, making it an invironmental friendly option. TOWCs are an even more compact cooling solution which are the best choice in applications where water is available and space and or noise emmissions are a demand. Using our market-leading double tube safety heat exchanger design, this system safely separates the oil and water, while providing optimum heat exchange. Additionally, it can also be used to recover heat from transformers.

Whichever system is right for you, we offer Premium, Advanced and Smart options, in a wide choice of materials, all designed and precision-engineered to the highest standards to suit your operation.

Safety and reliability
We take pride in providing products that operate safely and reliably and have a long life time. That is why we subject our coolers to stringent tests in our workshops. Designed by Kelvion's R&D teams, our state-of-the-art testing station allows hot oil tests with pressured, hot transformer-oil.
The station is equipped with a battery of filters to eliminate any impurities that may be deposited inside the tubes during manufacturing. In this way, best-in-class preparation for integrating our cooling systems with transformers is assumed and monitored.

TCS – Transformer Cooling Systems

OVERVIEW



TRANSFORMER OIL AIR COOLER

Premium
Hot Dip Galvanized Design

Advanced
Compact Design

SMART
Most standardized solution available

Compact Customized
Compact design tailored to broad variety of requirements

Aluminum Block Cooler
The alternative to panel radiators with unbeatable higher power density and possibility to controll oil temparature actively.

Transformer Mobile Auxiliary Cooler
Instantly installable retrofit unit for transformer cooling capacity extension

TRANSFORMER OIL WATER COOLER

Premium
Double Tube Safety Design,
25% fouling reserve
according to DIN 50216-9

Advanced
Double Tube Safety Design,
10% fouling reserve
Adjusted DIN values for cost optimization

SMART
Double Tube Safety Design,
5% fouling reserve,
fixed tube bundle

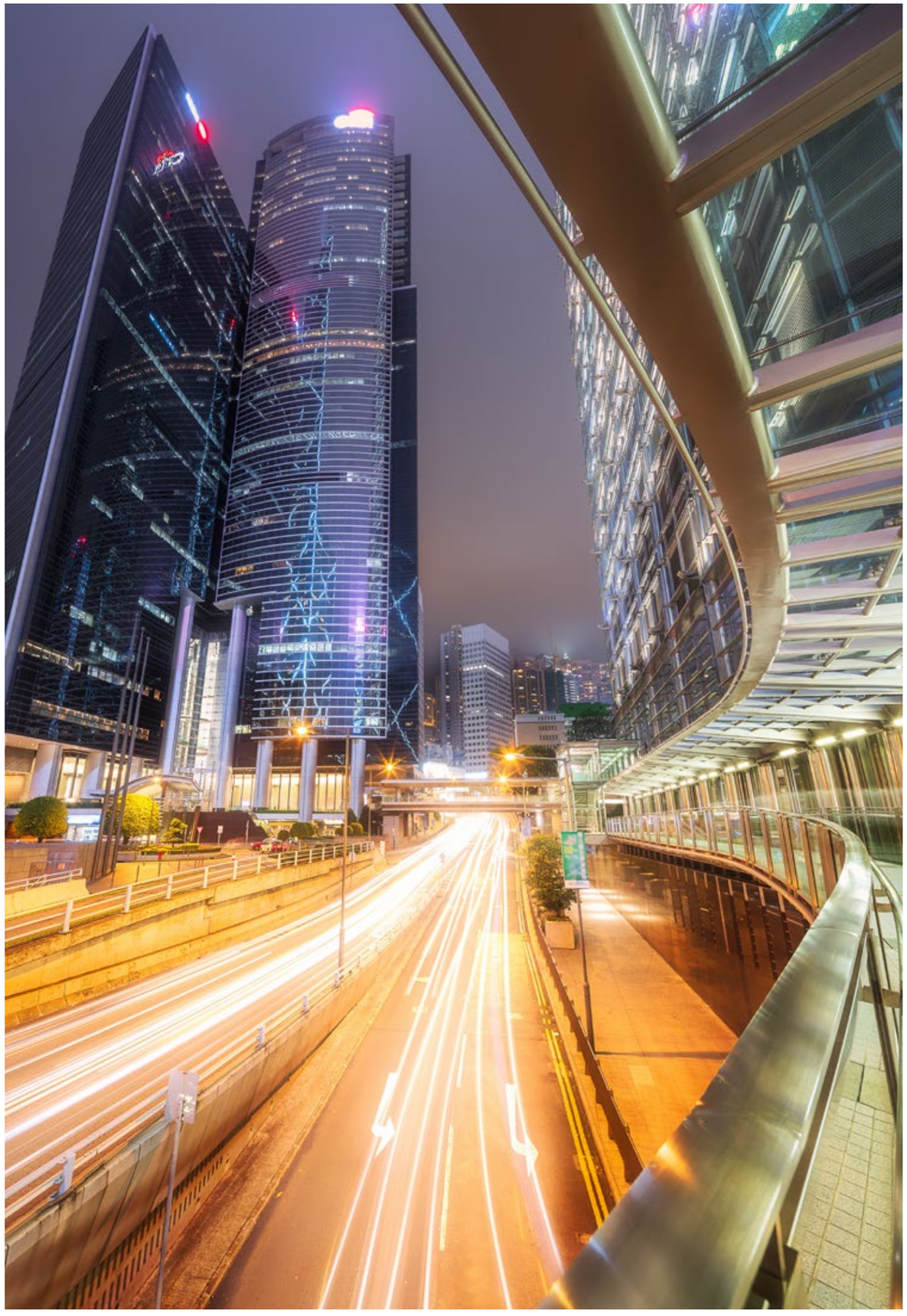
TRANSFORMER OIL PUMPS

Axial pumps
for forced cooling systems,
with radial impellers and
maintenance free sleeve bearings

Axial pumps
for radiator cooled systems,
large flow cross-section of
propeller allows natural convection
if pump is switched off

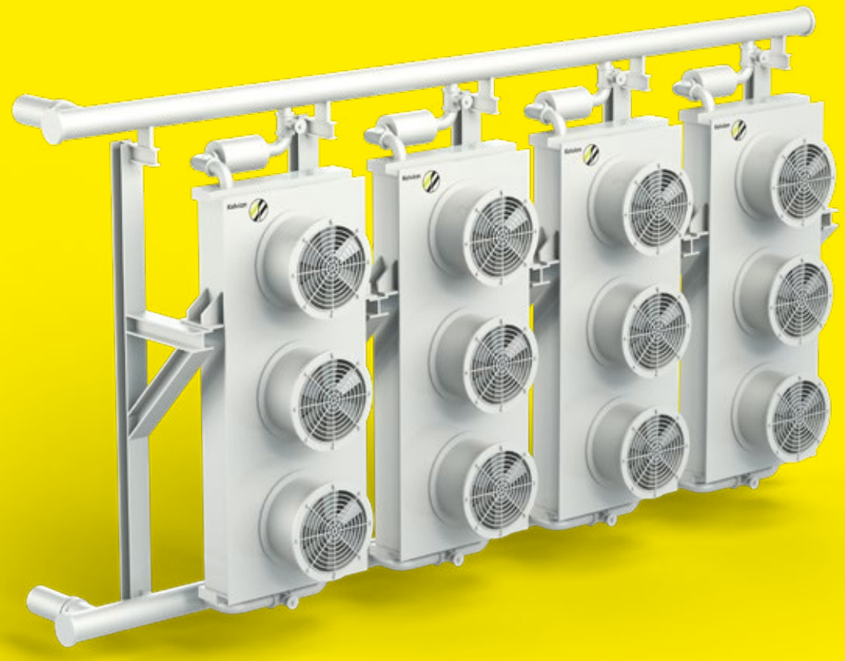
Angle Type pumps
for forced cooling systems with
special space requirements,
with radial impellers

Traction pumps
lightweight Radial impeller pumps
for locomotives

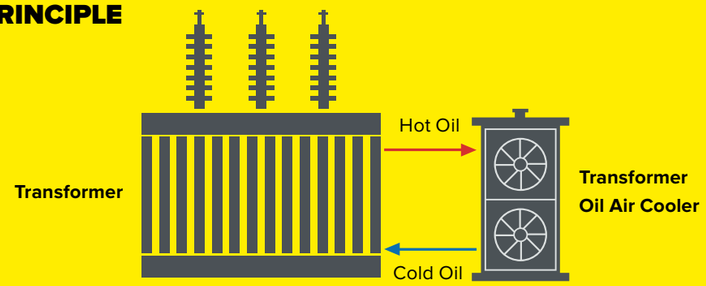


TOAC – Transformer Oil Air Coolers

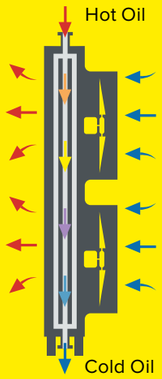
RELIABLE, COST-EFFECTIVE & ECO-FRIENDLY



OPERATION PRINCIPLE

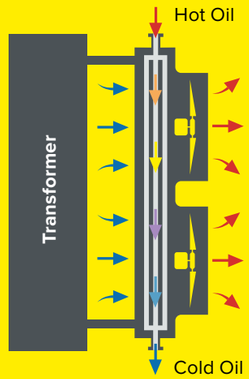


FORCED DRAFT



- Standard when coolers are erected remotely of the trnas-former position
- Position of the fan in cool air flow increases cooler system overall efficiency

INDUCED DRAFT



- Standard when the cooler is mounted to the transformer
- No recirculation of hot air
- good accessibility of fans for cleaning & mainte-nance

Kelvion TOACs are built on over 80 years' of expertise in providing robust solutions for taking the heat out of cooling oil reliably and cost-effectively.

Using ambient air as a coolant offers many advantages. It is freely available, generally non-corrosive and avoids the thermal overload of nearby rivers and lakes, making it the greener choice. Also our transformer oil coolers work anywhere with a power supply, which means no additional circuitry are required.

TAOC – components & operation
Hot oil from the transformer is pumped into the tube bundles within the cooler where it is then cooled down by air provided by one or more fans. The fans can be either forced draft or induced draft, depending on whether the cooler is mounted directly to the transformer or remotely.

With forced draft the fan is installed below the tube bundle which offers higher cooling efficiency with a lower air flow, which means reduced noise levels. However, there would be the danger of air recirculation if the cooler would be mounted on the transformer tank. The induced draft option, with the fan placed above the tube bundle, can be mounted on the transformer tank without risk of air recirculation.

Fins on the tubes enlarge the surface area to achieve optimal heat exchange performance. Headers/manifolds distribute the hot oil efficiently through the whole cooler volume and gather the oil coming from the cooler into one tube. An optional air filter is available to protect the tubes fins and fan.

TOAC SMART

We developed the TOAC Smart as a cost-effective entry into the Kelvion TOAC class. It can be customized for a wide range of standard industrial applications with low production costs. The Smart version has fewer components than other coolers. It functions without a tube sheet – the tubes are brazed directly into the collector manifold. This series offers a cooling duty of 100-600 kW. The casing is made of sendzimir-galvanized carbon steel with a high-quality powder coating. The tubes of the compact-finned heat exchanger are made from copper. Depending on the ambient conditions, the fins can be copper or aluminum.

TOAC SMART FEATURES

DESIGN

- Standardized compact coil design
- Economic header design
- Up to four fans
- Vertical or horizontal mounting position

OPERATION

- Cooling capacities: 100 - 600 kW
- Designed for 50 or 60 Hz

MATERIALS

- Copper tubes
- Copper or aluminium fins
- Carbon steel, sendzimir galvanized or powder coated housing

BENEFITS

- Cost effective standardized solution
- Compact & light

TOAC ADVANCED

The Advanced variant is lighter than the Premium version and 85% of the price level. It is designed to meet standard project requirements and selected additional specifications. The tubes and compact fins are available in copper or aluminum and the tubes are rolled into a steel tube sheet. This variant is manufactured in four different lengths and can have up to four fans. It can be fixed vertically or horizontally and has a cooling capacity of 100-600 kW.

TOAC ADVANCED FEATURES

DESIGN

- Compact coil design
- Up to four fans
- Vertical or horizontal mounting position

OPERATION

- Cooling capacities: 100 - 600 kW
- Designed for 50 or 60 Hz

MATERIALS

- Copper tubes
- Copper, aluminium, aluminium with Blygold coated or AlMg fins
- Carbon steel, sendzimir galvanized or powder coated housing

BENEFITS

- Compact & light
- Adjustable corrosion protection
- Customizable by options available

TOAC PREMIUM

A hot-dip galvanized carbon steel single elliptical finned tube is at the heart of the Premium series. It ensures a high heat transfer coefficient, minimum pressure loss and optimum protection against corrosion in all climate conditions. The steel fins are robust and easy to clean and the welded headers provide an extraordinary stable thermal connection. The Premium cooler has a cooling capacity of 100-600 kW and is available in seven different lengths and four widths, with up to four fans. It can be mounted on the transformer vertically or horizontally.

Custom-designed to meet the most complex applications, our Premium TOACs have the highest levels of stability, the lowest noise levels and the longest life time.

TOAC PREMIUM FEATURES

DESIGN

- Multitude of different length & width available
- Up to four fans
- Vertical or horizontal mounting position
- Aerodynamic core tube
- Finned tubes

OPERATION

- Cooling capacities: 100 - 600 kW
- Designed for 50 or 60 Hz

MATERIALS

- Steel tubes
- Steel fins
- Hot dip galvanized

BENEFITS

- Best corrosion protection
- Solid metallic fin to tube connection
- Longest possible lifetime
- Minimum pressure loss
- Lowest noise level

TOWC – Transformer Oil Water Coolers

MARKET-LEADING DOUBLE TUBE SAFETY TECHNOLOGY

Since 1974 we have been pioneering the development of double tube safety heat exchange technology, which continues to be at the forefront of industry standards. It is ideal for TOWCs as the double tube wall keeps the transformer oil separate from the cooling water as well as vice versa.

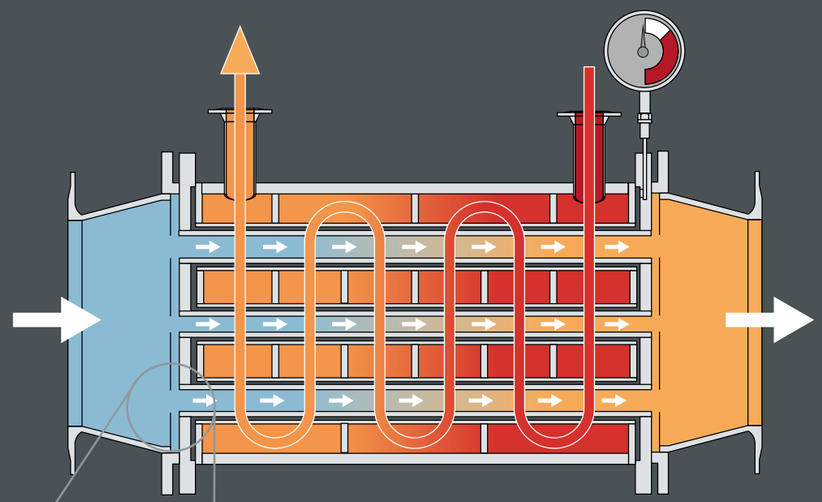
Because TOWCs are much smaller than air cooling systems, they are the perfect choice for applications with space restrictions. This solution is particularly suited to furnace and rectifier transformers and transformers in hydro power plants.

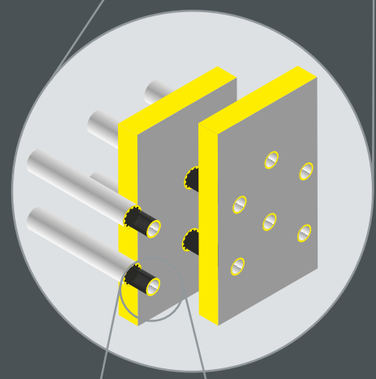
As an added benefit, heat transferred from the oil to the cooling water can be used for heating in further processes and simultaneously cooled down.

TOWC components
The double tube safety exchanger consists of a low-finned copper outer tube and an inner tube of copper, copper nickel, stainless steel or titanium, slected according to water quality.

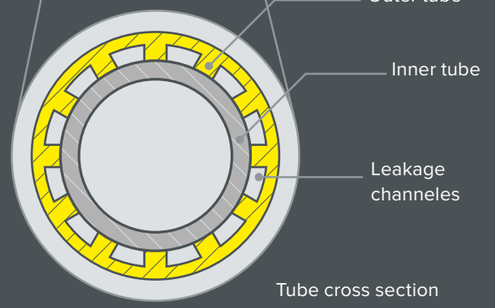
While cooling water flows through inner tube, heat from insulating oil flowing through the shell and around the exterior surface of the outer tube is efficiently transferred through the two walls of inner and outer tubes and carried away by the cooling water.
If a tube wall is damaged, due to corrosion, material failures or erosion, the oil flows through small channels arranged between the double tubes into a leakage collection space and triggers an alarm in the leak detection device. Because the second tube wall remains undamaged the media are kept separate. This means that the operator can continue to run the heat exchanger until the next scheduled maintenance, avoiding costly unplanned downtimes, as well as contamination of the equipment.

Our TOWCs can be configured horizontally or vertically and are available in Premium, Advanced and Smart versions, all designed and manufactured in close co-operation with you to meet the demands of your application.

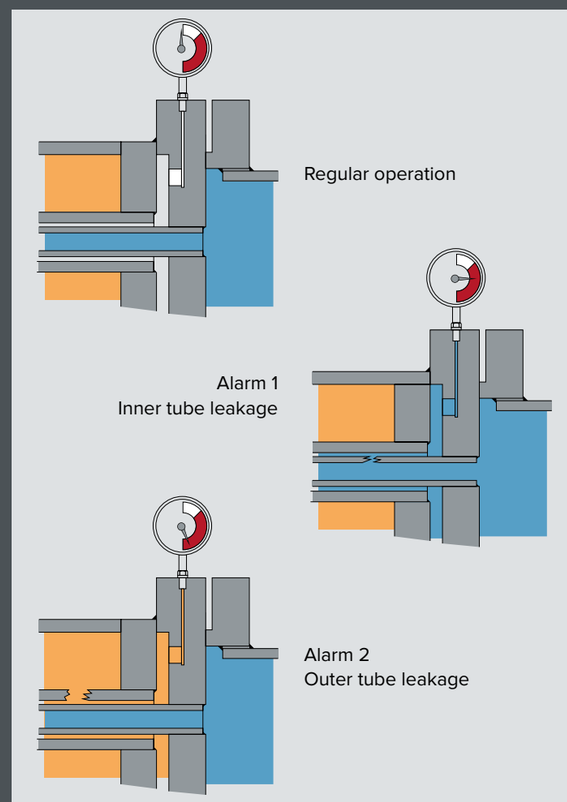




Double tubes &
double tube sheets



Tube cross section



LEAKAGE DETECTION SYSTEM

We offer a range of devices in our portfolio for the leakage detection system. These include:

- Level indicators
- Capacitive indicators
- Pressure indicators

These can be combined with display units and further armatures.

TOWC SMART

- 40 - 2000 kW
- Layout: 5% fouling reserve
- Fixed tube bundle
- Standardized design
- Min. ambient temperature -10°C
- Specified Accessories
- Streamlined design due to cost optimization

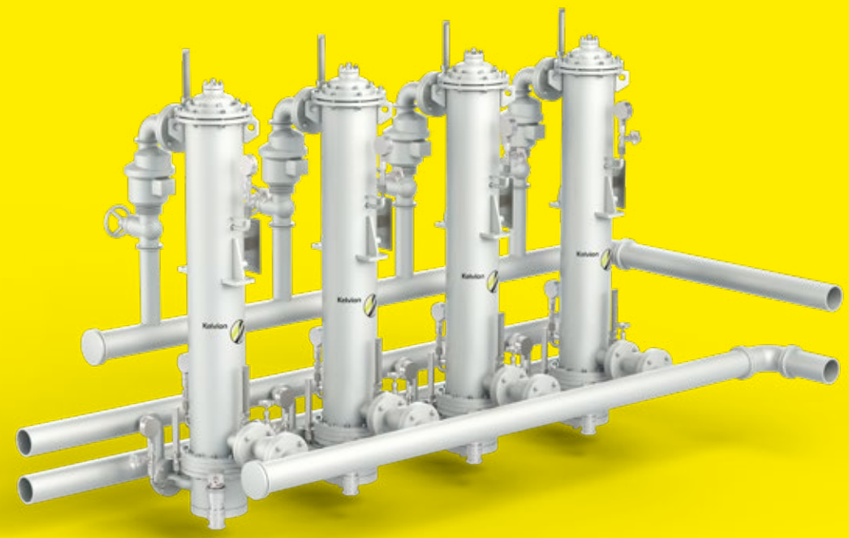
TOWC ADVANCED

- Customized material
- Choice to tailor cooler to water quality
- 40 - 2000 kW
- Lower Details than DIN (due to cost optimization)
- 10% fouling reserve
- Individual design possible
- Multiple accessories possible

TOWC PREMIUM

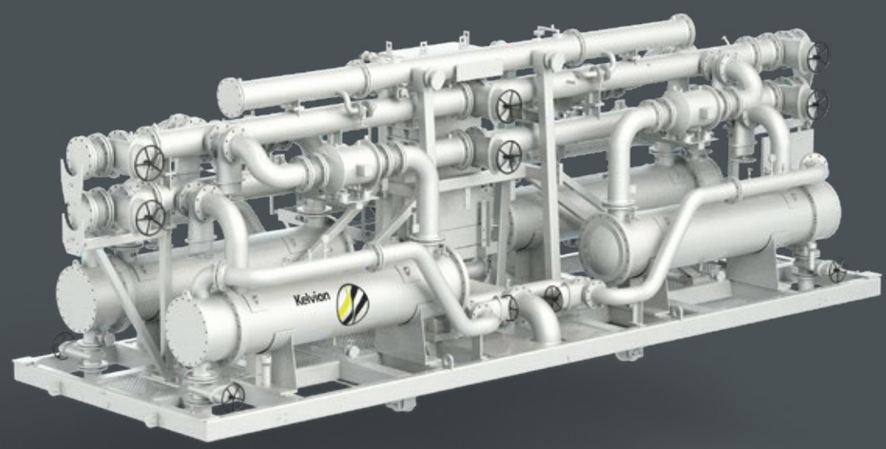
- 40 - 2000 kW
- According to DIN50216-9
- 25% fouling reserve
- Maintenance friendly
- Individual design possible
- Different accessories available

TOWC SKID



Transformer Oil Water Cooling-Plant with six
Double Tube Safety Heatexchangers in vertical position,
complete with pumps, instruments and valves
flanshed and ready to be connected with transformer.

TOWC SKID



Transformer Oil Water Cooling-Plant with four
Double Tube Safety heat exchangers
in horizontal position, complete with instruments,
pumps, valves and control cabinet
flanshed and ready to be connected with transformer.

TRANSFORMATOR OIL PUMPS OVERVIEW

Kelvion is specialized in design and manufacturing of transformer oil pumps. With over 60 years of experience in this field and countless worldwide installations, we are able to provide a pump for each individual requirements. Our oil pumps are designed to last. Our maintenance free sleeve bearings guarantee long lifetime.

Axial-Pumps (In-line) with Radial Impellers
Inline pumps with radial impellers 25, 50, 100, 2AR2 and 2AR4 series for forced transformer cooling systems. The transformer oil flows through an inline mounted pump. A spiral casing serves for pressure buildup. The flowrate can be specifically adapted to the cooling system by varying the impeller diameter. Maintenance free sleeve bearings are available at 25, 50, 100 series.

Axial-Pumps (In-line) with Propeller-Type Impellers
PR series pumps are used for transformers which are cooled by radiator batteries. The pump operation supports the natural convection during start-up and when ambient temperatures are high. Thanks to the large flow cross section of this pump, the free flow of the transformer oil is not restricted when the pump is switched off. For this reason, there is no need for a bypass when the pump is shut down in part-load operation. Partially available with sleeve bearings.

Transformer Oil Angle Pumps with Radial Impellers
Where space is restricted, angle-type pumps of the W series can be used for transformers with oil/water or oil/air coolers. A axial spiral casing serves for pressure buildup. The bearings and the motor are flushed with a transformer oil side-stream. The flowrate can be specifically adapted to the cooling system by varying the impeller diameter.

Transformer Oil Pumps with Radial Impellers for Traction Transformers
Due to their lightweight and compact aluminum construction, the pumps of the B2 series are especially suited for transformers and power converters for rail-mounted vehicles. Pressure buildup takes place in the impeller. The bearings and the motor are flushed with transformer oil. The flowrate can be adapted to meet the operating requirements by varying the impeller diameter.

Propeller Pump
Radiators
(e.g. panel radiators)
- DN 150 – 300
- 20 – 500 m^3/h

OUR SERVICE IN THREE WORDS: PEACE OF MIND

START-UP SERVICES

We ensure that our products are delivered safely and are fully validated to give a robust and reliable performance over as long a life cycle as possible.

- Assistance to assembly and disassembly, shipping and transport

SPARE PARTS AND SPARE PARTS SOLUTIONS

Even the best equipment shows signs of wear over time. We use only the highest quality spare parts, designed to match the excellence of the originals. This ensures that the optimum interaction between components is maintained. By safeguarding the original design we offer maximum security of your investment.

- Delivery and assembly of spare parts

REPAIRS AND OVERHAULS

We understand that unscheduled downtime can be disastrous. That is why our trained engineers are ready to respond quickly in an emergency. We will review and repair components while keeping any disruption to a minimum. Any overhaul work is carried out in our service centers and conforms to the highest quality standards.

- Complete overhaul, repair or new production
- Renewal of corrosion protection and exterior painting
- Overhaul of fan motors and fans
- assessment of zinc layer of finned tubes fieldregarding remaining lifetime
- Assessment (on site) and renewal of corrosion protection at the remaining exterior surfaces if necessary (at factory)

INSPECTIONS AND MAINTENANCE

Through regular inspections and maintenance, we help you to reduce costs, extend the lifetime of all your Kelvion products and to achieve a reliable performance. This also helps you with budget planning.

- Internal cleaning (tube side: at factory or on site, shell side: at factory)
- Cleaning and flushing of shell and tube side including documentation of results
- Brush cleaning tube side including documentation of results
- electrotechnical and mechanical inspection of fans and drive motors

TESTING AND MONITORING

Having an understanding of the condition of the equipment allows you to secure reliable production, improve safety and energy efficiency and increase equipment lifetime. It can also help you to prevent breakdowns and prepare for the future.

- Function test
- Thermal and hydraulic measurements at test stand (oil-water or water-water)
- Thightness test and refurbishment / repair
- Performance measurement
- Noise measurement
- Bearing monitoring

UPGRADES AND REPLACEMENTS

We replace components to keep our heat exchangers running smoothly and to prevent downtime. Where parts have become obsolete, we will suggest an upgrade.

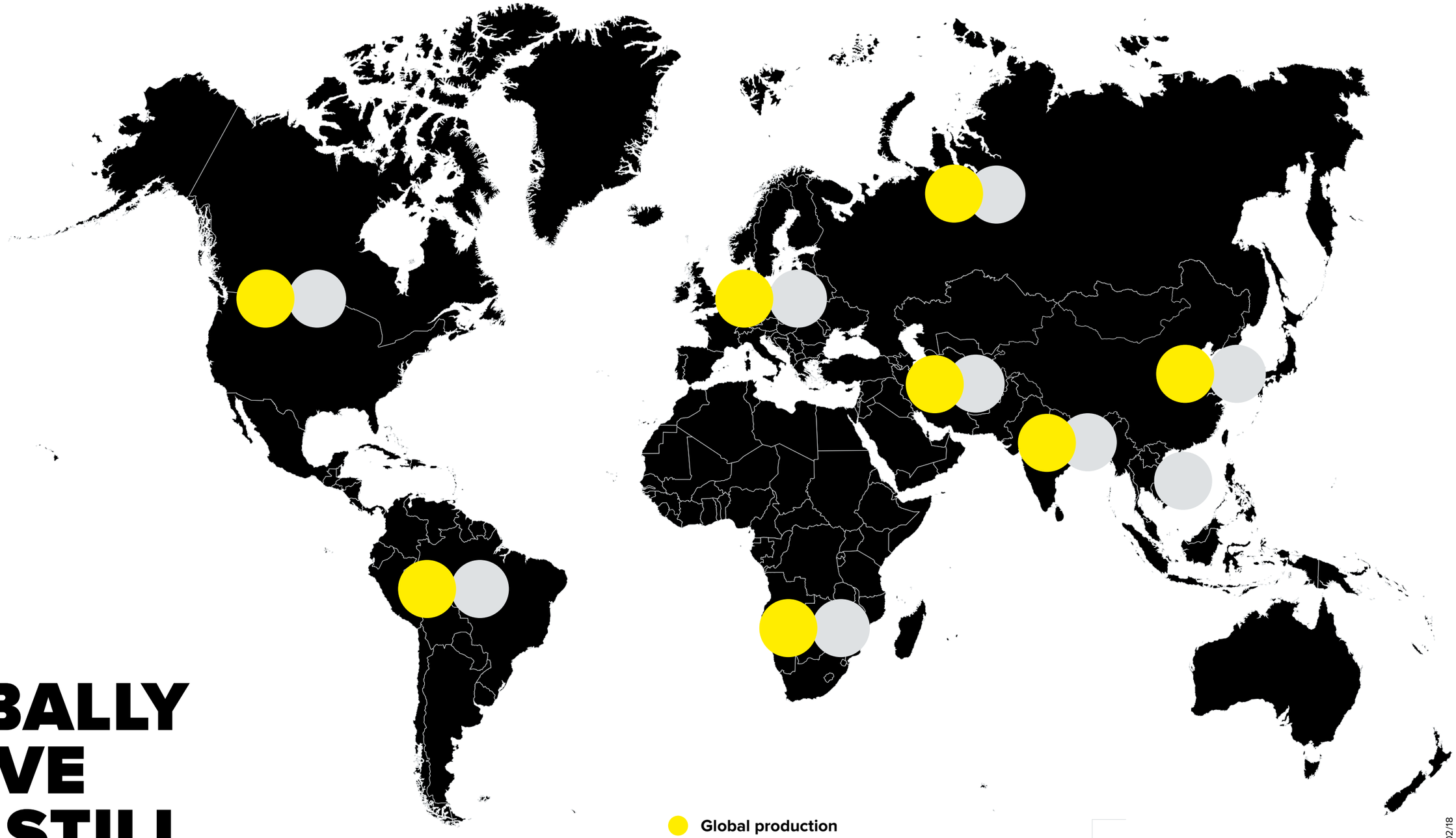
- Analysis and assessment of performance bottle-necks
- Adaptation of water and oil side to new operational demands
- optimizaton of air side to reduce noises, right up to installation/extension of sound-absorbing facilities
- Bearing replacement and functional check

CONSULTING AND TRAINING

Would you like a consultancy service that takes into account the special features of your process and were you feel that finding the right solutions are more important than closing the deal quickly? Then you will feel right at home with Kelvion. We will work closely with you to develop the exact solution that is best tailored to your needs.

- Planning, processing and documentation of service
- Assessment of operating conditions
- Examination and assessment of operating conditions
- Consulting for design, construction and optimization of the complete plant at any stage of the project

FURTHER SERVICES ON REQUEST



GLOBALLY ACTIVE AND STILL CLOSE BY

No matter where your market is, regardless of country, we are never far away. We are always happy to answer any questions you may have and meet your requirements. Even the largest, most successful project begins with an initial, profitable conversation. We look forward to hearing from you.

Global production footprint

Global sales and service

Just scan this QR code with your smartphone or visit our website at: www.kelvion.com – there you will find a highly competent contact in your immediate vicinity.

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www.kelvion.com