

Kelvion



Product Line: Transformer Cooling Systems

# FACE INCREASED ENERGY DEMAND WITH **COOLNESS**



Kelvion



# EXPERTS IN HEAT EXCHANGE – SINCE 1920

Welcome to Kelvion! Where Heat Exchange is our Business. We are one of the leading global manufacturers of heat exchangers and have been providing solutions for almost every industrial application imaginable since the 1920s, specializing in customized solutions suitable for extreme environmental conditions - as of 2015 under the name of Kelvion.

With one of the most extensive selections of heat exchangers in the world, we are a well-known partner in many industries, including transportation, energy, oil and gas, chemical, marine as well as food and beverage, data center and the HVAC and refrigeration technology sector. Our products include Compact Fin Heat Exchangers, Plate Heat Exchangers, Single Tube Heat Exchangers, Transformer Cooling Systems, Cooling Towers and Shell & Tube Heat Exchangers.

Our many years of experience and in-depth expertise have made us specialists in this field. Our heat exchangers are designed specifically to meet the needs of the respective machine or equipment system, ensuring outstanding energy efficiency and reliability in any market segment. This gives our customers a cutting-edge over their competitors while also reducing operating costs over the long term.

As your heat exchange partner, we understand that outstanding and reliable after-sales services are critical for you, our customer, and we work alongside with you in close partnership supporting you throughout the full life cycle of your plant and equipment to ensure lasting business success.

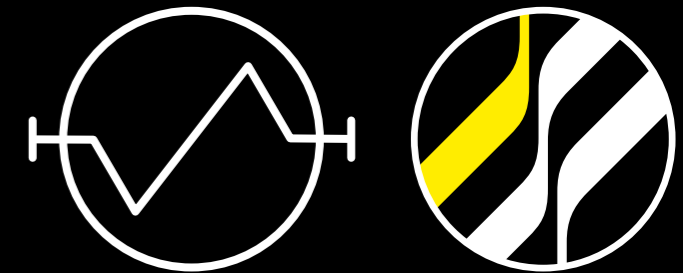
Kelvion – Experts in Heat Exchange.

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

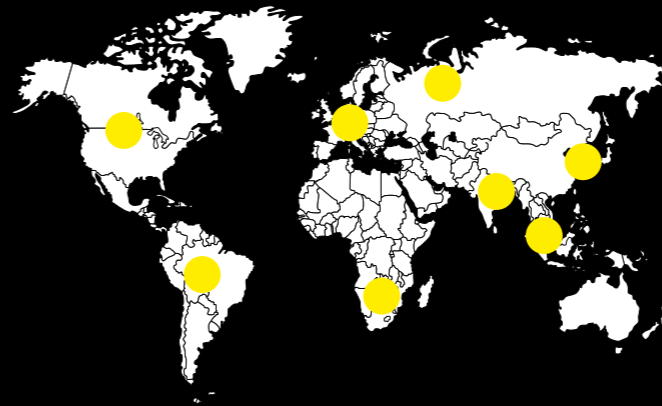


Lord Kelvin formulated the laws of thermodynamics and absolute units of temperature are stated in kelvin, in his honor.

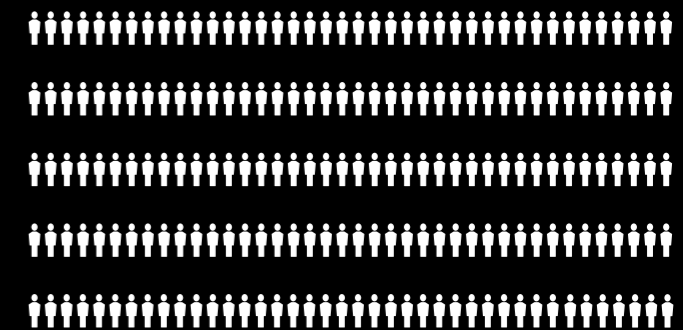
## OUR LOGO – INSPIRED FROM THE SCHEMATIC FOR HEAT EXCHANGER



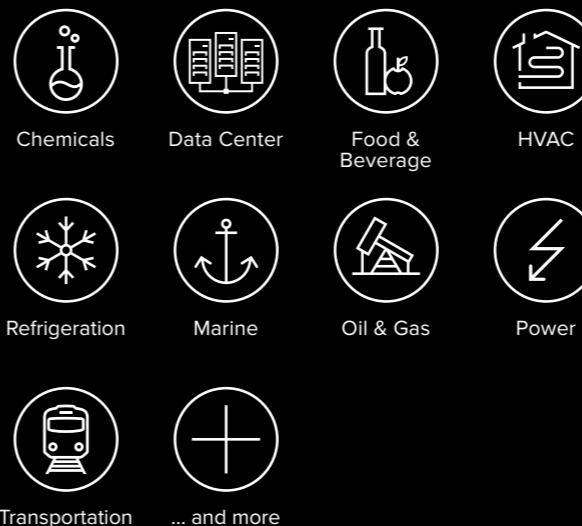
## 67 BRANCHES AND SALES PARTNERS WORLDWIDE



## 5,000 EMPLOYEES WORLDWIDE



## YOUR MARKETS ARE OUR MARKETS



## KELVION HAS A LONG HISTORY



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 types 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 quantities, making it an environmental 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 emissions 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.

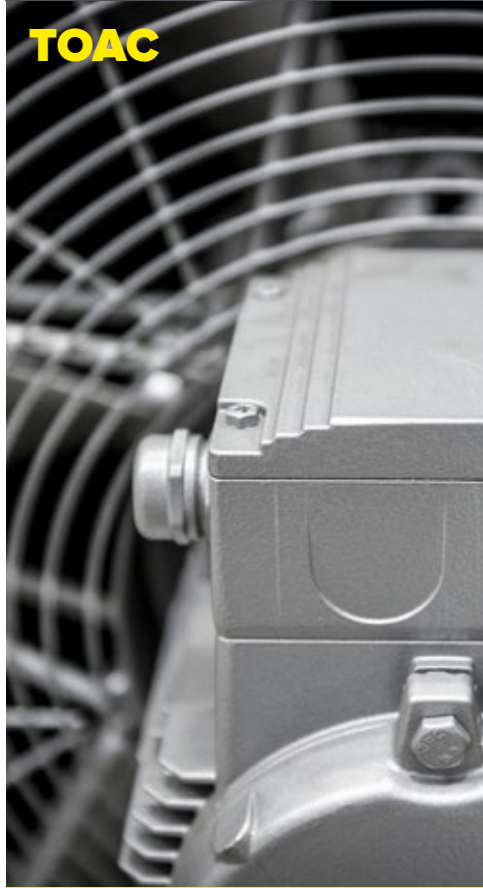
## **Safety and reliability**

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.



# OVERVIEW

## TOAC



**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 control oil temperature actively.
- Transformer Mobile Auxiliary Cooler**  
Instantly installable retrofit unit for transformer cooling capacity extension

## TOWC



**TRANSFORMER OIL WATER COOLER**

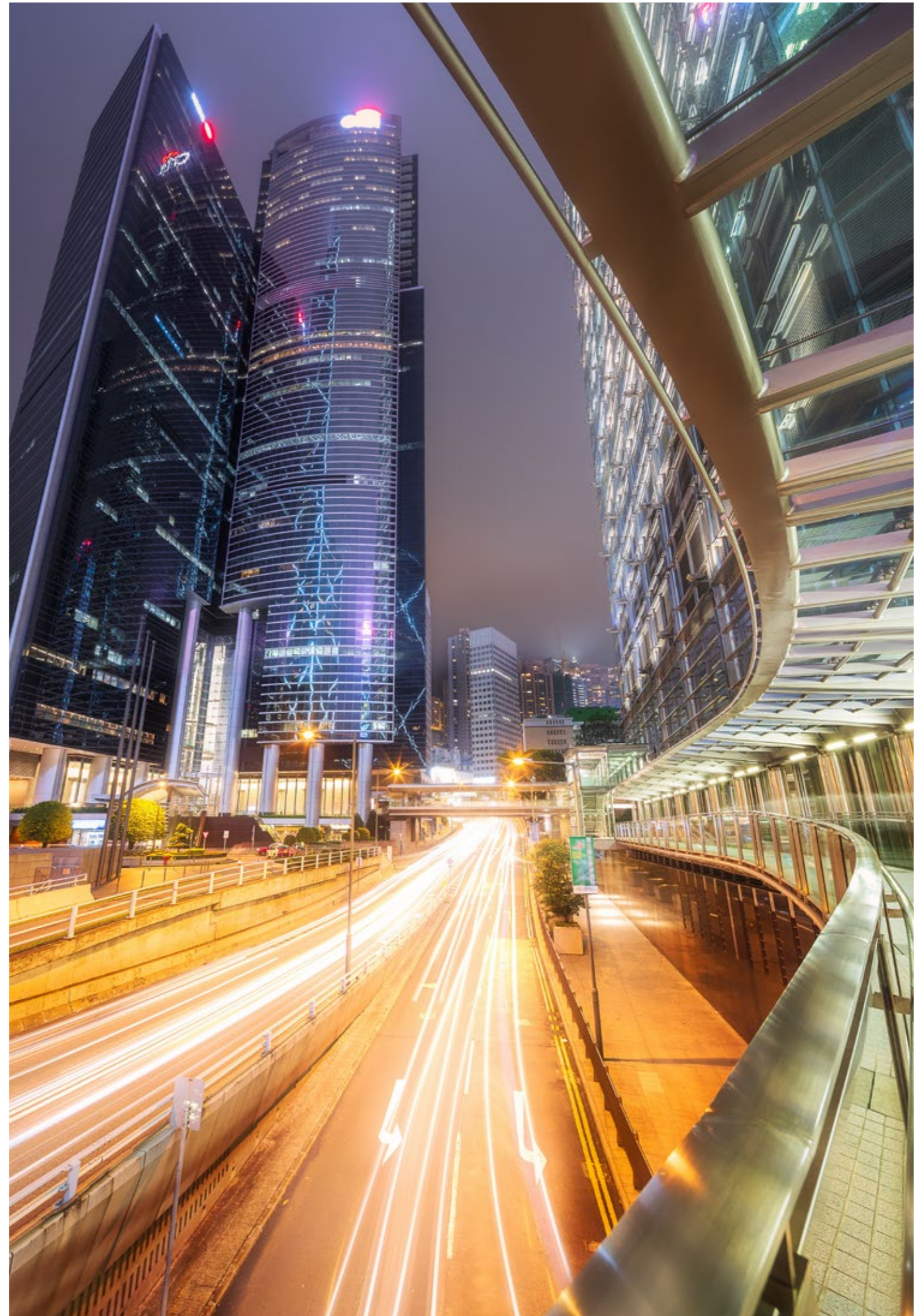
- Premium**  
Double Tube Safety Design, 25% fouling reserve according to DIN 50216-9
- Advanced**  
Double Tube Safety Design, 10% fouling reserve  
Adjusted DIN values for cost optimization
- SMART**  
Double Tube Safety Design, 5% fouling reserve, fixed tube bundle

## TOP



**TRANSFORMER OIL PUMPS**

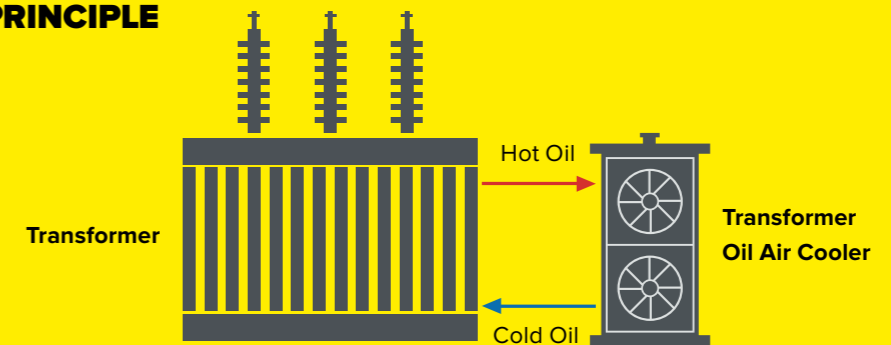
- Axial pumps**  
for forced cooling systems, with radial impellers and maintenance free sleeve bearings
- Axial pumps**  
for radiator cooled systems, large flow cross-section of propeller allows natural convection if pump is switched off
- Angle Type pumps**  
for forced cooling systems with special space requirements, with radial impellers
- Traction pumps**  
lightweight Radial impeller pumps for locomotives



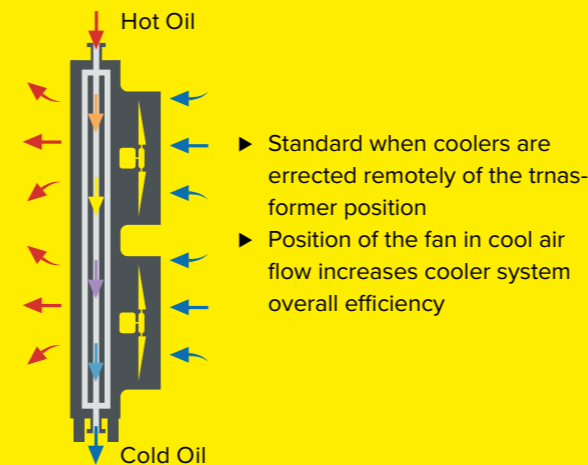
# RELIABLE, COST-EFFECTIVE & ECO-FRIENDLY



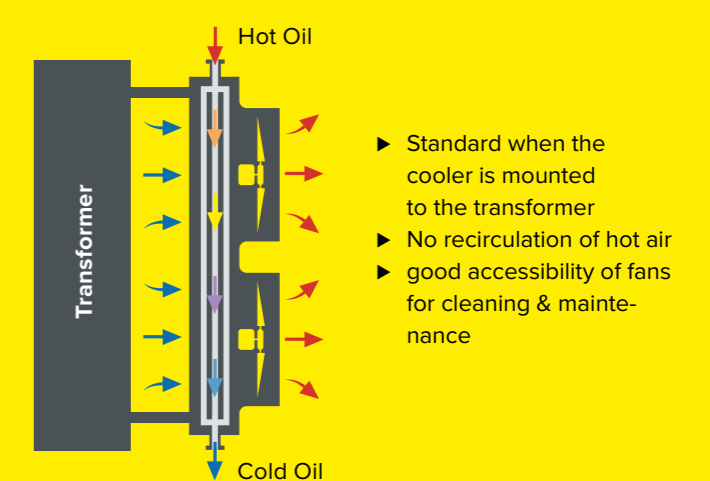
## OPERATION PRINCIPLE



## FORCED DRAFT



## INDUCED DRAFT



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

## 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, selected 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.

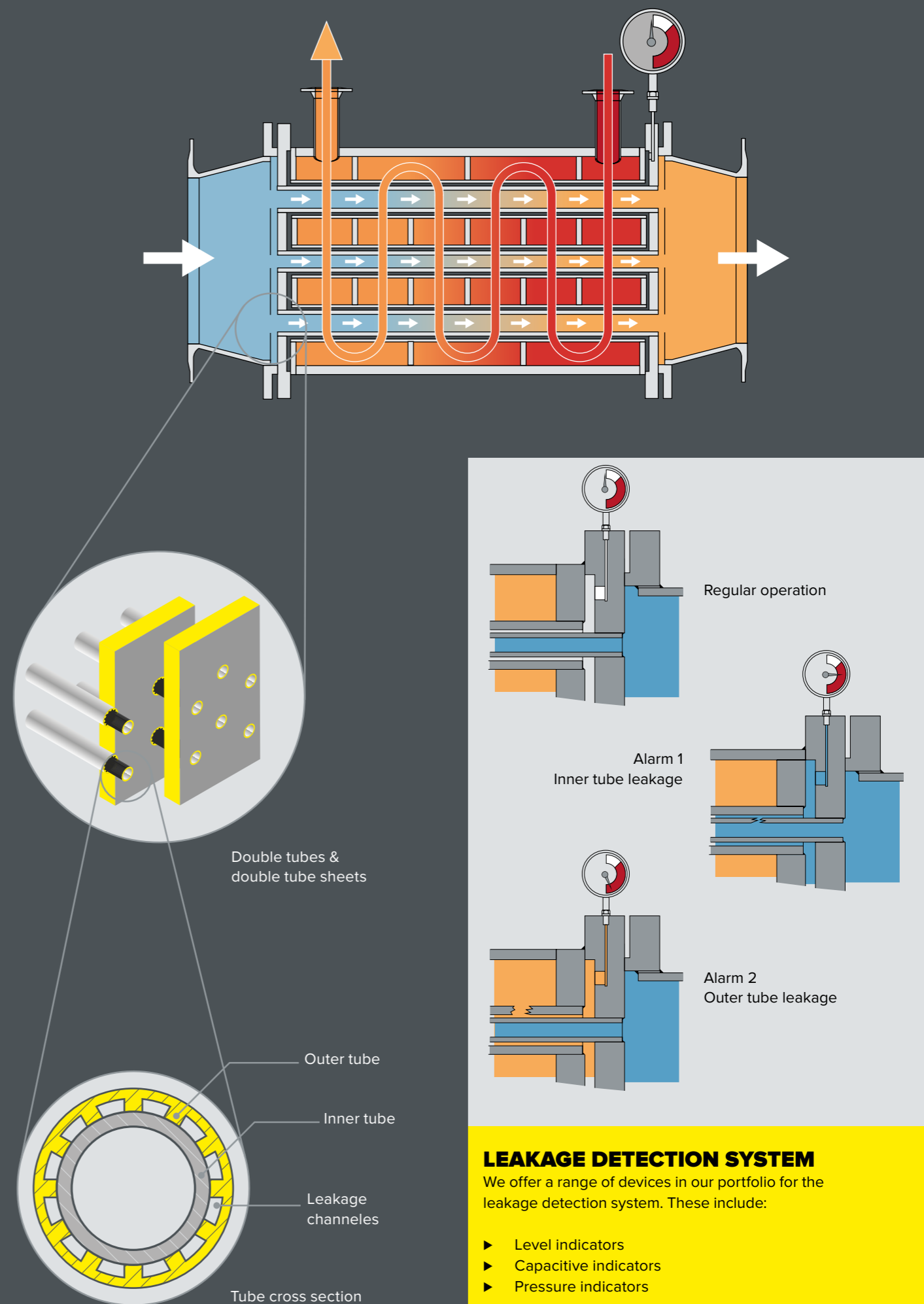
If a tube wall is damaged, due to corrosion, material failures or erosion, the oil flows through small channels arranged between the double tubes into a leakage collection space and triggers an alarm in the leak detection device. Because the second tube wall remains undamaged the media are kept separate. 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.

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.



## 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

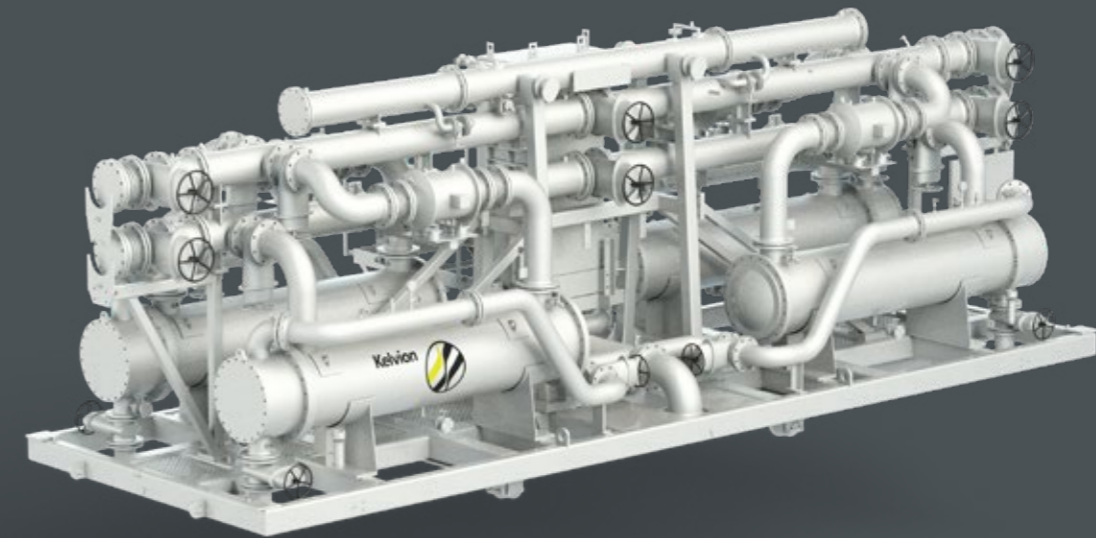
- ▶ 40 - 2000 kW
- ▶ According to DIN50216-9
- ▶ 25% fouling reserve
- ▶ Maintenance friendly
- ▶ Individual design possible
- ▶ Different accessories available

### TOWC SKID



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

## Transformer Oil Pumps

# 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

In-line 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<sup>3</sup>/h

# OUR SERVICE IN THREE WORDS: PEACE OF MIND



## START-UP SERVICES & ONSITE 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.

And should you encounter a problem with your equipment after it is fully commissioned, our team of experienced Field Service technicians is at your disposal to come to your site to investigate and correct any malfunctions.

- ▶ 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



## MONITORING, CONSULTING & TRAINING

Knowledge of the equipment's condition allows you to secure reliable production, improve safety and energy efficiency, increase equipment lifetime and prevent breakdowns.

We offer consultancy services that take into account the special features of your process, making use of our profound design knowledge of heat exchange equipment.

And we 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



## REPAIRS, OVERHAULS & MAINTENANCE

Unscheduled downtime can be disastrous. That is why our trained engineers are ready to respond quickly in case of an emergency, and review and repair components while keeping any disruption to your production to a minimum. Any overhaul work is carried out quality-oriented in our service centers or on your site with the supervision of our qualified staff.

Regular inspections and maintenance help to reduce costs, extend the lifetime of your Kelvion products and achieve reliable performance.

- ▶ 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 field regarding remaining lifetime
- ▶ Assessment (on site) and renewal of corrosion protection at the remaining exterior surfaces if necessary (at factory)
- ▶ 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

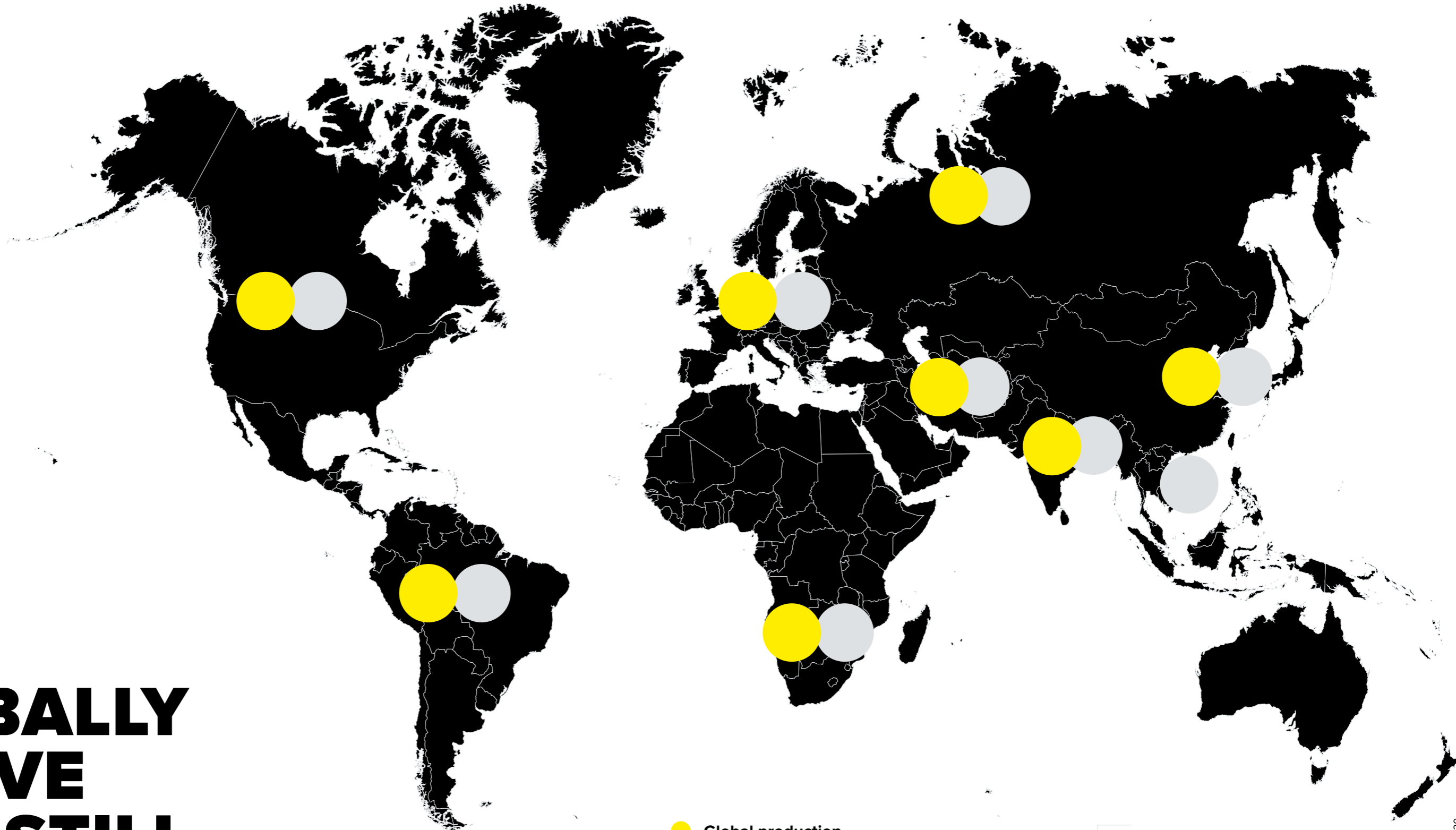


## UPGRADES AND REPLACEMENTS

We replace components to keep our heat exchangers running smoothly and to prevent downtime. Where parts or components have become obsolete due to age, we will suggest a suitable upgrade. In these cases, we can often also suggest new, state-of-the-art technology which additionally enhances the performance and reliability of your process.

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

**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](http://www.kelvion.com) – there you will find a highly competent contact in your immediate vicinity.

[www.kelvion.com](http://www.kelvion.com)