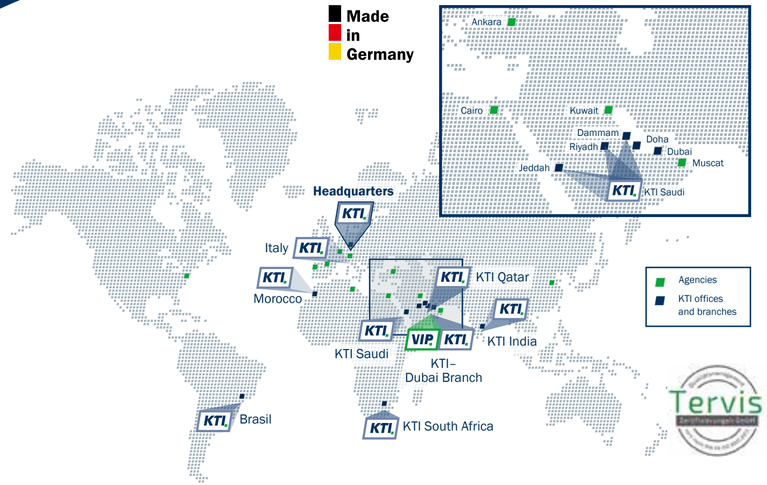
KTI Agencies and Registered Offices



KTI-Plersch Kältetechnik GmbH
Carl-Otto-Weg 14/2
D-88481 Balzheim
Germany
Tel.: +49/7347/95 72-0
Fax: +49/7347/95 72-22
E-mail: info@kti-plersch.com
Web: www.kti-plersch.com

KTI-Plersch Kältetechnik GmbH (Dubai Branch)
Damac Business Tower
Office 1004
Dubai, United Arab Emirates
Tel.: +971/4/58 97 945
E-mail: info@kti-emirates.com

VIP – Various Ice Products
Sales Representative – Middle East for KTI-Plersch
P.O.Box 17618 (Jebel Ali Free Zone)
Dubai, United Arab Emirates
Tel.: +971/4/88 09 666
Fax: +971/4/88 09 966
E-mail: vip@vipdubai.ae
Web: www.vipdubai.ae

KTI

Worldwide #1 in Concrete Cooling

KTI-Plersch Kältetechnik

Concrete Cooling Systems

Made in Germany

KTI – Worldwide #1 in Concrete Cooling

Family owned and dedicated to customers worldwide

Caroline Walleter-Plersch, M.Sc., and Dipl. Ing Rupert Plersch, CEOs of KTI-Plersch

Founded in 1986, KTI-Plersch Kältetechnik GmbH is a 100% family owned company. As the inventor of the first containerized turnkey refrigeration plant, KTI has installed more than 4,000 units all over the world, including Cold and Ice Water Plants, Flake Ice and Plate Ice Plants as well as our highly sophisticated Mobile Ice Storages. KTI's well-experienced team of refrigeration specialists is able to provide the best support to find the ideal design for customers' individual requirements. For more than three decades, KTI stands for high-end, cutting-edge refrigeration plants of highest quality. With its headquarter in Germany, service companies worldwide and a global network of agents and partners all over the world, KTI is able to attend to customers' needs reliably and within the shortest time. KTI's highly qualified and international engineers and technicians provide an unique 24/7 service – anywhere, anytime.

Vision

KTI is a renowned manufacturer of innovative refrigeration and heating solutions and is leading its core markets by delivering customer focused advisory, high-end engineering and service excellence.

At KTI, we are committed to the following principles:

- We place utmost emphasis on the quality of our products and processes. We stand for first-class, cutting-edge refrigeration and heating plants of highest standards.
- We provide unique after-sales service and support to customers worldwide.
- We are customer service oriented. To guarantee custom-made plant concepts and reliable operations of every plant, we globally employ a highly qualified team of engineers and service technicians.

Customer Satisfaction is our Ultimate Goal.

Modular Turnkey Solutions
Installation & expansion on the spot

The modular turnkey systems of KTI are installed and commissioned within the shortest possible time. An installation can be performed quickly for concrete cooling systems consisting of:

- cold or ice water plant (~one to three days)
- cold air plant (~one week)
- flake or plate ice plant together with ice storage and water tank (~two to five days)
- outside piping, cabling and installation of ice delivery system (~two to five days)
- stairways and platforms (~one to three days)
- bolted ice storages (~two to three weeks)

The entire installation time depends on site preparation and local requirements.

Erection of Ice Plants with Storage and Accessories:

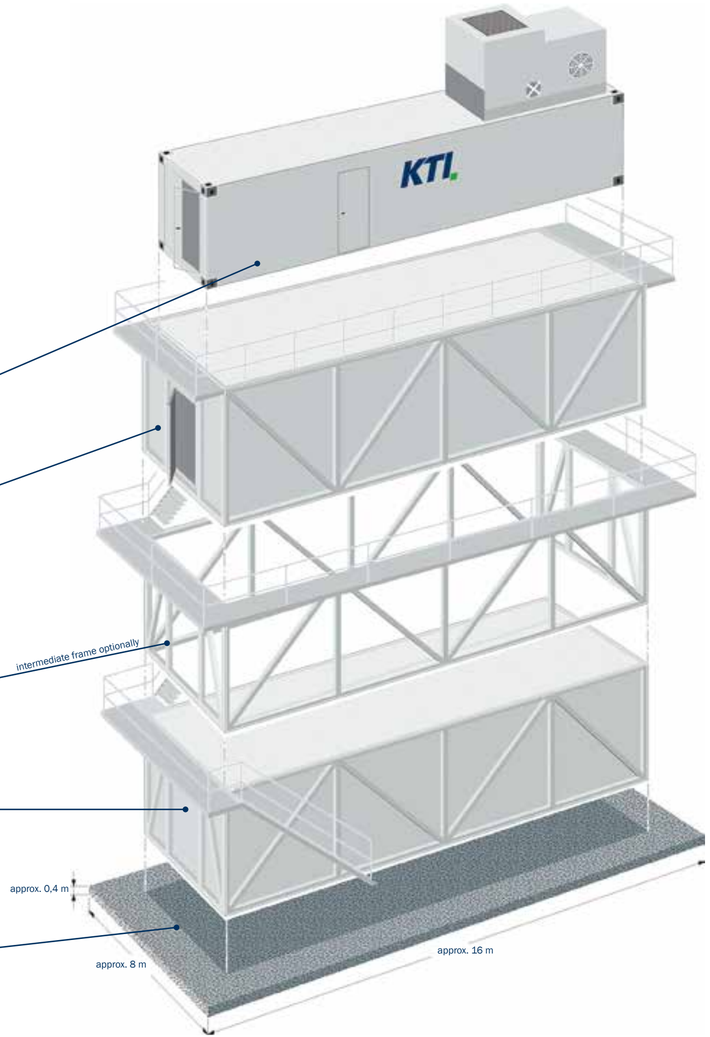
Step 5
Installation of the platforms and stairways – all hot dipped galvanized – for easy access to the plants. All platforms and stairways are bolted to the frames and can be dismantled and re-assembled for future installations.

Step 4
Installation of flake or plate ice plant (e.g. FLIP 42 – with a daily capacity of 42 tons per day or PLIP 80 – with a capacity of 80 tons per day) on top of the ice storage.
Optionally, two ice plants can be installed next to each other on top of ice storages with capacities of 75 tons or more.

Step 3
Installation of insulated ice storage for up to 90 tons flake or plate ice including fully automatic ice rake and ice discharge system. On top of the structure the ice outlet sits on a certain height appropriate to the batching plant. (Bolted ice storages will be assembled on-site.)

Step 2
Installation of bottom frame with ladders and platforms to adapt the height of the ice discharge outlet corresponding to the batching plant. Optionally, the bottom frame can be executed with an insulated water tank holding 150,000 liters of water or with integrated discharge system for pneumatic ice transport.

Step 1
Empty space with concrete foundation of approx. 8 x 16 m will be prepared in advance according to the layout drawing of KTI.



Made in Germany

Working with KTI benefits the customer
KTI's success is based on eight pillars

Holistic Product Portfolio for Single Sourcing
KTI provides a holistic range of products to deliver customer specific applications for concrete cooling:
- ice making and cold water production
- ice storages and water tanks
- ice delivery systems by screw conveyors and ice blowers
- ice weighing system
- aggregate cooling by air and water

All necessary accessories such as support frames, stairways and platforms for easy access to the plants are within the scope of KTI.

Re-usability
Most of the KTI systems are applied on special projects, which are usually completed after two or three years. After that, the equipment must be relocated immediately and easily.
Only with KTI's unique modular systems this can be achieved.
Dismantling and re-assembling can be carried out in less than two weeks including the new start-up procedures.

Quality
KTI chillers, ice plants and cold air plants are designed by German engineers – based on their long-lasting experience and know-how – and assembled in KTI's own factory in Germany by a superior team of technicians and craftsmen. The ice rake and delivery systems are also designed and produced in our own facilities. KTI uses only the best parts available on the markets.
Storage containers and blowing stations are assembled in VIP's modern factory in Dubai under the constant supervision of KTI's engineers.

Cost Efficiency – No Hidden Costs
KTI's modular systems turn out to be the most cost-efficient solutions in terms of
- fixed investment costs on the equipment
- costs on additional water tanks and pumping systems
- costs on extra foundation, stairways and platforms
- re-usability on later projects.

Piersch Family Crest

Customers
The majority of the world's top ready mix companies and contractors use KTI equipment – most of them – exclusively.
They opted for KTI's
- quality and reliability
- after sales service
- availability of spare parts and
- technical support.

Turnkey Solutions
All plants are fully automatic and especially modular, which makes it possible to provide KTI's customers with turnkey installations without hidden costs.
KTI provides simple and highly cost-efficient solutions. They require
- no extra underground water tank
- no separate support construction
- no additional engineering and design work.

The modular systems of KTI are set up within the shortest possible time. With proper site preparation a complete concrete cooling system can be in operation within one week.

Easy Expansion
The KTI design is ready for future growth.
If the demand for ice increases over the years, the ice production capacity can be doubled by simply adding another ice plant on top of the existing ice storage. Both, ice storage and ice delivery systems only need to be slightly modified.
KTI's customers start with a smaller plant (with lower budget) and invest additionally just when it is necessary. More economic efficiency is not possible.

International Standards
As a globally active company, KTI builds all systems according to internationally accepted standards. As per the requirement of the customer, KTI's engineers are fully capable to design and manufacture all plants according to several standards.
Beside others the most important are CE, ASME, CSA and CRN.

Turnkey Installation

Setup with two ice plants on top of an ice storage

Temperature Controlled Concrete

Concrete cooling is the key to save time, effort and money in complex constructions

When cement is mixed with water, both raw materials react with each other to form the cement paste. Aggregates are incorporated into the resulting structure, and the concrete begins to solidify and strengthen. This process is commonly known as hydration. The strength of concrete is considered its most valuable property. The development of the strength is accompanied by releasing heat during the hydration, called heat of hydration.

In case of thin and small elements, the heat of hydration can be dissipated comparatively quickly over the surface. Whereas in thicker concrete sections (mass concrete), the heat dissipates slower than it is generated, which results in hot concrete.

The heat of hydration can raise the concrete temperature up to 25 degrees causing an increase of volume. After curing, the concrete cools down, reducing its volume again. This thermal expansion and contraction causes cracking of the concrete and can ultimately reduce the expected compressive strength – it is commonly known as thermal shock.

In addition to that, high ambient temperatures cause the water in the fresh concrete to evaporate faster. This reduces the effective water content and negatively impacts the effective water-cement ratio. High temperatures also speed up the hydration causing a weak cement compound.

Fighting the Heat of Hydration

The management of concrete temperature is crucial to prevent damages, minimize delays, and meet project specifications. Since the concrete temperature at the time of placement influences the concrete's maximum temperature, a simple method is to limit the pouring temperature not exceeding a certain value determined by consultants.

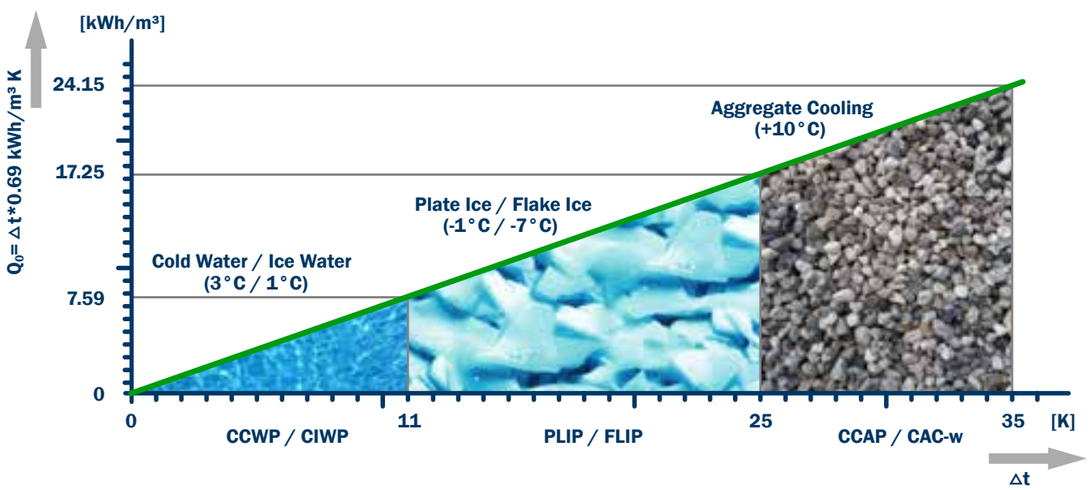
A pouring temperature of maximum 25 °C has proven its practical value, although the required temperature can vary from project to project and depending on national regulations of the construction sites (from 7 °C to max. 30 °C). This simple specification is already challenging for producers and users of concrete during summer or in hot climate regions.

A comprehensive refrigeration system to control the concrete temperature is required to deliver the specified concrete quality. As the investment and cost of operation for such refrigeration systems can be quite high, it is crucial to have an optimized system installed.

Concrete Cooling Potentials

Controlling the initial pouring temperature can be achieved by applying different measures as a stand-alone cooling system or a combination of several systems to achieve the optimal results. The fresh concrete temperature can be reduced by using the classical KTI equipment consisting of water chiller systems and ice plants as ingredients of the mix.
In addition, pre-cooling the concrete aggregates is not only a method to manage severe conditions or achieve lowest temperatures but is one of the most effective methods to reduce the fresh concrete mix temperature. Since coarse aggregates are the biggest proportion of the concrete mix, a drop in aggregate temperature causes the greatest reduction in fresh concrete temperature. KTI aggregate cooling equipment can run up to 40 % more efficient, i.e. savings in power, compared to classical cooling equipment.
Innovating concrete cooling, KTI sets an emphasized focus on possibilities of energy efficiency. In this course, beside affirming Ammonia as natural refrigerant, the application of cold air equipment plays a major role and opens further possibilities to all customers in the concrete business, depending on their aim to strive for

- lower concrete temperatures
- more efficient production for power saving
- increased capacity of fresh concrete output.



Concrete Cooling Options

The effect of various possible combinations of KTI concrete cooling equipment is shown in an exemplary use case below:

Sample Mix Design

Tropical Conditions T_wb = 30 °C T_db = 45 °C T_freshwater = 45 °C Daily production = 1000m³ Target Temperature = 28 °C

Concrete Mix Design	concentration	moisture	concentration separated	specific heat	temperature before cooling
	kg / m³	%	kg / m³	kJ / kg K	°C
cement	300		300	0,7955	70
flyash	160		160	0,7955	70
sand 0/2	700	2	686	0,921	45
aggregate 5/20	600	2	588	0,921	45
aggregate 20/40	500	2	490	0,921	45
		36 l total moisture			
total water (incl. aggregate water)		**150 l /m³**			
max. additional water		**114 l /m³**			

CASE	Used Cooling Equipment	Achieved Temperature	Concrete Production	Energy View	
#1	no cooling	**46 °C**	**1000 m³**	**n.a.**	■ Fresh concrete temperature not acceptable ■ Proper concrete cooling system required
#2	3 °C 114 l	**38,6 °C**	**1000 m³**	**+++**	■ Cold water only not sufficient to achieve required concrete temperature ■ Cold water system is most efficient ■ Only marginal effect with ice water (1 °C)
#3	3 °C 114 l + 20 °C	**28 °C**	**1000 m³**	**+++**	■ Required concrete temperature achieved ■ No ice needed! ■ Cold air plus cold water is highly energy efficient
#4	3 °C 36,3 l + 77,7 kg	**28 °C**	**1000 m³**	**+**	■ Required concrete temperature achieved ■ Cold water + ice is energy-intensive solution ■ Ice production, storage and delivery needed ■ 40% less power consumption with plate ice
#5	3 °C 67,3 l + 35 °C + 46,7 kg	**28 °C**	**1000 m³**	**++**	■ Required concrete temperature achieved ■ Cold Air reduces amount of ice ■ Comprehensive concrete cooling solution
#6	3 °C 36,3 l + 35 °C + 77,7 kg	**23,9 °C**	**1000 m³**	**+**	■ Lowest concrete temperature achieved ■ Water-cement ratio is not limiting anymore ■ Cold air provides further cooling capacity
#7	3 °C 65,4 l + 35 °C + 48,6 kg	**28 °C**	**1600 m³**	**++**	■ Required concrete temperature achieved ■ Daily capacity increased through cold air ■ Cold air plant supersedes second ice plant ■ Bigger water chiller capacity required

Caption
Water T_{water} V_{water} | **Cold Air** $T_{aggregate}$ | **Ice** m_{ice} | **+++** highest efficiency **++** improved efficiency **+** energy-intensive

What does a Concrete Cooling System look like?

A variety of options leads KTI to find the best solution for every demand

Ready Mix Industry

A concrete cooling system for the Ready Mix industry can consist of a variety of different components, depending on the customer's requirement. KTI as your partner for elaborating the best system configuration, will advise which of the different modules are the optimal solution.

In general, a concrete cooling system consists of the following elements:

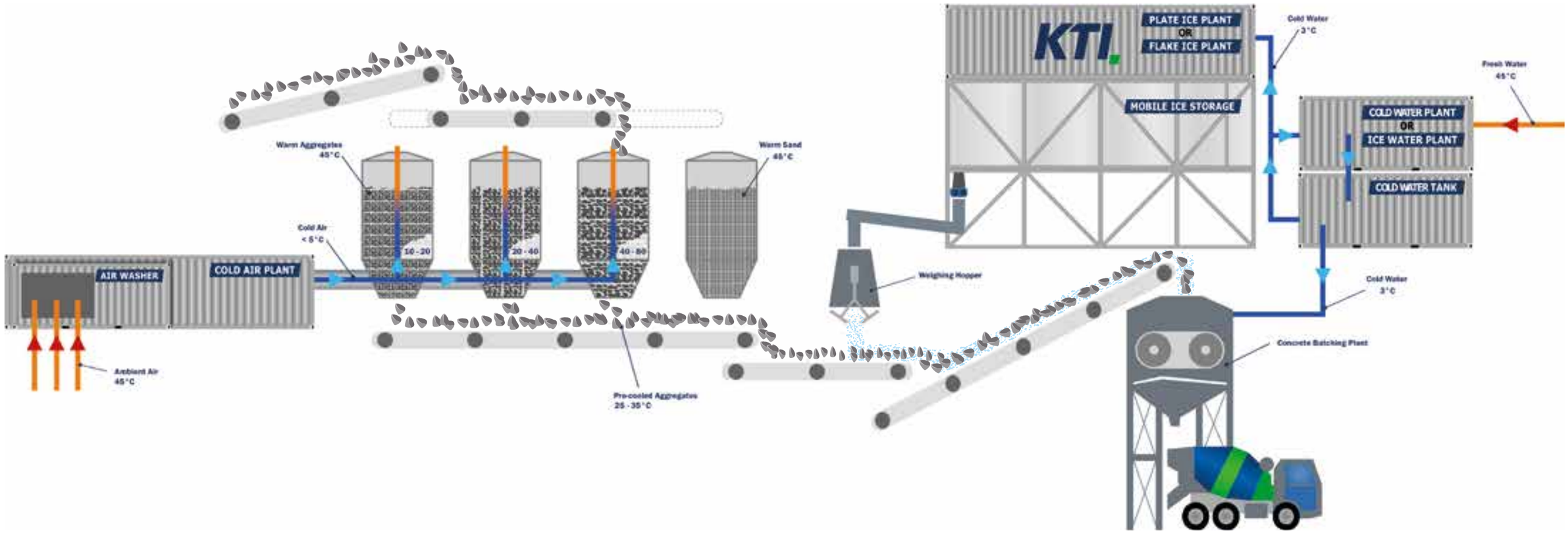
- **Water Chilling Plant**
  to replace the high temperature mixing water with ice or cold water
- **Insulated Water Tank with Pumping Station**
  to supply the batching plant and ice plant with the required amount of water
- **Cold Air Plant**
  to pre-cool the aggregates before mixing
- **Ice Plant**
  for either flake ice or plate ice production
- **Ice Storage with Rake System**
  to hold and automatically discharge flake or plate ice
- **Ice Delivery and Weighing Systems**
  to supply the required amount of ice to the concrete mixer

Mass Concrete Production

KTI's experience in large-scale concrete productions shows that the specifications for mass concrete often require cement types, minimum cement contents, and maximum supplementary material contents. With this information, the engineers at KTI start to design the concrete cooling system for a certain project with the target to reach a defined concrete temperature after mixing.

In mass concrete projects like hydropower dams, bridges or airports, aggregate cooling and post-cooling of the casted concrete plays a major role. With a post-cooling system, the developing heat of hydration is dissipated from the inside during the curing process.
In addition to the already mentioned cooling equipment, KTI engineers consider the following methods during the design phase:

- **Aggregate Cooling System consisting of a**
  - **Cold Air Plant**
    to pre-cool the aggregates in silos with cold air before mixing
    OR
  - **Wet Belt System**
    to cool the aggregates with cold water on a flooded belt conveyor before mixing
    OR
  - **Flooded Silo System**
    to cool the aggregates with cold water in flooded silos before mixing
- **Post Cooling System**
  to cool the concrete after pouring from the inside through an embedded water piping system



KTI – A full-range provider of Concrete Cooling Equipment

Premium equipment designed throughout all ranges for concrete cooling

KTI is a full-range provider of concrete cooling equipment. KTI offers not only plants but entire custom-made concepts exactly tailored to the demands of its customers. A constant development of innovative systems to cool the concrete effectively and efficiently for an increase of concrete production and saving costs at the same time, makes KTI the world leading manufacturer of tomorrow's demands. Not only new products and methods are an essential part of a concrete cooling system, but also KTI's experience and in-depth advisory on the design when it comes to complex projects.
Over the last decades KTI has pioneered concrete cooling technologies and became the worldwide number one in this field. KTI's portfolio comprises equipment to meet each and every market demand for helping its customers in finding the right solution – now and in the future.

Discover the broad range and different concepts in this specific KTI "Concrete Cooling Systems" catalogue:

- Containerized Cold and Ice Water Plants (CCWP, CIWP) page 12
- Containerized Cold Air Plant (CCAP) page 14
- Containerized Aggregate Chiller (CAC-w) page 16
- Containerized Plate Ice Plant (PLIP) page 18
- Containerized Flake Ice Plant (FLIP) page 20
- Mobile Ice Storage (MIS) page 24
- Ice Handling Equipment (Delivery, Weighing) page 26
- Post Cooling System page 28
- CombiMaster (Concrete Cooling & Heating) page 30

KTI not only provides equipment for concrete cooling but also services its customers with several other features:

- KTI-CONTROL page 32
- KTI-ONLINE page 33
- Engineering & Advisory page 34
- Excellent Service and After Sales page 36

COP X,X

The product pages show the COP of the respective plant. The COP (Coefficient of Performance) reflects the provided cooling capacity compared to necessary power consumption. Higher COPs equate to lower operating costs.

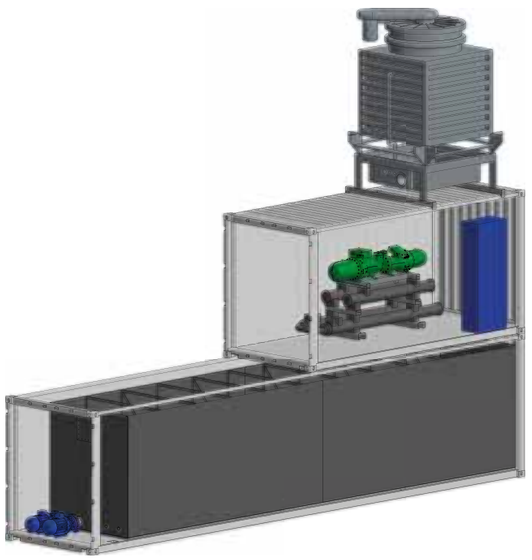
ENERGY EFFICIENT REFRIGERATION

Containerized Cold Water & Ice Water Plants
(Type: CCWP / CIWP)

Your Advantages

- **Highly energy efficient (up to 55% less power consumption) compared to conventional water chiller systems**
- **High temperature difference up to 44K for extreme fresh water temperatures of up to +45°C**
- **Cold water production of +3°C (CCWP) or less than +1°C (CIWP)**
- **Automatic water recirculation to maintain the water temperature inside the cold water tank**
- **Low refrigerant charge**

COP 4,4



CCWP installed on top of an insulated water tank

COP 4,2

CIWP with ice bank system

KTI Design

Water is an essential ingredient for the concrete production but most of the time only available in hot temperatures. Cooling down the water is a first and very efficient step in the whole concrete cooling process.
KTI's water chillers are the basis of an entire concrete cooling system and a must before an ice or cold air plant is considered for concrete cooling.
KTI specially designs its chiller systems for cooling the mixing water for the batching plant down to low temperatures in a highly efficient way using multi-stage cooling.
KTI chillers are superior to any common conventional water chiller available in the world with lower power consumption between 30% and 55%.
There are water chillers available for moderate conditions cooling fresh water from up to +30°C down to +3°C, whereas chillers for tropical conditions cool water down to +3°C from any temperature up to +45°C. They are called Containerized Cold Water Plants, Type: CCWP.
More effective to reach lower concrete temperatures are water chillers cooling the fresh water down to +1°C via an additional cooling stage, a special ice bank system accumulating ice around tube or plate heat exchangers. They are called Containerized Ice Water Plants, Type: CIWP.
As KTI's CCWPs and CIWPs are highly efficient, it is always recommended to cool down the entire water for the batching plant in order to get the best possible performance. Each water chiller is equipped with an extra pump for re-circulating the cold water inside a separate insulated water tank through the chillers once the tank is full.
KTI designs its plants either with evaporative condensers for plug & play units or with water cooled shell & tube condensers with cooling tower to be installed on top of the container. Executions with cooling towers perform most energy efficient.

Cold Water Tank

As the perfect complement to the cold water & ice water systems, KTI offers perfectly insulated water tanks that are either directly installed in the machine container (ICWT), installed as a unit into a separate container (CCWT) or in a solid steel frame (SFWT).

Each water chilling system requires a properly insulated cold water tank to maintain a certain level of mixing water to cover peak demands. The size depends on the non-production period of the batching plant and the required full load water consumption.

For most concrete cooling systems, cold water from the KTI water chillers (CCWP or CIWP) and cold water tanks (CCWT) makes its way to the KTI flake ice or plate ice plant, where it is turned into ice.

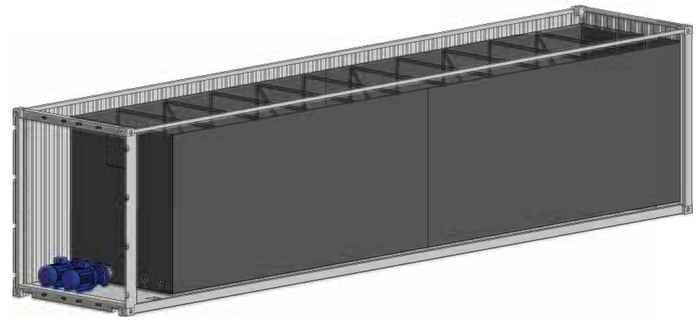
KTI manufactures the insulated cold water tanks with the required configuration like pumping systems, overflow pipes as well as level and temperature indicators.

There are 3 different possibilities for installing such a tank:

- The cold water tank is made of concrete and is insulated locally – any size is possible
- KTI Cold Water Tank (CCWT) is made of steel, installed and insulated inside a 40-ft. container – maximum size: approx. 50 m³
- KTI Cold Water Tank (SFWT) is made of steel, installed and insulated inside a steel frame – maximum size: approx. 150 m³

In all three cases it is recommended to install the water chiller on top of the tank to save space and to reduce installation costs.

Insulated water tank inside a heavy-duty steel frame (SFWT)



CCWT with pumping station

There are various chiller types for different conditions available:

Type	Water Capacity	Max. ambient temp	Wet bulb temp	Fresh water temp.	Temp. Difference	water outlet temp	Refrig-erant	Con-densing System	execution
	m³ / d	°C	°C	°C	K	°C			
CCWP	56 - 432	40	26	30	27	3	R134a	evi	Container, Plug & Play
CCWP	100 - 440	60	30	45	41	4	R717	evi	Container, Plug & Play
CCWP	150 - 448	60	30	45	42	3	R134a	ct	Container, Split Unit, Cooling Tower on top
CIWP	130 - 438	60	30	45	44	1	R134a	evi	Container, Plug & Play
CIWP	130 - 438	60	30	45	44	1	R134a	ct	Container, Split Unit, Cooling Tower on top

evi = evaporative condenser, ct = cooling tower with shell & tube condenser

For special capacities and other configurations (e.g. air cooled execution), please contact your KTI sales partner.

Containerized Cold Air Plant
for Aggregate Cooling (Type: CCAP)

Your Advantages

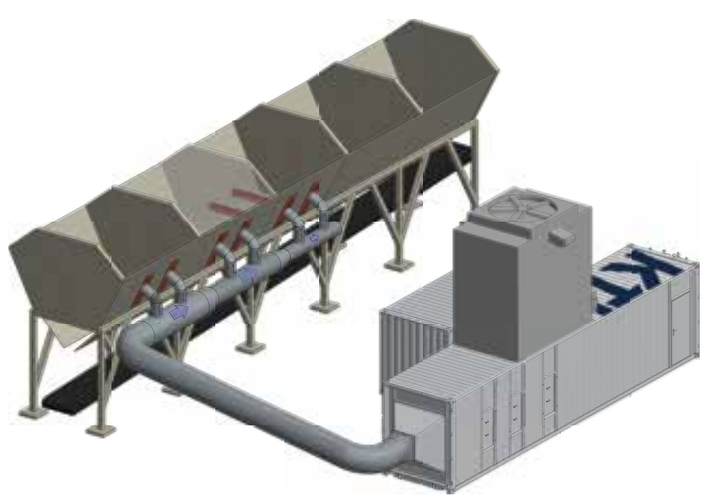
- Drastically lower concrete temperatures possible
- Highest efficiency due to large surface heat exchangers
- Low maintenance due to clean air operation
- Proofed in dust polluted environments
- Perfect upgrade to existing concrete cooling solutions
- High performance fan for an optimized air flow around the aggregates (for best cooling properties)

COP 3,8

Concept layout for aggregate cooling by cold air – Live image on top

Cold Air Generation with Air Washer

Cold air for aggregate cooling is generated by cooling the ambient air down to a certain low temperature. Before cooling the air inside the CCAP, the fresh air has to be cleaned to prevent the heat exchangers from fouling which would have a negative impact on the plant's efficiency. KTI's edge-breaking innovation is the KTI Air Washer, which not only cleans the air without dry filter systems but also enhances the efficiency of the plant. The clean air is pushed by a high-performance fan through a multi-stage cooling system consisting of specially designed finned pack heat exchangers, where it is cooled down. Via air ducts the cold air is then further pushed through the silos or inline bins where it evenly flows around the aggregates to lower their temperature.



CCAP with Air Washer connected to open inline bins

KTI Design

Producing temperature controlled concrete with KTI's Containerized Cold Air Plants (CCAP) is the most energy efficient way. Including a CCAP to a concrete cooling system can improve its total efficiency by about 30% and significant cost savings can be achieved. Using cold air to lower the temperature of aggregates before the mixing process is a highly efficient and economical technology. KTI's CCAPs can be connected to any type of silo since KTI supplies customer specific air nozzles made to meet the customer requirements. There are Cold Air Plants available from 100 to 1200 kW refrigeration capacity. Depending on the ambient conditions – in particular outside temperature and relative humidity – the air can be cooled down to a certain temperature (normally below 5 °C). KTI manufactures CCAPs for tropical conditions (e.g. Gulf region) and moderate conditions (e.g. Europe) to meet the requirements of all customers worldwide. While concrete cooling with cold water and even with flake or plate ice comes to its limits when the cement-water-ratio is reached, cold aggregates provide the capability to bring down the concrete temperature even further. A certain retention time of the aggregates inside the cold air stream is necessary to achieve the required temperature, which requires a certain silo or bin size.
In addition, a reduction of ice through using cold aggregates helps KTI's customers to save costs since a CCAP operates more efficiently than any ice plant.

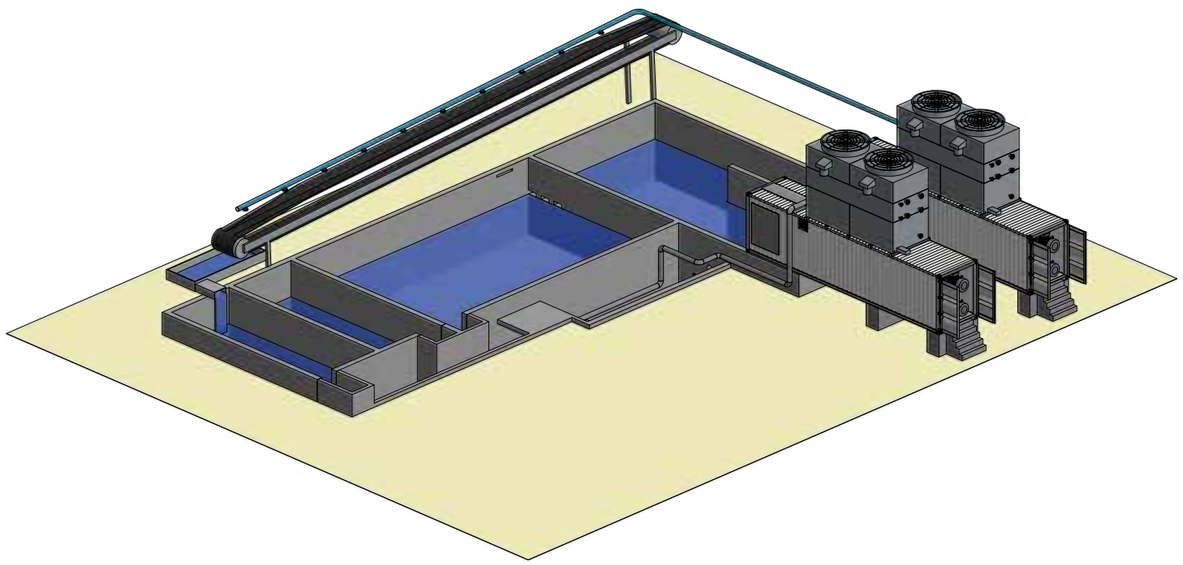
Live image of ductwork for cold air supply

Containerized Aggregate Cooling
by Water (Type: CAC-w)

Your Advantages

- **Fastest way to cool down aggregates**
- **Lowest concrete temperatures possible**
- **High durability due to age-resistant materials**
- **Easy-to-clean stainless steel evaporator**
- **Proofed to contaminated water**
- **Environment-friendly refrigerant**

COP 3,6



Concept layout for aggregate cooling via a welt belt system with sedimentation basins

KTI Design

The fastest way of cooling the aggregates is to flood them on a belt conveyor or in flooded silos with ice water. Depending on their sizes the aggregates can reach an average temperature of 5 °C within 1 to 8 minutes for sizes up to 80 mm. For the big sizes up to 150 mm a dwell time of approx. 35 minutes has to be considered.
The cooling process itself occurs much faster in ice water than in a cold air stream, due to a better heat transfer. However, it is necessary to have a well-functioning de-watering system installed to separate the aggregates from the “cooling water” for chilling it down again and recirculating it. Furthermore, a subsequent settling tank is mandatory to separate solid particles from the water to receive cleaned water in the ice water plant.
The most efficient and reliable water cooling equipment for aggregate cooling is our specially designed Falling Film Evaporator Plant, Type: CAC-w, which can also be supplied as a completely containerized version. It consists of stainless steel plate-heat-exchangers, which are easy to clean manually even during operation. There are sizes available from 740 – 1500 kW refrigeration capacity covering the demand of KTI’s customers worlwide.

Water chiller systems CAC-w for aggregate cooling via wet belt systems

Aggregate Cooling on Wet Belts

Aggregate belts are flooded by ice water. After the cooling process the water flows into a sediment basin to separate sand, mud and water. By the use of huge chiller plants the water out of these basins is chilled to 2 °C.
The special design of KTI’s water chillers for wet belt applications also allows to cool contaminated water with parts of sediments such as sand or mud. Instead of using a shell and tube heat exchanger, KTI uses falling film evaporators. These evaporators consist of stainless steel heat exchanger plates. Water is sprayed onto these refrigerated plates and flows down into a basin below.

Wet belt conveyor flooded with cold water

Stainless steel falling film evaporator cooling contaminated water

Aggregate Cooling in Flooded Silos

Beside the wet belt application, it is possible to pre-cool the aggregates by flooding them inside the silos. With two or more silos per aggregate size, the silos are flooded and drained alternaiting. The water which contains sediments of sand and mud is recirculated after passing the sediment basin.
Ice Water Plants equipped with a falling film evaporator are very reliable chillers. They are used for wet belt applications as well as for silo cooling.

Flooded silo system with KTI water chillers for aggregate cooling

Plate Ice Plant
(Type: PLIP)

Your Advantages

- **Substantial energy advantage of up to 45 %**
- **Environment-friendly refrigerant**
- **Fully containerized - up to 200 tons ice production per day in one unit**
- **Low maintenance due to non-moving parts inside the ice makers**
- **No corrosion thanks to stainless steel ice generators**
- **Compatible with next generation KTI Mobile Ice Storages (MIS)**
- **Highly flexible through different optional operation modes**

COP 2,4

Plate Ice

Setup with a Containerized Plate Ice Plant on top of a Mobile Ice Storage with Screw Conveyor

2x PLIP 100 on top of MIS 75 and Cold Water Plant beside

KTI Design

Plate Ice Plants have always been considered as reliable products to produce ice in the most efficient way. However, storing and delivering plate ice requires the utmost experience and know-how. KTI, being the world's number 1 in the field of ice production, designed and developed a highly reliable Mobile Ice Storage (MIS) to guarantee a secure and efficient handling of plate ice.
KTI's Plate Ice Plants (PLIP) together with KTI's Mobile Ice Storages (MIS) are the perfect combination and fulfill future needs in respect to energy efficient ice production, costs and power savings.

Compared to conventional ice production systems, KTI's PLIPs give you one particular advantage.
Three different operation modes coming with the same PLIP provide the highest flexibility in concrete cooling:

- **Ice production only**
- **Ice water and ice production**
- **Ice water production only**

All Plate Ice Plants can be installed and operated on top of the specially designed Mobile Ice Storage with storage capacities from 23 to 120 tons or large-scale ice storages up to 250 tons capacity.

Plate Ice Production

Plate ice is formed on stainless steel plate evaporators where a water film constantly flows over the surface area. Depending on the required ice thickness the water freezes on the surface for a certain period. The ice is removed by defrosting the plate evaporator using hot gas provided by the compressor. The ice falls directly into the refrigerated ice storage located below the ice maker. Excess water is separated and pumped back into the system.

Plate Ice during harvesting by defrosting

Stainless steel plate ice generator installed inside a container

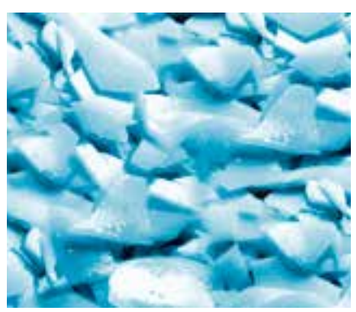
Flake Ice Plant
(Type: FLIP)

Your Advantages

- **Optimized ice removal and water distribution systems**
- **Optimized energy efficiency due to state-of-the-art components**
- **Available also with Ammonia as refrigerant for highest efficiency**
- **Precise thickness of ice flakes**
- **Fast melting during mixing process**
- **Sub-cooled, dry and crisp ice, ideal for pneumatic delivery**

COP 1,5

Made in Germany



Flake Ice

Containerized Flake Ice Plant with cooling tower on top of a Mobile Ice Storage

KTI Design

For many years KTI has designed and produced containerized Flake Ice Plants (FLIP) which are in operation throughout the world under the most extreme climatic conditions – to the fullest satisfaction of our customers. KTI's Flake Ice Plants are installed inside of 40-ft. containers and available with daily capacities up to 100 tons per unit either as plug & play or split units.

Equipped with the latest technology of compressors, heat exchangers and regulating equipment, all FLIPs can be built with an evaporative condenser or cooling tower. Under certain conditions, as they can be found e.g. in the European or North American market, an air-cooled condenser can be installed alternatively to meet local requirements.

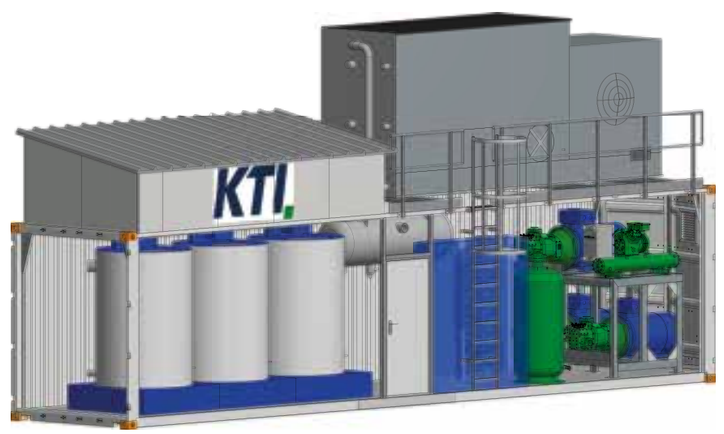
All Flake Ice Plants are equipped with ice makers built with non-rotating drums to avoid the danger of leakage through a shaft-seal. The ice makers constantly produce flake ice with an optimal ice thickness of 1.5 mm but can be adjusted to produce up to 2.5 mm thick ice depending on the requirements of our customers and different conditions on site.

Inside view of FLIP

Setup with FLIP-87 on a MIS-75 for the ready mix industry

Flake Ice Production

The classical flake ice of high quality is produced on refrigerated drums by spraying water onto the drum's cold surface where it freezes immediately. After sub-cooling to approx. -7 °C the ice is sheared from the surface by the ice removal tools and it falls out of the bottom of the ice maker into a refrigerated ice storage located below the ice plant. The optimum ice thickness is 1.5 mm which guarantees the highest possible output and the shortest possible mixing and melting time inside the concrete mixer.



Premium Flake Ice Plant with three ice makers and evaporative condenser

Combined FLIP/CCWP

Your Advantages

- **Cost savings compared to individual plants**
- **Power savings up to 30% compared to separate plants**
- **Shorter installation time**
- **Less space required due to the one-container installation**
- **Maximum flexibility due to different operation modes**
- **Lower shipping cost due to the compactness**

COMBINED
COP 2,4

Flake ice maker with compressor units and oil separator

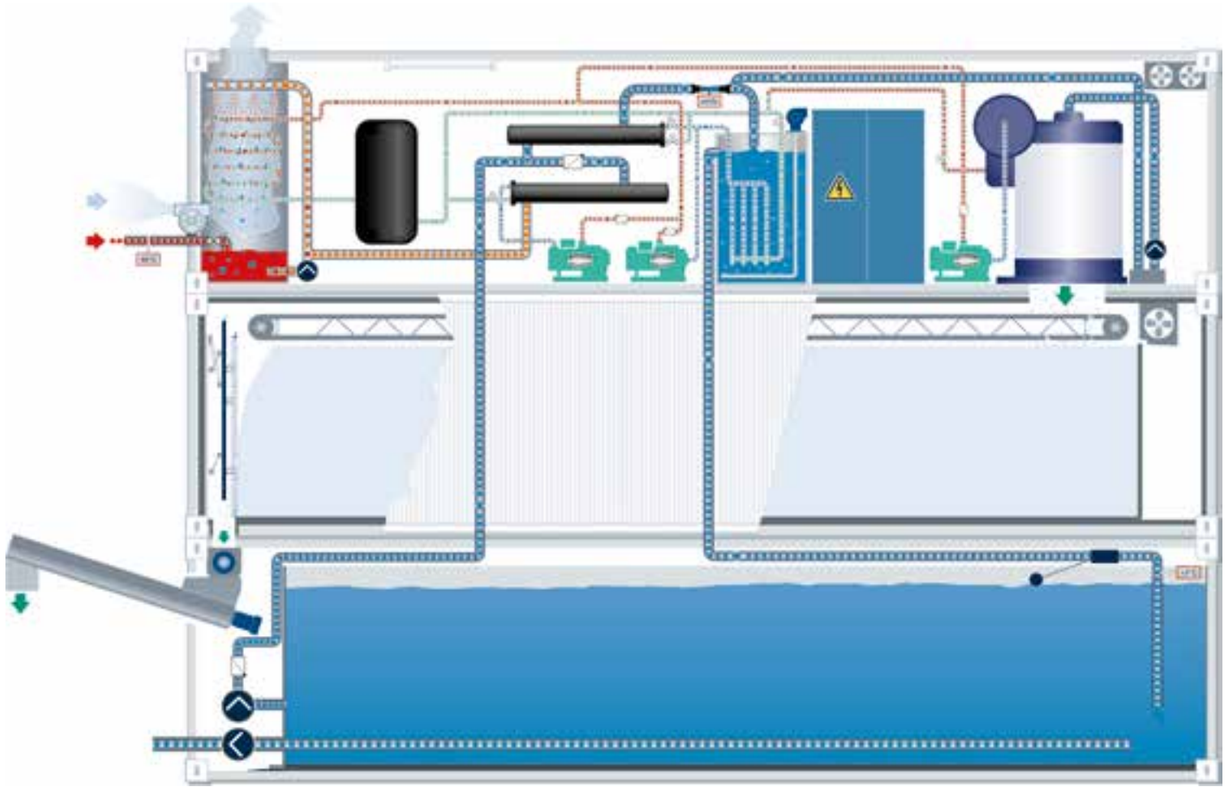
Combined Ice Water / Flake Ice Plant

KTI Design

A combined plant manufactured by KTI is a two-in-one solution with the highest possible compactness in design. KTI installs two full-fledged plants, one flake ice plant and one cold water or ice water plant, inside of one 40-ft. container.
The main advantage of a combined plant is that both systems use one common condenser system (evaporative condenser or shell & tube condenser with cooling tower). During 100% production of each plant there is no advantage. However, once the flake ice plant has stopped (because the ice storage is full or there is no use for flake ice during the cold season) the chiller runs with the condenser system which has double the capacity than necessary. This lowers the power consumption and increases the efficiency. Over the period of one year power savings of up to 30% can be achieved. Furthermore, it increases the life expectancy of the compressors thus reducing the costs for spare parts.
By using these synergies, not only the production costs of combined plants are lower but also the costs for transportation, installation and commissioning. Further, combined plants normally have less space requirements and need smaller support structures.
For pure Ready-Mix applications (where 50% and more of the water added is flake ice) we recommend to use only Cold Water Plants with an outlet temperature of 3 °C together with the suitable flake ice plants. If flake ice is used in the mixing process the positive effect of 1 °C water compared to 3 °C water is neglectable.

Ice water section of combined plants

ENERGY
EFFICIENT
REFRIGERATION

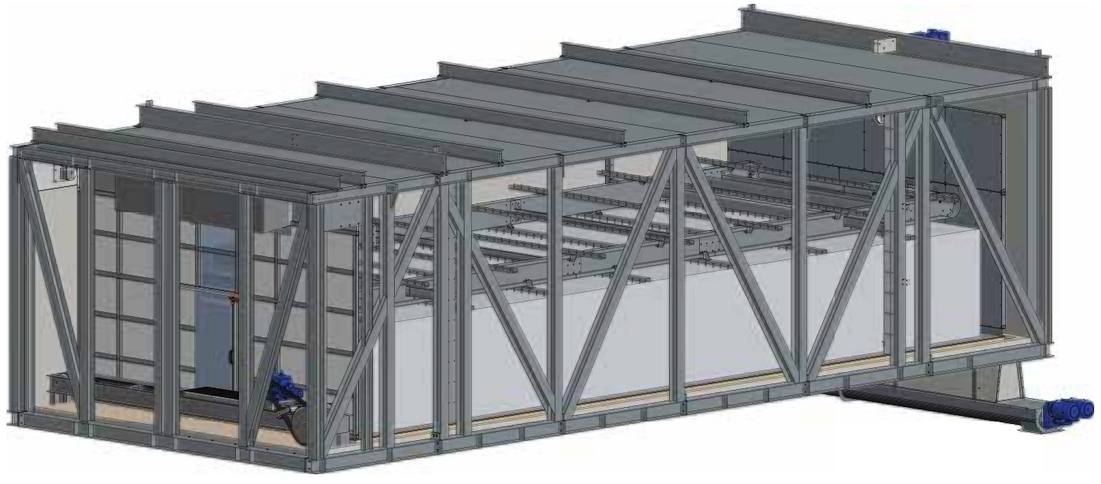


Combined plant for flake ice and ice water production on top of a containerized ice storage and water tank

Mobile Ice Storage
(Type: MIS)

Your Advantages

- **Integrated ice rake for automatic leveling and discharge**
- **Special designs for storing flake ice, plate ice and other types of ice**
- **Combinable with any ice plant**
- **Patented air circulation and room cooling system to maintain the inside conditions**
- **Pre-assembled or bolted versions available – transportable and relocatable all over the world**
- **Ice discharge screw conveyor delivering ice either in 1 or 2 directions**



3D design layout of a MIS-120 bolted – Live picture on top

KTI Design

Beside an efficient production of ice, proper storing and transportation equipment are important parts of an entire plant setup to secure the reliable supply of ice to the batching plant. Handling of ice is difficult, as its properties are different to conventional bulk materials and requires the utmost experience. Flake ice is dry and crispy while plate ice is wet and slippery. KTI Mobile Ice Storages provide the optimal condition for both types of ice.

Mobile Ice Storage

KTI, being the worldwide number one in the field of ice handling, manufactures Mobile Ice Storages for holding capacities of up to 90 tons including robust and fully automatic ice rake and discharge systems, Type: MIS 40 to 90. They are installed inside of heavy-duty steel frames. Smaller ice storages with a holding capacity of up to 23 tons (Type MIS 23) are installed inside of standard high-cube containers. All types have a specially designed double-wall insulation which allows a proper air circulation around the ice even when the ice storage is completely full. Thanks to KTI's modular concept, all Mobile Ice Storages can be combined with any KTI Flake Ice Plant (FLIP) or Plate Ice Plant (PLIP).

Each ice storage comes with a re-designed heavy-duty ice rake in hot dipped galvanized execution for an even ice distribution inside the ice storage and transport to the outlet.
In the event of ice demand, the pneumatically operated bin door opens, and the ice is discharged into the reversible double discharge screw conveyor underneath the ice storage to avoid clogging of the bin door during closing (MIS-23 has a single discharge screw conveyor).

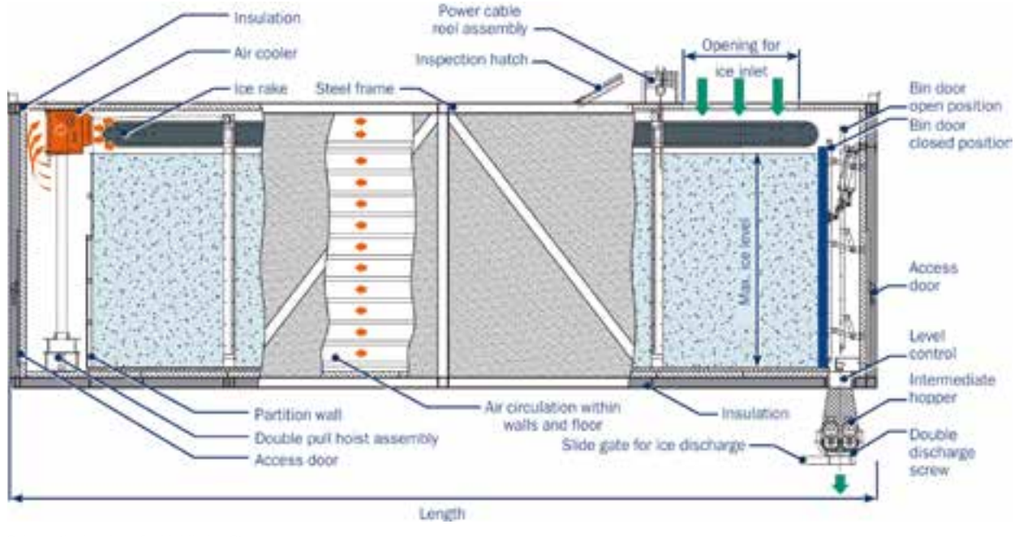
Bolted Ice Storage

KTI Bolted Ice Storages (Type: MIS-b) are available for holding capacities from 40 up to 250 tons. Prefabricated at KTI's production facilities, they can be dismantled for easy transportation all over the world. The ice storages are installed in galvanized and bolted steel frames, which allows a fast and easy assembly on-site - either by KTI or by the customer under KTI supervision. If required, all ice storages can be easily relocated.

Special Execution (TIS, MIS-sa)

Beside the fully automated ice storages, KTI provides semi-automatic executions (Type: MIS-sa) for small batching plants. The ice is manually discharged from the refrigerated ice storage while a distribution screw on top of the storage levels the ice during ice production.
The transportable ice storage (Type: TIS) is similar to the semi-automatic ice storage but integrated into a trailer for ice transportation between various batching plants.

Model	Ice storage capacity		Ice discharge rate
	tons	m^3	tons/hour
MIS	18-90	33-164	15-40
MIS-b	40-250	73-454	21-50
MIS-sa	12-26	21-40	10-15 (manually)
TIS	15	27	15 (manually)

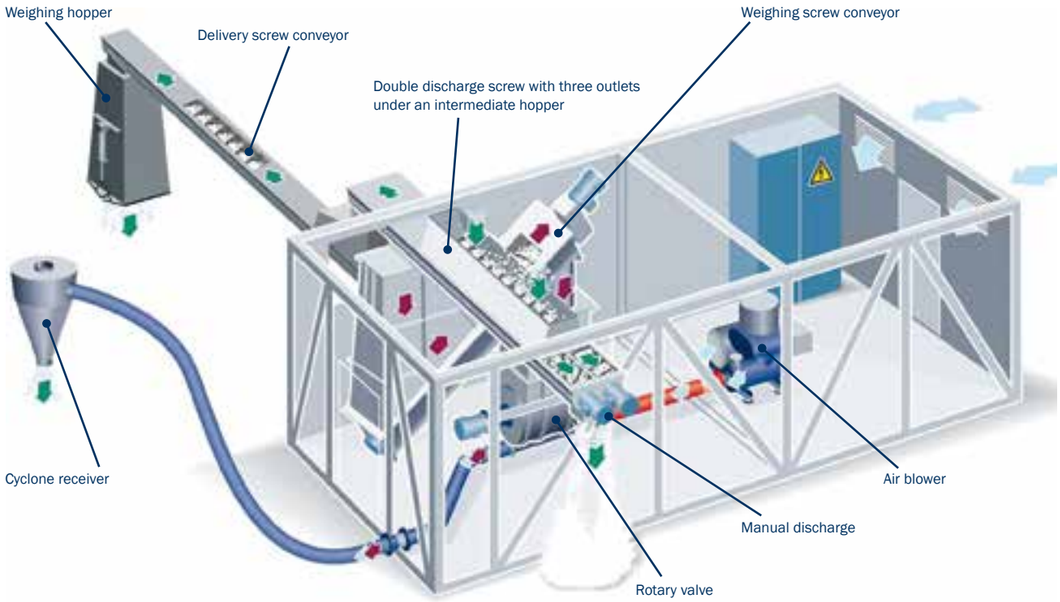


Schematic drawing of a Mobile Ice Storage

Ice Handling Equipment
Ice Delivery & Ice Weighing

Your Advantages

- **Fully automatic delivery and weighing**
- **Easy, efficient and fast delivery of ice**
- **Exact dosing of ice**
- **Long lifecycle thanks to a robust design with age-resistant materials**
- **Customized solutions for individual needs**
- **KTI advisory for optimal ice handling concepts**



Schematic layout of a comprehensive ice delivery and weighing system

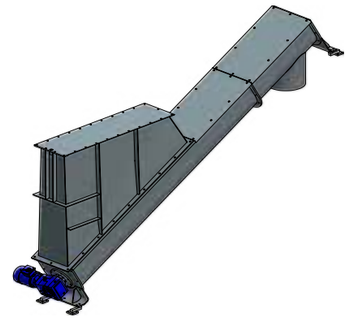
KTI Design

Beside ice production, the ice handling and transportation is an important part of a plant setup. Similar to a proper storage of ice, its handling is also difficult and requires experience. KTI equipment provides the optimal conditions for both types of ice, flake ice and plate ice.
After the ice is discharged from the ice storage, it is transported to the batching plant specified by the customer's requirement where the ice is weighed.
KTI provides various possibilities of ice transportation and weighing systems to secure an efficient and reliable handling of ice for an improved performance of the batching plant.

Ice Weighing Systems

Weighing Screw Conveyor
A weighing screw conveyor could be placed above the aggregate belt or above the mixer. An advantage of the weighing screw conveyor is the concept of discharging in a controlled and adjustable speed.

Weighing Hopper
The ice weighing hopper discharges the ice by gravity, after being weighed, either into the skip, onto a belt conveyor, or directly into the mixer. This is the fastest and easiest way of adding ice to the mixer.



Design of a weighing screw conveyor

Heavy-duty weighing hopper

Ice Handling Equipment

Screw Conveyor
A screw conveying system is an economical and reliable solution to transport ice. Two batching plants can be supplied simultaneously while connected with the ice storage through screw conveyors.
In order to provide highest flexibility, KTI offers a wide range of various diameters and lengths, covering all requirements.
Several delivery screw conveyors can be installed after one another and the ice can be discharged to the final remote discharge point.

Slide Gate
The heavy-duty slide gates in the reliable and established KTI design are a must for a proper handling of ice. The slide gates are attached to the end of the screw conveyors and serve as a separator to keep the ice inside a certain closed section. More important, they also lock out the warm ambient air and prevent the ice from clogging due to melting.

Ice Discharge System
The discharge screw system is located directly under the MIS connected by an intermediate hopper which collects the ice. A discharge screw conveyor consists of a double trough system, which allows to convey the ice to two outlets simultaneously. Special designs provide even three outlets, where a blower for pneumatic delivery can be connected as well.

Delivery screw conveyor with weighing hopper

Pneumatically operated heavy-duty slide gate

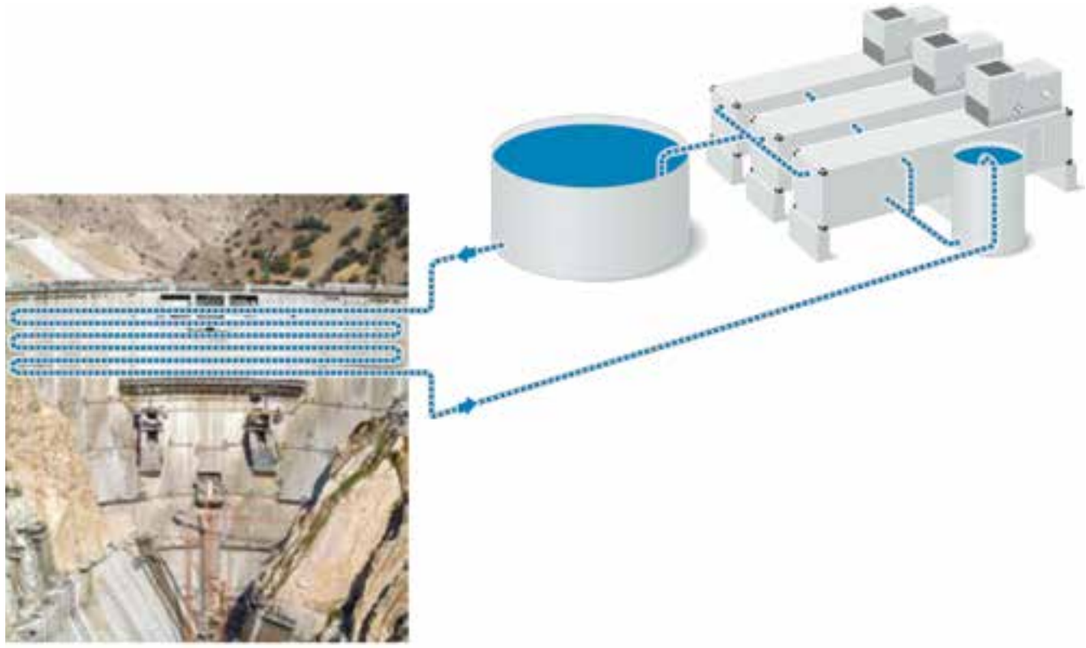
Double discharge screw conveyor

Pneumatic Ice Delivery System

All components and parts of the pneumatic ice delivery system are pre-assembled in a steel frame or separate container, which can be used as the foundation for a setup.
The pneumatic ice delivery system gives the possibility to transport flake ice as needed over long distances to the batching plants.
The location of the ice plant is not as important as it is when screw conveyors are used as the ice is blown through flexible air ducts which can be designed and even changed according to the customer's needs.
A pneumatic ice delivery system consists of a high-performance blower station to create the required air flow. In this, a rotary valve doses the ice which is previously weighed by a weighing screw conveyor. At the final point, e.g. over the concrete mixer, a cyclone receiver separates the ice from the air. Optionally, a diverter valve can be installed for multi-location applications.

Post-Cooling Systems

Massive concrete elements or mass concrete constructions like dams are likely to be affected by thermal cracking due to the generated heat of hydration – even with temperature controlled fresh concrete. Therefore, depending on the design of a dam, it might be required to cool the concrete after it has been poured from the inside and to reject the heat with cold water.
An effective method is to control the temperature inside the mass concrete structure by post-cooling it. This is done by pumping cold water through a pipe cooling system embedded inside the dam. For this purpose, KTI's regular Containerized Cold Water Plants (CCWP) are used. These chillers are built similar to the chillers for cooling the mixing water. The water outlet temperature from the chiller is approx. 3 °C, the return temperature usually about 10 to 15 °C. The water is re-chilled and fed again into an intermediate tank, from where it is pumped through the system and returned. This circular water flow through the embedded pipes inside the dam stays for several weeks up to years until a defined target temperature is reached.
A big advantage provided by KTI's containerized solutions is their flexibility and facilitated transportability. The plants can be easily and frequently relocated during the construction of the dam depending on the progress of the works. This enables a relocation of the plants through all levels of the dam until its final height is reached.



Principle of post-cooling systems for mass concrete constructions

Cold water plants with re-circulation water basin for post-cooling

Cold water plants on the edge of a hydropower dam

Multiple locations of KTI's post-cooling equipment

CombiMaster
(Type: CM)

Your Advantages

- **All-in-one system providing cold or hot water & air**
- **All year-round operation possible with only one plant**
- **Optimal temperature controlled concrete throughout all seasons**
- **Highest flexibility due to compact containerized installation**
- **Highest efficiency for low operation costs**

KTI Design

The CombiMaster is the only solution on the market to use both the air and water as a cooling and heating medium. While cold or hot air is blown into the existing bins or silos of the concrete batching plant to cool or heat the aggregates, cold or hot water can be added to the mixer directly. This is the most cost-effective solution to ensure the desired concrete temperature – in summer as in winter.
As the CombiMaster is a combined cooling and heating plant, a refrigeration cycle and two heating plants are installed – the basis are the reliable chiller and air plants of KTI and the systems HWS (Hot Water Station) and OLH (Hot Air Plant) of the SAUTER series. As all equipment is installed inside and on top of a container, its footprint is very small – just a 40-ft-container.

Latest design of the CombiMaster – Live image on top

Hot & Cold Environments

Climate change is resulting in increasingly hot summers and sudden periods of intensive cold in winter. Building contractors are under constant economic pressure. At the same time, building projects must be completed within ever-shorter time frames. Building has become a round-the-year activity.
The Combined Cooling and Heating Plant, KTI SAUTER CombiMaster (CM) is the ideal solution, specifically designed for these purposes. The CombiMaster combines two competences in one plant, KTI's experience as the worldwide # 1 in concrete cooling systems, and excellence of the world's leader in concrete heating, SAUTER.

Technical Features – CM50

Cooling Mode		Heating Mode	
Installed Refrigeration Capacity	257 kW	**Installed Heating Capacity**	600 kW
Cold Water Capacity	5 m³/h	**Hot Water Capacity**	5 m³/h
Cold Water Temperature	4 °C	**Hot Water Temperature**	85 °C
Water Inlet temperature	15 °C max.	**Water Inlet temperature**	5 °C min.
Cold Air Capacity	177 kW	**Hot Air Capacity**	300 kW
Cold Air Temperature	7 °C (@max. Ambient Temp)	**Hot Air Temperature**	130 °C (@min. Ambient Temp)
Ambient Air Temperature	35 °C max.	**Ambient Air Temperature**	-10 °C min.

Technical Dimensions	
Container Size	40-ft HC + chiller on top
Air Ducting	DN400
Water Piping	DN65

For higher production capacities of 80m³ concrete per day, the CM80 is available. Please contact your KTI and/or SAUTER sales partner.

Cooling and Heating Solution in One Hand

In mega projects like the building of hydropower dams or airports, the construction works last over several years. Over the entire year certain temperature limits of the fresh concrete must not be exceeded to achieve optimal strength and durability.
KTI offers holistic plant setups comprising concrete cooling and heating equipment to deliver an all-year-round solutions. KTI's SAUTER series, a broad portfolio of heating equipment, is available. This enables KTI's engineers to advise and design an entire setup covering all demands in terms of temperature controlled concrete.

KTI's SAUTER series comprises the following plant types:

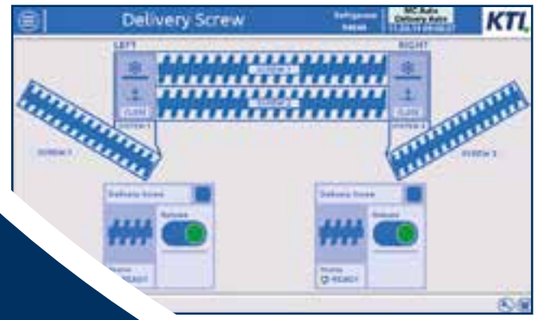
- **HWS (Hot Water Station)**
- **OLH (Air Heater)**
- **TURBO (Hot Air and Hot Water Generation with highest efficiency)**
- **BOOSTER (Hot Air and Hot Water for inside use through exhaust-free design)**

With KTI concrete heating equipment aggregate heating and sand heating is possible. Furthermore, the hot water station provides up to 85 °C mixing water.
Concreting in wintry conditions is not a problem anymore.

SAUTER

KTI-CONTROL
New User Interface

All KTI concrete cooling systems are equipped with the same user interface. The handling is very easy and all functionalities are subdivided in a logical way. Remote access is available and the system is multilingual, of course. Customization is also possible. Behind this user-friendly interface, a Siemens PLC – well-known for its reliability and its optimized functionalities – is installed.



Your Advantages

- KTI interface included in all KTI plants
- User-friendly touch panel in various languages
- Remote control for all plants available
- Siemens PLC for highest reliability and optimized functionalities
- Intuitive design for simple operation
- Customized sub-pages

KTI-ONLINE
Remote Monitoring System

Monitor your KTI plant with KTI-ONLINE by using your smart phone, tablet or a standard desktop computer. The browser-independent visualization mirrors the panel screen of the KTI plant on your device and informs you about the plant's current status.
In case of alarms, KTI-ONLINE enables you to analyze the situation and identify the root cause remotely. Further, the action to be taken to remedy the misfunction can be decided without necessarily visiting the KTI plant and directly delegated to the operator in charge. Remote monitoring is a vital function in the area of plant and system operation. KTI offers you the remote module for a safe monitoring of your system as an option of your KTI plant. This can also be integrated into existing systems with a PLC controller as a system upgrade.
The remote maintenance system is completely integrated into the system control cabinet and connected directly to the PLC controller. The connection to the internet is established via a fixed network or via a mobile telephone network (SIM card) – it is therefore largely independent of the system location.

Benefits of KTI-ONLINE

- **Easy support for optimization of parameters, software updates and troubleshooting**
- **Alarm signaling via E-mail or SMS (optional)**
- **Remote control of systems (optional)**

Your Advantages

- After entering the web address or scanning the QR-code, all data from your plant is available in real time
- Usable with all common browsers and standard internet access
- Secure access and connection
- Optimized for mobile phones or tablets
- Neither additional software nor IT-knowledge required
- Retrofittable with all PLC controlled KTI plants

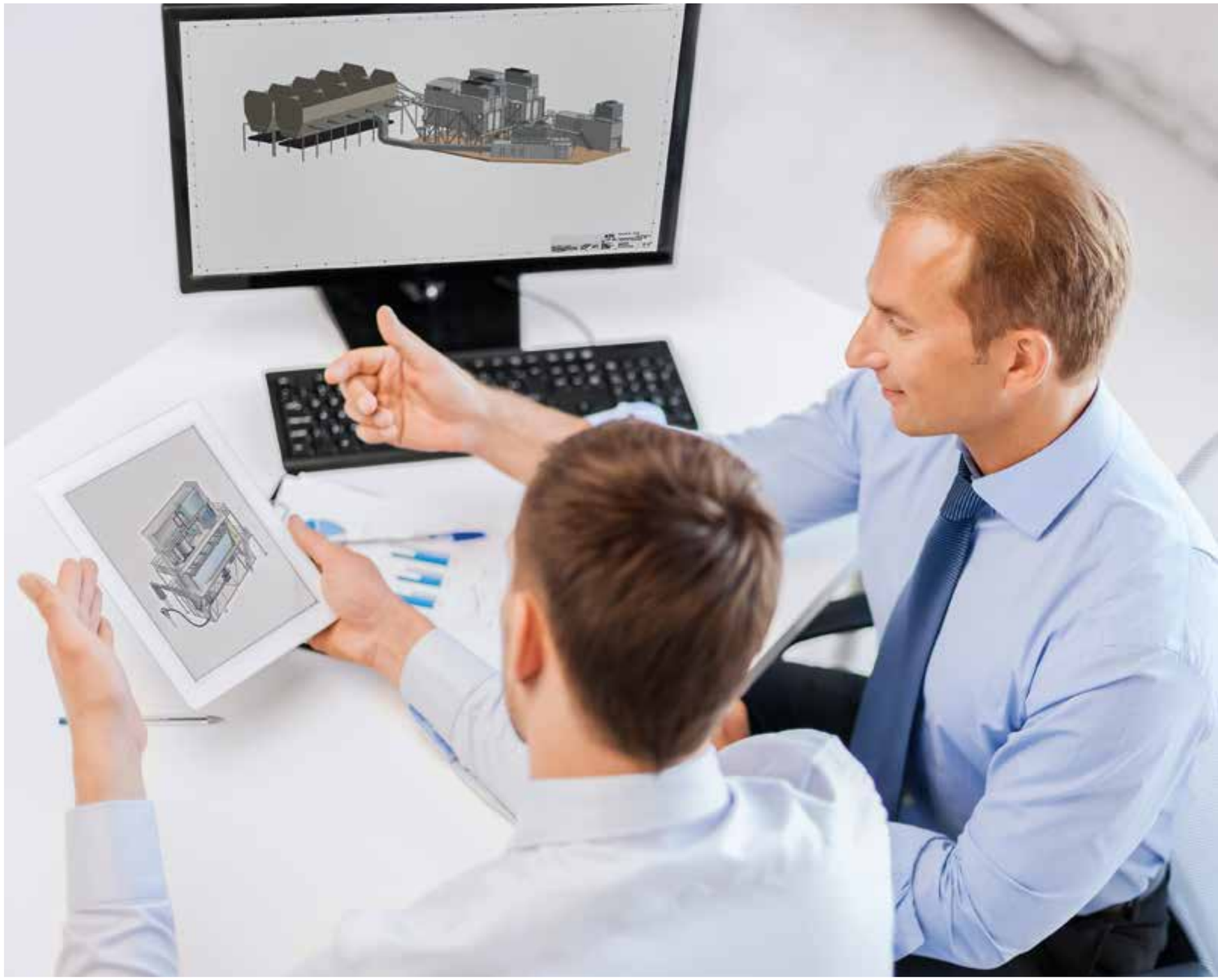
KTI Engineering & Advisory

More than 30 years engineering expertise for optimal advisory

- **Engineering excellence –**
  we utilize our fundamental know-how & experience
- **Technical advisory –**
  we consult our customers for an optimal design
- **Custom-made design –**
  we deliver exactly what our customers require
- **Design-to-cost –**
  we take care about the value for our customers
- **Modular setups –**
  we generate flexibility to our customers
- **Reliability through quality –**
  we deliver proven systems for secure operations

Successful Concrete Cooling Projects

- **We calculate the required cooling requirements**
  with our own software KEP©
- **We advise on cooling equipment necessary to achieve**
  the target temperature
- **We provide comparison in terms of technology**
  and energy efficient operations
- **We elaborate comprehensive solutions**
  for extraordinary and complex projects
- **We implement the entire cooling equipment**
  into the concrete batch system of our customers



Excellent Service and After Sales

„Excellent service and maximum availability of spare parts is crucial for us to guarantee our customers‘ satisfaction!“

Made in Germany

ENERGY EFFICIENT REFRIGERATION

Our Strength

- Dedicated to customer care
- Worldwide service network
- Highly qualified teams of service engineers and technicians
- Efficient fleet of fully equipped service cars
- KTI´s own spare parts warehouses in Balzheim, Dubai, Doha, Dammam, Jeddah, Riyadh and Sao Paolo
- 24/7 availability
- Training centers in Dubai and Germany
- Training of service staff and customer personnel by German engineers according to German regulations

Complementing our portfolio of turnkey industrial refrigeration & heating solutions, KTI-Plersch Kältetechnik GmbH offers highly professional technical support and after sales services. For over 30 years, KTI employs comprehensively qualified teams of professional engineering masters and service technicians worldwide.
KTI has set up service centers including warehouses for spare parts in Germany, U.A.E., Qatar, Saudi Arabia and Brazil to guarantee support for all customers. This enables us to minimize our respond and on-site arrival times. Working very closely, KTI's headquarter, overseas offices, branches, and agencies, provide an unique customer-focused after sales service – highly reliable, everywhere in the world, all year round.
Safeguarding customer satisfaction by delivering excellent service is KTI's highest priority.

Your Benefits

- KTI service mentality
- German quality standard
- Enhanced reliability
- Optimized running costs
- Longer life expectancy
- Minimized breakdowns
- 100% spare parts availability
- Permanent service availability
- On-site and inhouse training
- Service contracts

Lifecycle Service Portfolio

Inspections & Service

Maintenance

Genuine Spare Parts

Service Contracts

Remote Monitoring

Overhauls

Relocation

Plant Shut-Downs & Start-Ups

Training

Service Facilities

KTI GERMANY

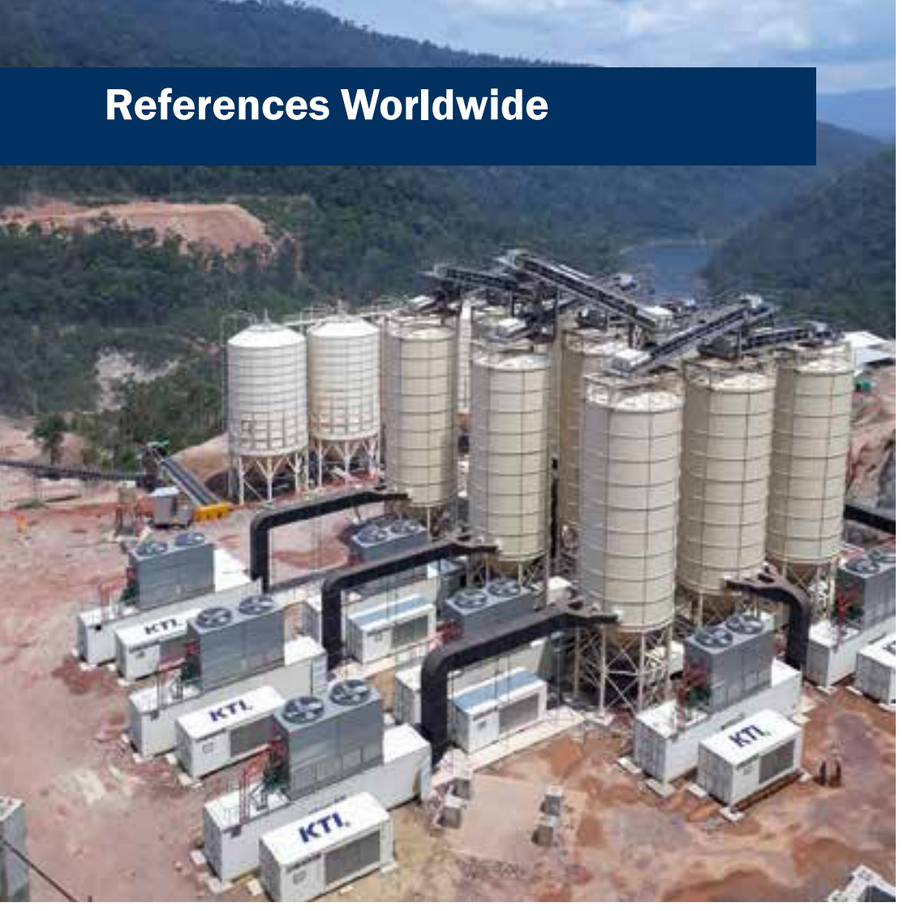
KTI QATAR

KTI DUBAI

KTI SAUDI

References Worldwide

References Worldwide













KTI Production Facilities

KTI Headquarter and Production Facility in Germany

Production Facility in Dubai

Important Details, Units and Conversions

Container dimensions	width [ft.]	length [ft.]	height [ft.]	width [mm]	length [mm]	height [mm]
20-ft. Container Standard	8	20	8,5	2438	6096	2591
20-ft. Container High-Cube	8	20	9,5	2438	6096	2896
40-ft. Container Standard	8	40	8,5	2438	12192	2591
40-ft. Container High-Cube	8	40	9,5	2438	12192	2896

Lengths					
meter	1m =	39,4 in =	3,28 ft. =	1,094 yd =	100 cm
yard	1 yd =	36 in =	3,00 ft. =	0,914 m =	91,4 cm
foot	1 ft =	12 in =	0,333 yd	0,305 m =	30,5 cm
inch	1 in =	25,4 mm			

Area					
square meter	1 sqm =	1552 in^2 =	10,9 $ft.^2$ =	1,196 yd^2 =	10000 cm^2
square yard	1 sqyd =	1296 in^2 =	9,0 $ft.^2$ =	0,8360 m^2 =	8360 cm^2
square foot	1 sqft =	144 in^2 =	0,1111 yd^2 =	0,0929 m^2 =	929 cm^2

Volume						
cubicmeter	1 m^3 =	1.000 l =	35,31 $ft.^3$ =	1,308 yd^3 =	264 US-Gal =	220 Imp-Gal
cubicyard	1 yd^3 =	765 l =	0,7646 m^3 =	27 ft^3 =	202 US-Gal =	168 Imp-Gal
cubic-foot	1 $ft.^3$ =	28,3 l =	0,0283 m^3 =	0,037 yd^3 =	7,481 US-Gal =	6,229 Imp-Gal
liter	1 l =		0,0353 $ft.^3$ =		0,264 US-Gal =	0,220 Imp-Gal
US-Gallon	1 US-Gal =	3,785 l	0,1337 $ft.^3$ =			0,8327 Imp-Gal
Imperial Gallon	1 Imp-Gal =	4,546 l	0,1605 $ft.^3$ =		1,201 US-Gal =	

Weight / Force				
kilogram	1 kg =	9,81 N =	2,205 lbs =	35,3 oz
Newton	1 N =	0,102 kg		
pound	1 lb =	0,454 kg =	4,45 N =	16 oz
ounce	1 oz =	28,35g =	0,063 lb	

Pressure				
bar	1 bar =	1 kg / cm^2 =	1000 mbar	14,504 psi
pound per square inch	1 psi =	0,06895 bar =	68,95 mbar	6,90 kPa
Water Column	1 m WC =	98,1 mbar	39,4 in WC	
Pascal	1 PA =	0,01 mbar =	1,00 N/m^2	0,102 mm WC

Energy					
Kilowatt-hour	1 kWh =	860 kcal =	3600 kJ =	3413 Btu =	0,012 ref.ton-day

Power					
Kilowatt - thermal	1 kW =	860 kcal / h =	3600 kJ / h =	0,2846 US tons.	0,2572 Br. tons.
Kilowatt - mechanical	1 kW =	1,36 PS =	1,341 HP		
US refrigeration ton	1 US ton =	3,513 kW =	3.024 kcal/ h =	0,9037 Br. tons	
British refrigeration ton	1 Br. ton =	3,888 kW =	3.340 kcal/ h =	1,1045 US tons	

Temperature		
Kelvin	1 K =	1,8 F
Fahrenheit	1 F =	0,556 K
Centigrade	°C =	(°F - 32) * 5/9
Fahrenheit	°F =	(°C * 9/5) + 32