Milk Cooling & Storage Solutions

Intelligent cooling systems - freeze energy costs

GEA engineering for a better world

gea.com

Image source: iStock

Overview

Your cows produce precious milk every day and fundamental to the task of collection, is the storage.

Milk quality can only be guaranteed when the milk cooling process is efficient and reliable. The refrigeration of milk is essential to maintain its quality, prevent bacterial growth and ensure high quality milk for processing. Whether it is a standard solution for storage of milk or an integrated solution which takes in smart controls, snap chilling, energy saving and heat recovery, GEA has a solution to meet your cooling needs.

Intelligent cooling strategies, individually tailored

GEA provides you with the perfect, long lasting cooling strategy. Ensure that your milk is of the highest quality while minimising energy use and ongoing operating costs at the same time.

Also take advantage of the extensive selection of tank variants and volumes. In combination with high-performance cooling units, the entire system can be individually tailored to your production method from the milking parlour to the tank. Compatible heat recovery systems also transform your cooling system into a small power plant. Produce free hot water, purely as a sideline and at zero expense!

Content

- Documentation of all running processes including the individual cooling phases, agitation processes and cleaning intervals over long periods of time
- ICool Analyzer provides information on factors such as capacity trends, temperature values, agitation processes, the status of up to four cooling units and the last hundred washing phases directly on screen, as well as the original data for further analysis. Data can also be stored up to 10 years on a USB stick.
- The electricity meter and digital dipstick can be used to monitor energy usage and its relationship to milk volumes during cooling and cleaning in order to help you develop optimisation strategies
- Seamless integration into GEA herd management systems
- Safety thermostat ensures complete safety and prevents the milk from freezing
- Ergonomic design for simple, convenient operation and fast access to components during maintenance.

ICool – Intelligent milk management

Clever control unit ensures maximum milk safety

Food safety is a hot topic for the modern milk industry, but intelligent management and precise controls right on the tank can make things an awful lot easier. ICool is the latest generation of tank control units from GEA, specifically designed to support you as a milk producer maximise your business' potential.

Secure monitoring, documentation and valuable energy savings

ICool not only cools, homogenises and monitors your valuable milk yields automatically, it also provides comprehensive documentation of storage and tank hygiene data. So you can face the future with confidence, safe in the knowledge that the tailored functions will allow you to react flexibly to the ever-shifting standards of processors and dairies. The intelligent ICool control unit's low consumption values mean that it is also incredibly energy-efficient. Because sustainably produced milk and proven, documented quality are the keys to achieving the highest profits!

Simple to use

The main screens on the touchscreen monitor can be used to tailor the central cooling, washing and milk collection processes to meet your business' unique requirements quickly and easily. The device's wide range of functions give you access to all parameters of the agitators, compressors, pumps and relays. Regardless of if you milk by group, in an AutoRotor or use an automatic system, you can configure your individual cooling centre clearly, conveniently and intuitively with just a few simple steps.

Alternative remote access via WebGate

Operate the ICool control unit and look inside your milk cooling tank right from the herd management office. Remote access via Ethernet and Internet enables you to analyse all system components and optimise your parameters easily, wherever you happen to be.

Up to the minute information via SMS

The optional GSM module adds a notification feature to the ICool control unit. If there is an error, you can have your staff notified automatically via SMS, so they can intervene quickly and ensure the problem is resolved as soon as possible.

FLEXIBLE:

ICool enables you to control every tank in the TCool and VCool series, regardless of volume. It can also be retrofitted onto older tanks currently using an Expert control unit in the near future. And to ensure that milk producers around the world can benefit from GEA's cooling expertise, ICool's functions are available in 22 different languages.

TCool – The horizontal cooling tank

Innovative energy balance for a high return all round.
Thanks to intelligent cooling the profits flow with the milk!

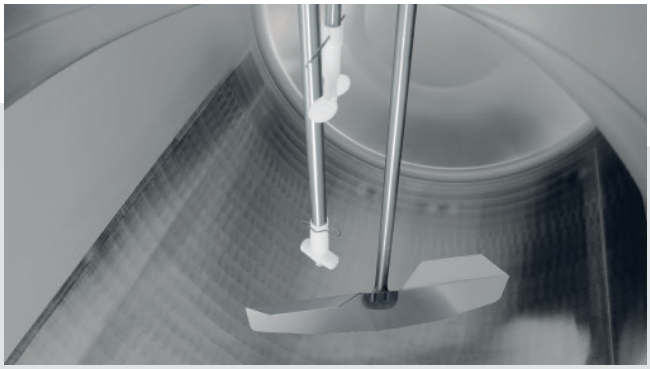
Invest in a cooling concept that guarantees the best results when it comes to milk quality, and simultaneously reduce energy consumption. Achieve maximum money for your milk with minimum energy costs with TCool!

From milking through to the arrival of the milk truck, the clever ICool control system keeps a close watch on all TCool parameters. The high-performance cooling units combined with the highly effective tank insulation reduces not only the milk temperature but also the operating costs to an ideal level. In addition, the unique cleaning procedure and the patented AED cleaning equipment guarantee excellent hygiene.

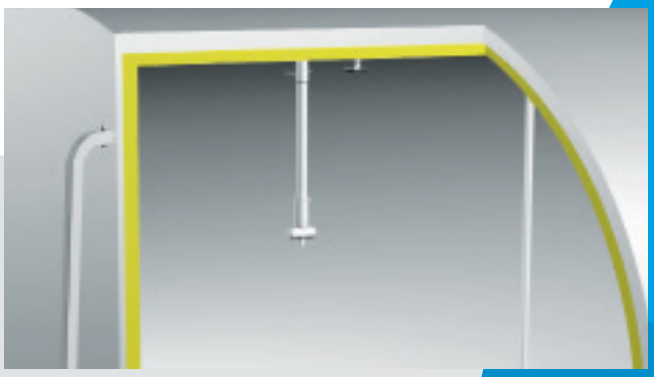
Finally, the investment in TCool remains manageable, as the high-performance equipment can be re-paid rapidly. Your profit flows with the milk and you reap the benefits!

Suitable preferred connection and safe hygiene:
Professional robot connection via patented 3-way valve technology separates water and milk during cleaning and milking processes

Concentrated cleaning down to the last millimetre:
The metering pumps measure acid and alkaline cleaning agents autonomously and always economically.
Optionally, a third metering pump can be used for disinfection.



Here everything revolves around the best milk quality:
The agitator stirs the milk gently and the spray nozzles ensure spotless cleaning at turbo speed. Depending on the tank volume, a 1 or 3-blade agitator is used.

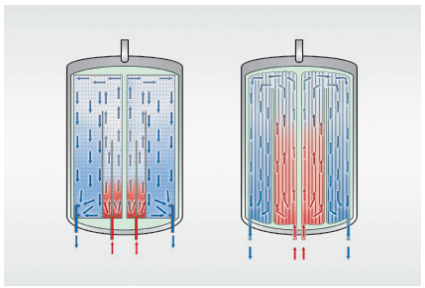


Fresh milk, packed in an energy-efficient way: The CFC-free insulation, which has an especially high density, maintains the milk at an ideal storage temperature over long periods of time and reduces the power consumption to a minimum.

A network of individual options

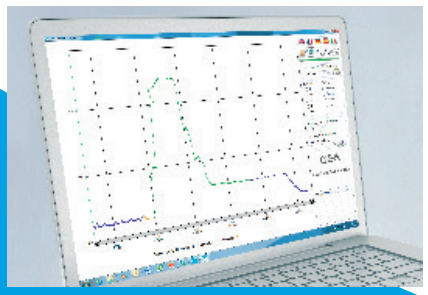
TCool stand is both an independent and high-performance cooling centre at the end of your production chain. Use the numerous equipment and connection options to integrate the TCool seamlessly into your herd management, the barn and operating concept!

Officially approved: The patented and digital dipstick records the quantity of milk automatically. The measuring method is recognised by numerous gauging offices.

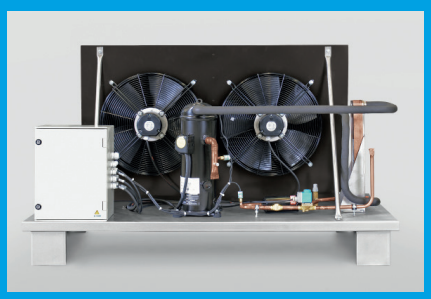


Innovative design for effective performance: STI and STIL evaporators cool the milk with minimum use of energy in the fastest possible way. With these evaporators you receive a durable, pressure resistant heat exchanger with highly efficient performance.

Safe cooling into the future with ICool: The intelligent tank control unit reliably cools, agitates and monitors your valuable, high-quality milk while you are waiting for it to be taken away from the farm. Regular cleaning intervals ensure the tank is kept as hygienic as possible. And ICool is already looking towards the future: all processes can be configured and adapted individually to suit changing requirements.



Excellent energy-efficiency, documented hygiene procedures: As ICool ensures that the cooling units and components are supplied with only the energy they need, it plays a key role in keeping your operation running as efficiently as possible. And the included ICool-Analyzer system keeps logs of all of the processes so you can generate detailed documentation as needed. See for yourself how convenient the functions and features of the ICool controller can be!



Designed to save energy: The scroll compressor and highly efficient condensers can be adjusted to the expected milk quantity. Altogether, 25 different cooling units with a refrigerating capacity between 3.82 and 30.7 kW/h and a milk cooling efficiency between 110 to 945 l/h are available.

A choice of tank volumes ranging from 1,010 to 33,500 litres in 24 variants is available.

Tank's volume ranges

Diameter (mm)	Litre	Height (mm)	Length (mm)
1,260	1,010	1,741	1,829
	1,500	1,733	2,339
	2,110	1,736	3,070
Diameter (mm)	Litre	Height (mm)	Length (mm)
1,510	2,500	2,020	2,406
	3,100	2,025	2,798
	3,600	2,030	3,104
	4,200	2,050	3,507
	5,200	2,060	4,147
	6,200	2,080	4,821
Diameter (mm)	Litre	Height (mm)	Length (mm)
1,785	5,000	2,299	3,083
	6,000	2,305	3,570
	7,000	2,333	4,058
	8,000	2,343	4,534
	9,000	2,359	5,012
	10,000	2,370	5,518
Diameter (mm)	Litre	Height (mm)	Length (mm)
2,250	10,000	2,805	3,905
	12,000	2,810	4,500
	15,000	2,815	5,385
	19,000	2,880	5,975
	25,000	2,921	8,362
	30,000*	2,977	10,010
Diameter (mm)	Litre	Height (mm)	Length (mm)
3,000	25,000	3,585	5,130
	30,000	3,610	5,980
	33,500	3,625	6,580

*The newly created 30,000 l tank is designed to be transportable in a container

THE FINAL RESULT IS WHAT ACTUALLY COUNTS:

The TCool cooling tank series combines individual volume with minimum use of energy and optimal hygiene standards. Ensure that your milk yield is of the highest quality and benefit from the maximum milk revenue for your farm!


GEA

VCool – Vertical cooling tank

Milk cooling in top form: Full yields in any weather.

VCool protects up to 40,000 litres of milk in weatherproof tanks outdoors. Through the vertical orientation the concept combines maximum storage capacity with minimum floor space.

Low space requirement, full yields: VCool represents a sustainable cooling concept that stores very large quantities of milk on a very small foot print. At the centre stands the vertically oriented tank with its robust casing of double-walled stainless steel. Equipped for all weather conditions, VCool is the stable solution for outdoor milk storage. With VCool you are ideally positioned because the evaporators, high-performance cooling units have been designed for the most sparing use of energy with the highest reliability at the same time. The high-quality insulation of the tank proves to be a particularly efficient component, ensuring that the ideal storage temperature is maintained over long periods. Therefore, completely cool the milk to the ideal storage temperature automatically after milking and put your energy costs on ice at the same time. The ICool control system monitors all processes, including cooling and agitation, and starts the integrated cleaning system for a high standard of hygiene with minimum water consumption.

With generous volumes of up to 40,000 litres, VCool is the ideal solution for all herd sizes. In addition, the flexible positioning of the tank opens up new perspectives in building planning.

Tailor-made to your requirements

VCool is available with two evaporators.

Tank volume VCool

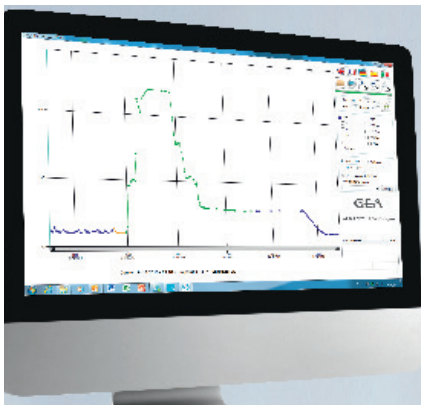
Outer diameter (mm)	Capacity (Litre)	Height (mm)	Hight with venting pipe (mm)	Weight without alcove (kg)
2,300	6,000	2,530	2,850	745
2,300	7,000	2,830	3,150	815
2,300	8,000	3,230	3,450	995
2,300	9,000	3,430	3,750	995
2,300	10,000	3,730	4,050	1,020
2,300	12,000	4,330	4,650	1,160
2,300	14,000	4,930	5,250	1,300
2,300	15,000	5,230	5,550	1,365
2,300	16,000	5,530	5,850	1,435
2,300	18,000	6,030	6,350	1,550
2,300	20,000	6,630	6,950	1,690
2,300	22,000	7,230	7,550	1,825
2,300	24,000	7,830	7,830	1,965

Tank volume VCool

Outer diameter (mm)	Capacity (Litre)	Height (mm)	Hight with venting pipe (mm)	Weight without alcove (kg)
3,000	10,000	2,600	2,830	1,185
3,000	12,000	2,900	3,130	1,333
3,000	15,000	3,450	3,680	1,500
3,000	18,000	3,900	4,130	1,650
3,000	20,000	4,260	4,490	1,770
3,000	25,000	5,072	5,302	2,025
3,000	30,000	5,900	6,130	1,320
3,000	35,000	6,700	6,930	2,610
3,000	40,000	7,600	7,830	2,974

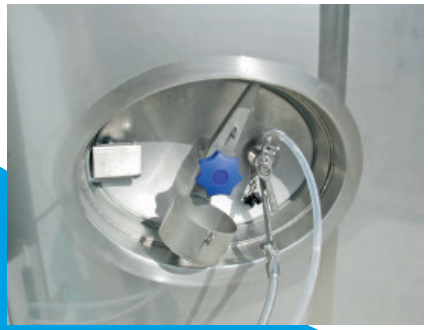
Best milk quality thanks to a team of specialists

With VCool all eyes are focussed on the milk quality, from both outside and inside. For minimum use of energy, the units communicate in a network, while all routine programs are started automatically and reliably.

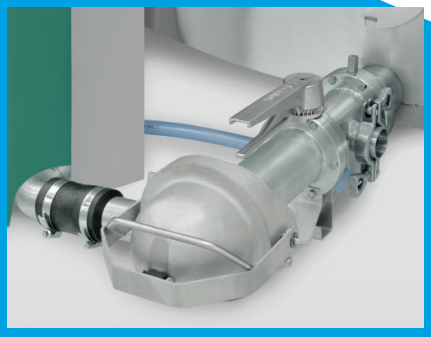


Seamless integration into operating processes: ICool can be fully integrated into your herd management system to provide a continuous data exchange. Plus, remote access and control features via a network or WebGate mean that you have a variety of options for monitoring the system and optimising parameters on the go. You can also have error messages sent as SMS notifications. Modernise your management system with ICool!

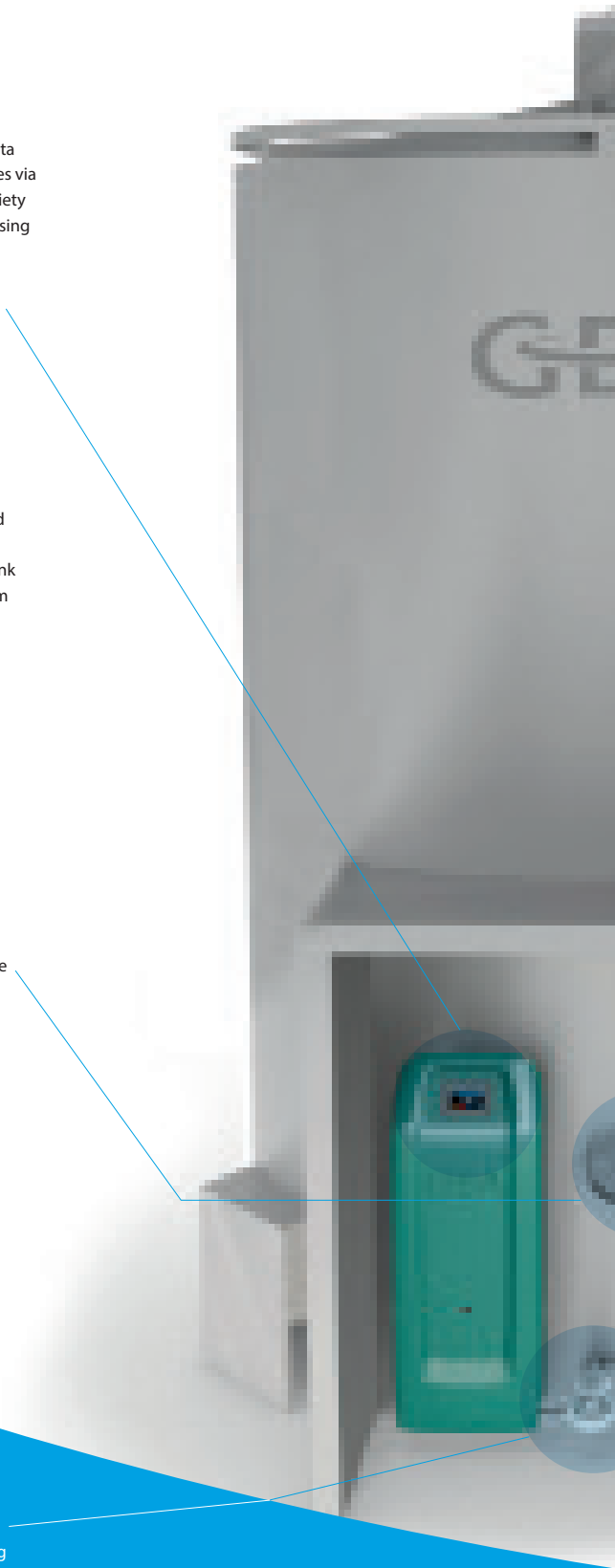
Flexible configuration for new construction and retrofitting: An extended outlet and a separately installed ICool tank control system enable the tank to be positioned at a certain spatial distance from the building.



Easy access when needed: The inspection hatch offers a view into the tank interior. Optionally, the hatch can be equipped with a sampling device.



Connected to suit your specific needs: The inflow and outflow of milk and water can be managed flexibly thanks to different connection options. Optionally equipped with a self-cleaning outlet.



Increase revenue with the right investment

All expenditure such as investments and feed, personnel and operating costs only pays off when the milk quality and, with it, the milk revenue are right. The intelligent cooling systems from GEA take into account all of these factors so that you can save.

Secured vent pipe: Reliably prevents contamination of the milk.

Innovation for optimum efficiency: Cooling units adapted to the cooling requirements enable a higher cooling capacity with simultaneously lower energy consumption.

For the best quality: Until the milk truck comes, gentle agitation keeps the milk in motion. The gentle stirring ensures that the texture of the valuable commodity remains uniform and homogeneous.

For perfect hygiene: Six high-performance nozzles ensure effective dynamics in the cleaning interval. Additionally, 4 separate in-line heating elements raise the water up to temperature in the main rinsing process. Minimum water consumption as well as economical metering of the cleaning agents are kept firmly under control by the ICool control system. In a final step the cone-shaped tank floor lets the milk and rinse water flow off quickly and completely.

ENERGY-SAVING TIP:

Use a heat recovery system, so that the heat emitted by the milk can be used for the hot water circuit or heating system!


GEA
CE
PCOOL

PCool – Small scale cooling tank

High efficiency for production that pays off, no matter what the size

Intelligent cooling all round, which translates into profit even for small scale operations

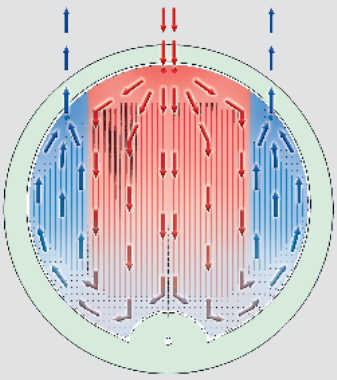
PCool milk cooling vats from GEA are an ideal solution for small-scale milk production and points where milk is collected. Ensuring that even small-scale production is profitable, the product series combines maximum efficiency and outstanding hygiene for volumes ranging from 320 litres up to 1,950 litres.

The faster the cooling, the better the milk!

Do not, therefore, give away even a litre of milk and place your trust in the sophisticated PCool concept: While the STI evaporator ensures ideal cooling efficiency, a programmable agitator gently keeps your milk in motion. The vat itself is manufactured from high-quality stainless steel and prevents temperature losses through its high-quality CFC-free polyurethane insulation. The A4 control system helps you keep an eye on all your processes - you can rely on it. Bundled dairy know-how pays off, as it is precisely in small-scale milk production that the quality of the milk ultimately determines its value.

Electric control unit – hygiene firmly under control

The A4 electric control unit keeps the desired temperature inside the vat constant via a thermostat. In addition, the user-friendly display can be used to programme the time intervals in which the agitator starts working and thus maintain the homogeneous texture of the milk. The automatic cooling delayed start during the first milking and the subsequent automatic monitoring of the cooling time, the milk is cooled in a product-friendly way throughout its entire storage time.



STI evaporator

Maximum heat exchange with minimum expenditure of energy: STI evaporators are the centrepiece of the PCool concept. You achieve the best possible exchange of heat by an ideal distribution of the refrigerant over the entire surface. In addition, the evaporators are extremely pressure-resistant and impress with their excellent oil return system.

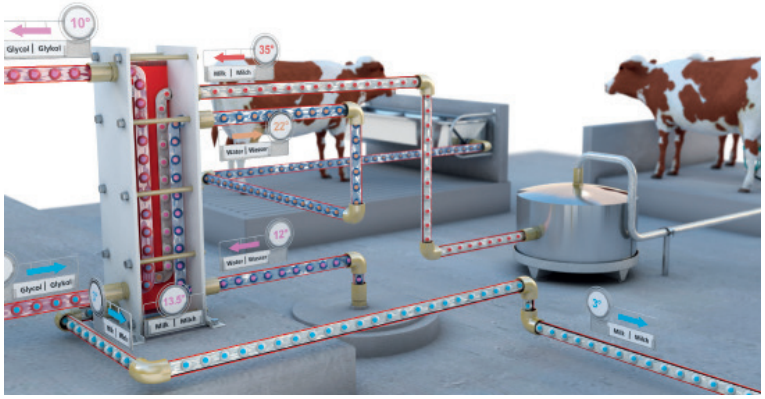
- Environmentally friendly start: Optional soft starters limit the starting current per compressor to 60%
- Heat recovery for maximum economy: The supplied heat recovery heats water for udder cleaning and further warm water usage
- Expandable for maximum output: With up to 3 XeCool, which can be controlled as a group via a sequencer, XeCool is equipped for the highest demands
- XeCool is a compact cooling unit whose speed and very high efficiency make an impression on dairy farmers thanks to their very low energy consumption. Developed for large herds, long milking times and up to 70% hourly outputs

XeCool – Rapid chilling solution

eXtra efficiency meets maXimum performance

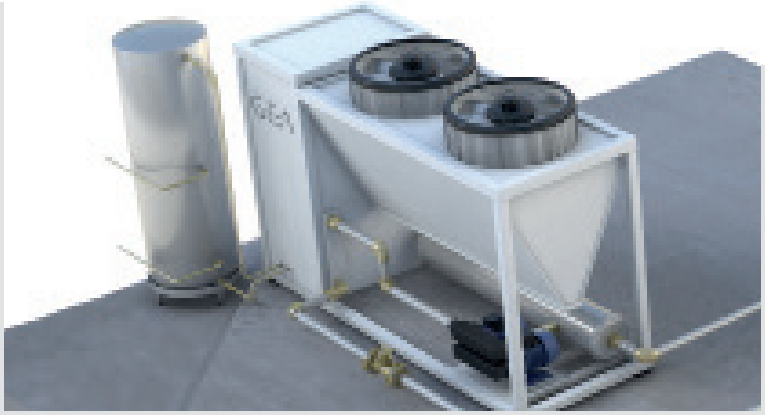
Enjoy eXtra efficiency with high milk flow

On large-scale farms today it is all about achieving more – larger herds, longer milking times, higher throughput. But anyone engaging in large-scale production must also have a suitable background setup. XeCool is the compact, rapid cooling system, whose capacity with the highest hourly outputs is designed for the cooling of large quantities of milk. But at the same time XeCool works with around 15 – 20% more energy efficiency than traditional systems. Still not enough? Then simply shift up a gear: By activating a pre-cooling stage you save up to 70% of the energy required for cooling altogether. Ultimately you can expect the best quality. Thanks to minimum operating costs your milk pays off on two counts!



At high speed into the milk cooling tank: XeCool cools 1,500 – 12,000 l/h milk from 37° C to 4° C.

Recognised efficiency (official EUROVENT certificate), to produce maximum profit: With the refrigerant R410A and a very powerful micro channel condenser, XeCool is 15 – 20% more energy efficient and achieves very low operating costs (below those of direct evaporator systems).



Save 70% of the energy by using pre-cooling: By integrating a water-powered pre-cooling stage the XeCool's work can be optimised and, depending on the water temperature, energy savings of up to 70% can be achieved.

aquaCHILL - Snap Chilling Solution

aquaCHILL is designed to help farmers meet cooling standards, ideal for a retrofit situation or a new install. aquaCHILL is a booster for your cooling system.

The advantages of aquaCHILL:

- Runs in tandem with existing vat chilling
- Hot water reclaim available
- A simpler solution means lower prices
- 'Plug and Play' solution (very little installation required)
- Can be moved from farm to farm if required
- Class leading energy efficiency (ERR)*

How does it work?

The aquaCHILL is a direct-on-line snap chilling system. What this means is that the power available for cooling at the Plate Heat Exchanger (PHE) is only what is produced by the chiller. The aquaCHILL only runs during milking.

The Glycol is circulated through the evaporator to the milk PHE and back to the buffer tank. The buffer tank provides a 'thermal shock absorber' and prevents compressor short cycling with milk pump switching.

*When compared to water or ice bank systems

What is included in the aquaCHILL package?

The aquaCHILL package is a 'plug and play' solution which requires minimal installation on site compared to any other snap chilling solution on the market.

All the required components are neatly assembled on a galvanized steel plinth and tested before delivery.

Components on the plinth are:

- Air-cooled water chiller with Ciat CONNECT2 controller
- Lowara 210/5 circulating pump
- Single bank Ecoflex NT50M 8000L Plate Heat Exchanger
- 500L Buffer Tank

The only installation required is diverting the milk line to the plinth mounted PHE and running power to the chiller from the switchboard. In an ideal installation the chiller can be installed and running between milkings.

Why Snap Chill Milk?

Milk starts to deteriorate the moment it is harvested from the cow.

Naturally occurring bacteria in the milk starts multiplying straight away and only cooling can slow the process down to preserve milk quality. Needless to say then, snap chilling milk has a number of fundamental benefits for both the milk producer and the processor.

High quality milk has a longer shelf life and can be processed into more high value products than raw milk that has higher levels of bacteria.

Milk Quality Compliance

- Bactoscan (bacteria count, milk chilling related)
- Thermoduric (heat resistant bacteria)
- Coliforms (wet weather / manure bacteria)

All of the above issues can be greatly improved by snap chilling and high grade heat recovery for maximum plant hygiene.

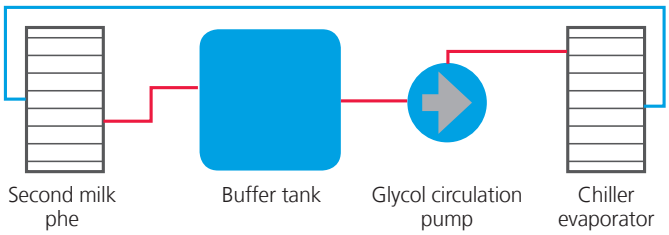
The regulatory standards requires milk to:

a) be cooled to 10°C or below within four hours of the commencement of milking; and
b) be cooled to 6°C or below within the sooner of:
   i) six hours from the commencement of milking, or
   ii) two hours from the completion of milking; and
c) be held at or below 6°C without freezing until collection or the next milking; and
d) must not exceed 10°C during subsequent milkings.

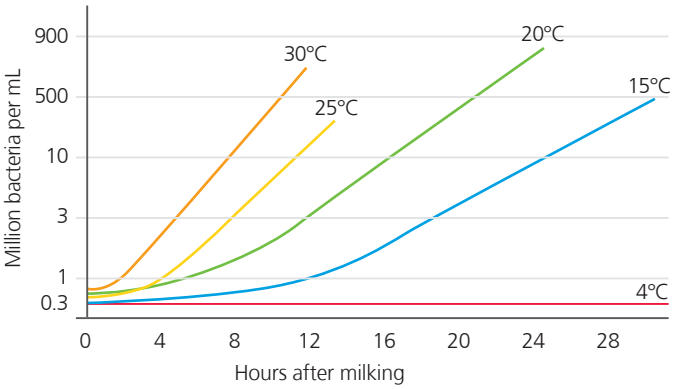
Key features

- Improved milk quality
- Assured milk processing compliance
- Future proof your farm in accordance with MPI compliance

HOW THE aquaCHILL SYSTEM WORKS



HOW CHILLING AFFECTS BACTERIA

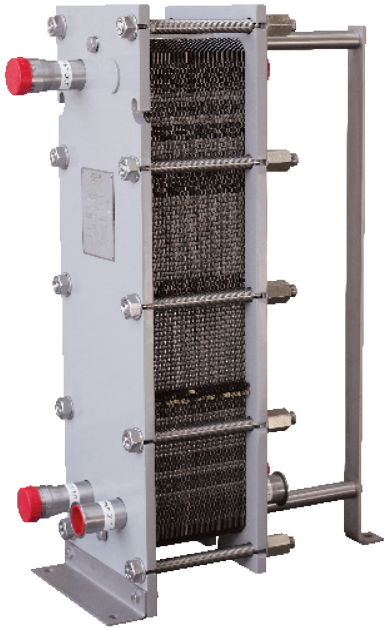


This graph above clearly demonstrates why milk processors insist on milk being chilled to 6°C or below as quickly as possible at the end of milking. The lower the milk temperature into the Bulk Milk Tank, the lower the bacteria or bacto count when the processor collects the milk.

Note: Below 10°C bacteria growth is seriously reduced and is practically stopped at 4°C.

Plate Heat Exchangers

Rapid exchange in a counterflow arrangement.



In your cooling system, focus on the highest efficiency throughout. The outstanding efficiency of GEA plate coolers impresses on two counts: Firstly, the flow-optimised profile of the cooling plates, which operate according to the counterflow principle, provides for outstanding cooling efficiency during milking. Secondly, the extremely low flow resistance during the cleaning process.

Usage as a primary and, if required, as a secondary model for rapid cooling:

- In the counterflow of 2L of water per litre of raw milk the milk temperature is cooled to a value of approx. 1°C above the water temperature*
- The water heated in the heat transfer can be used for other purposes, e.g. watering the cows

*Dependent on PHE type

Professional cooling, storage and delivery for maximum returns

Take advantage of globally recognised expertise across the entire cooling process. The intelligent cooling systems from GEA impress with their outstanding hygiene and exemplary energy balance. Also take advantage of the expert advice offered by our representatives and local GEA dealers. Joint, intensive planning enables your wishes to become reality.

With the professional solutions from GEA you achieve the highest returns for quality milk with low costs for ongoing operations.

Plate Heat Exchangers

Industrial Coolers

Single Bank Option

GEA Industrial Coolers are well suited to large installations. The coolers have less plates than traditional units. However the cooling surface area of each plate is greatly increased.

This has the advantage of fewer plates to service (lowering operating costs) while making the cooler a compact unit. The coolers provide very little backpressure, creating better cooling per litre of water. The cooler has 50mm tri-clover milk inlet and outlets with 50mm BSP water connection ports.

Double Bank Option

The Double Bank option has a primary and secondary cooling circuit built into a single compact cooler frame. This allows two liquids to be used to cool the milk.

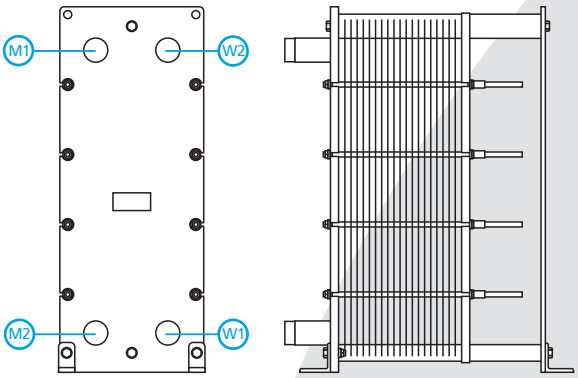
The primary connection typically carries ground water which reduces the milk temperature to within 2° C of the ground water temperature. The secondary cooling circuit typically carries glycol which reduces the milk temperature further. This is usually the same temperature as the milk which would be stored in the bulk tank.

The GEA range of industrial double bank plate coolers have been sized with additional capacity in the secondary bank to optimise the performance of all snap chilling solutions.

Both PHE options are available in a standard M frame or as a larger X frame.

The X frame allows you to chill milk to within 1°C of the chilling liquid. ie. 1°C difference in outlet temperature over 20,000L means you need 12kW less electrical consumption.

SINGLE BANK COOLER

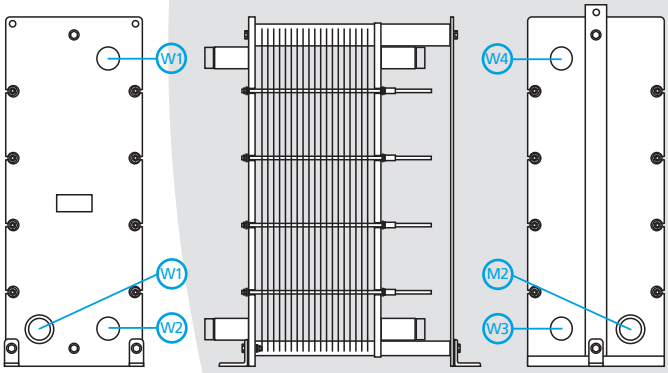


Front view Side view

Litre/Hr Milk	Litre/Hr Water
3000	6000
4000	8000
5000	10000
6000	12000
7000	14000
8000	16000
9000	18000
10000	20000
11000	22000
12000	24000
13000	26000

REF	Description
M1	Milk in
M2	Milk out
W1	Water in
W2	Water out

DOUBLE BANK COOLER



Front view Side view Rear view

Litre/Hr Milk	Litre/Hr Water
4000	8000
5000	10000
6000	12000
7000	14000
8000	16000
9000	18000
10000	20000

REF	Description
M1	Milk in
M2	Milk out
W1	Water in
W2	Water out
W3	Chilled water in
W4	Chilled water out

GEA buffer tank

Controlled intermediate stop for uninterrupted production

Clever parking, since every litre of milk counts

When using automatic milking systems, it is particularly important to bridge the time gap between the emptying of the milk cooling tank and the end of the cleaning interval. Here a buffer tank from GEA offers the ideal solution. Because instead of blocking access to the milking robot you are essentially parking the milk on the hard shoulder for a short time. Once all of the processes are finished, the control system directs the milk, freely flowing once again, into the milk cooling tank. The milk then flows automatically out of the buffer tank into this stream. Do not lose a single drop, as every litre of milk counts! With the buffer tank you can simply allow your cows to continue being milked, as you like. Stress-free, undisturbed and always in the habitual milking rhythm, the cows feel more at ease and produce the maximum quantity of milk.

Heat recovery system (HRI)

Absorbing and generating heat – each a specialist in their field

Generate free hot water

Your cows deliver not only a precious commodity but also valuable thermal energy. Exploit this free energy using the heat recovery system from GEA, and transform your cooling system into a thermal power plant, at virtually no cost. While your cooling system extracts the heat from the udder-warm milk to make it fit for storage, the heat recovery system exploits the released heat and stores it in the hot water tank with the greatest efficiency. Water temperatures up to 55° C can be easily achieved in this way. Depending on the quantity of milk and the hot water requirement, hot water tanks ranging from 100 litres up to 2,000 litres are available. Seize the chance: Use this hot water for cleaning the milking equipment or the TCool, or alternatively this free hot water can be used for a heating system.

A HOT WATER GENERATING PLANT, IN THE MIDDLE OF THE COOLING SYSTEM:

- In the layer system hot water is already available shortly after cooling begins
- High-quality insulation prevents heat loss, and anodes protect against corrosion
- Optional heating element ensures constant water temperature
- Upright tanks ranging from 200 l up to 2,000 l, operation via external plate heat exchanger
- Safety circuit as a preventive for lime and corrosion according to EN1717 standards and regulation drinking water ordinance


GEA

engineering for
a better world

We live our values.

Excellence · Passion · Integrity · Responsibility · GEA-versity

GEA is a global technology company with multi-billion euro sales operations in more than 50 countries. Founded in 1881 the company is one of the largest providers of innovative equipment and process technology. GEA is listed in the STOXX ® Europe 600 Index. In addition, the company is included in selected MSCI Global Sustainability Indexes.

GEA Australia
43-47 Northgate Drive
Thomastown
Victoria, Australia

Tel +61 3 8877 9999
Fax +61 3 9464 5455

1800 789 100
gea.com/contact