Dairy Practice Council 2020

Joint Task Force 1 & 5

On-Farm Milk Cooling, Storage & Controls 2020

Joint Task Force Sessions-Thursday, November 5th

8:30 a.m.-10:30 a.m. EST

TF 1 Farm Buildings & Equipment/TF 5 Milking Systems & Procedures

Topic: On-Farm Milk Cooling, Storage & Controls 2020 Guest Speakers: Chris Ancipink, Mike Kelley, and Rick McClenning, Paul Mueller Company

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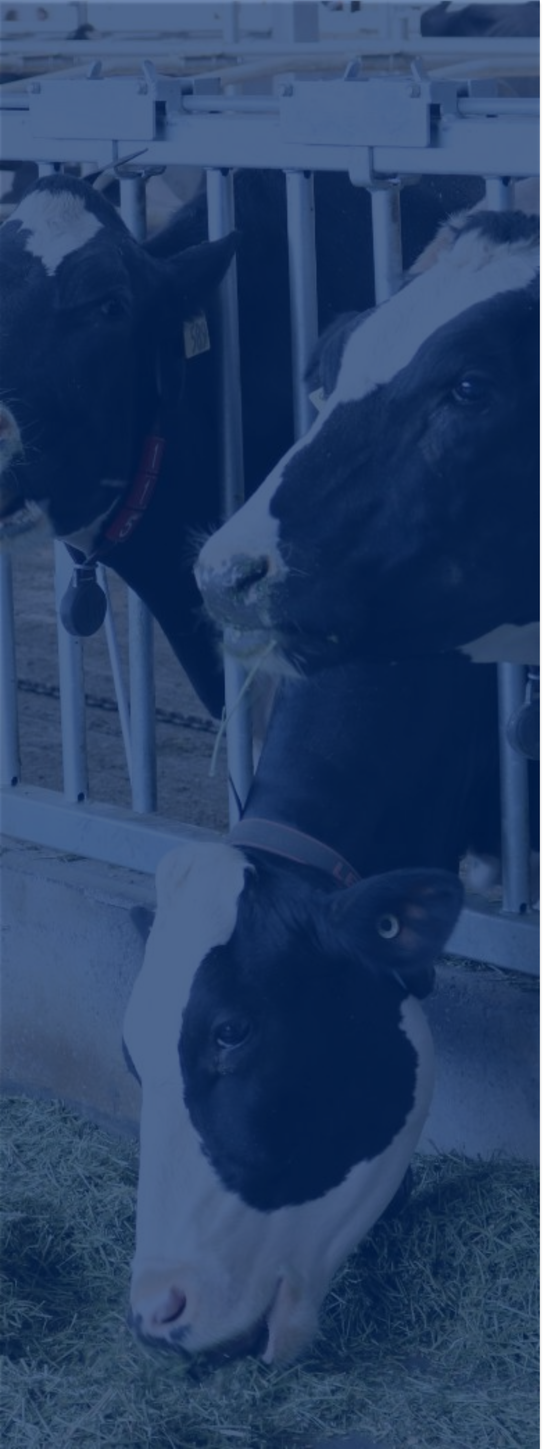

Milk Cooling - Past

Early methods of milk cooling: *Spring water or ice on heat transfer*

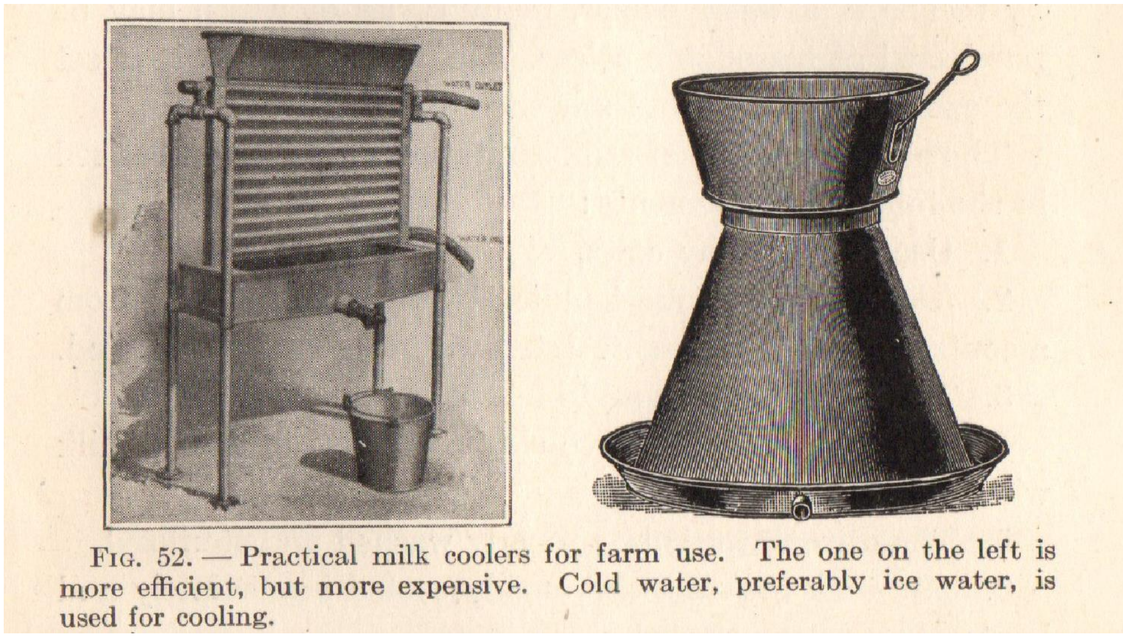

FIG. 52. — Practical milk coolers for farm use. The one on the left is more efficient, but more expensive. Cold water, preferably ice water, is used for cooling.

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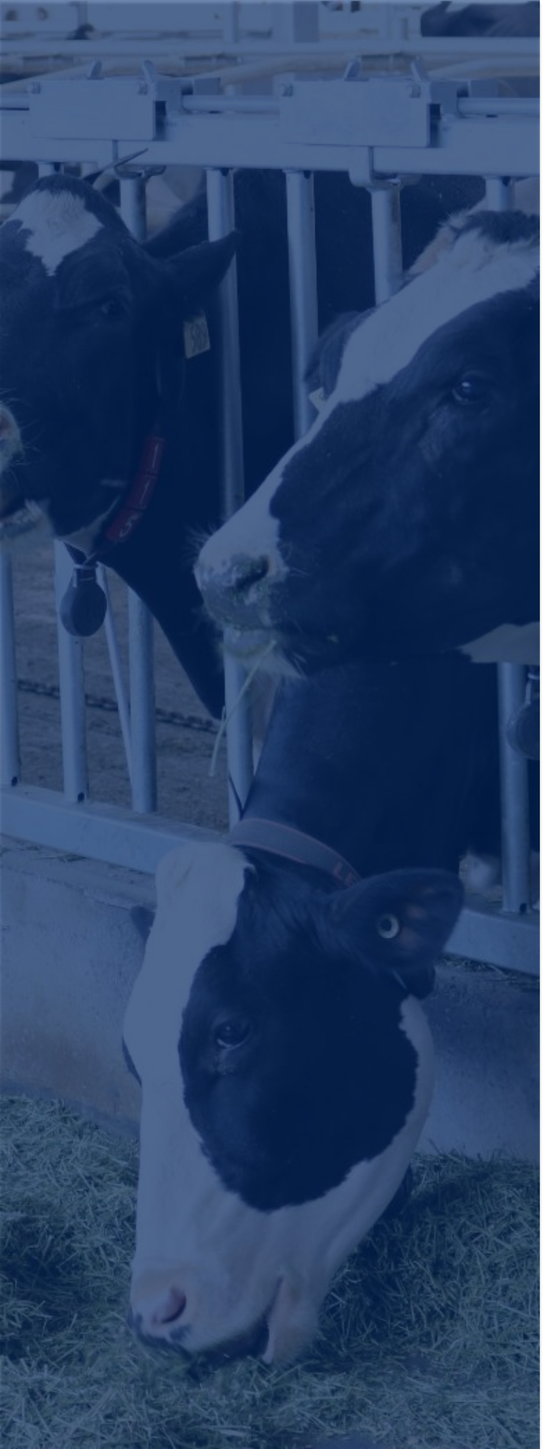

Milk Cooling - Past

Early Methods of Milk Cooling: *Can cooling with spring or well water*

FIG. 113.—Milk cooling tank, cover off to show arrangement of cans. All water pumped for the stock passes first through this tank. (Courtesy Minnesota Tank and Silo Co., Minneapolis, Minn.)

FIG. 114.—Milk cooling tank, cover in place. (Courtesy of Minnesota Tank and Silo Co., Minneapolis, Minn.)

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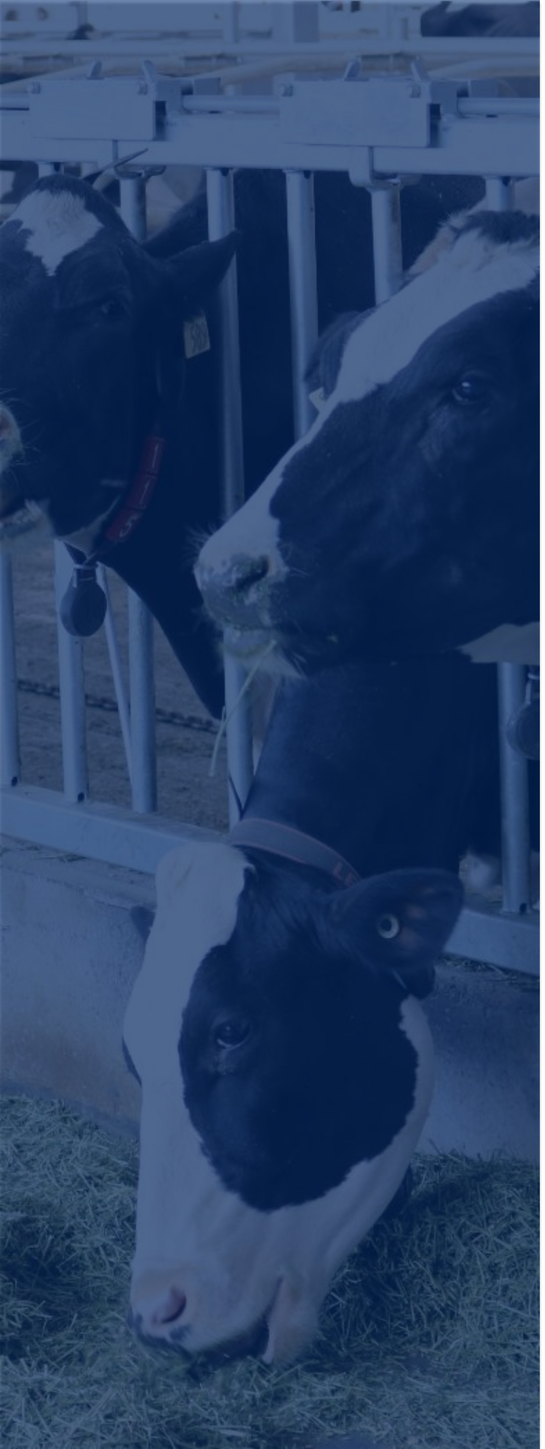
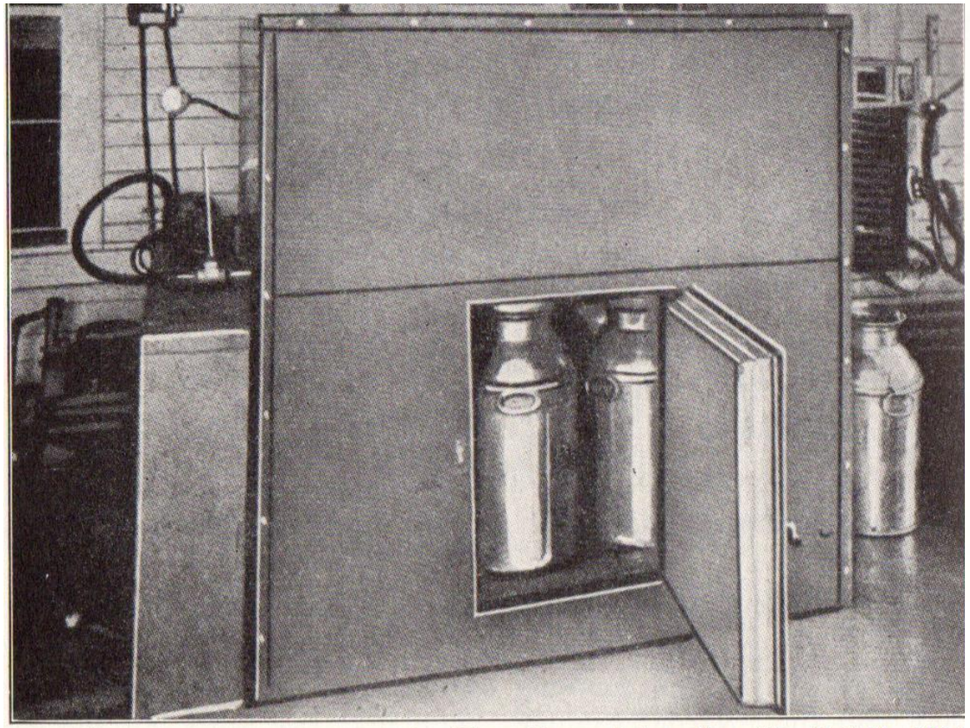


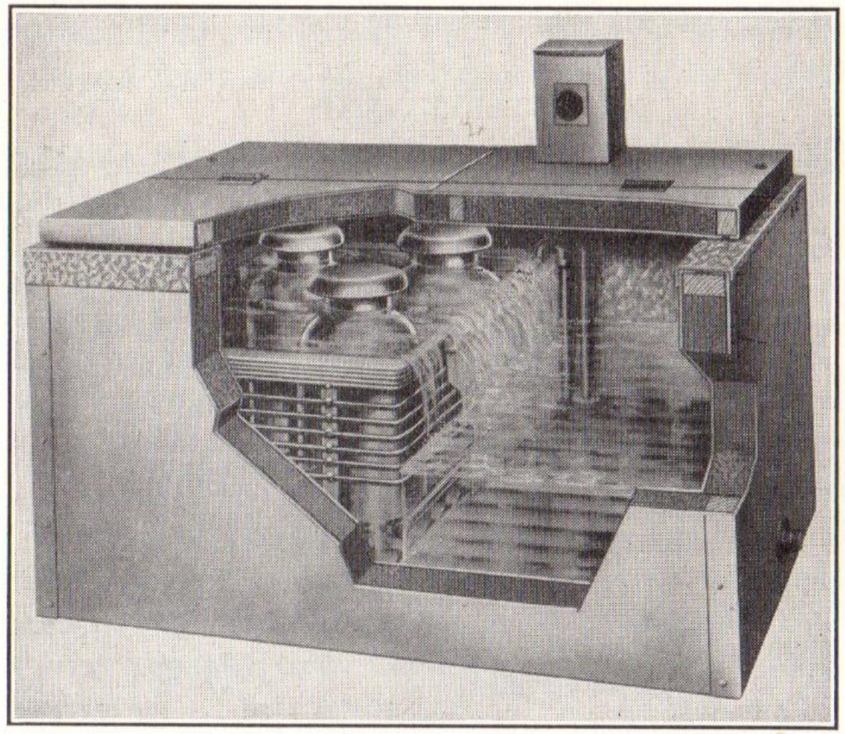
Milk Cooling - Past

Early Methods of Milk Cooling: *Can cooling with ice or refrigerated air*



(From Vermont Agr. Exp. Sta. Bulletin 300.)

FIG. 51. Dry-storage milk cooling unit.



(Courtesy of Esco Cabinet Company.)

FIG. 52. Cut-away view of a mechanical milk cooling tank.

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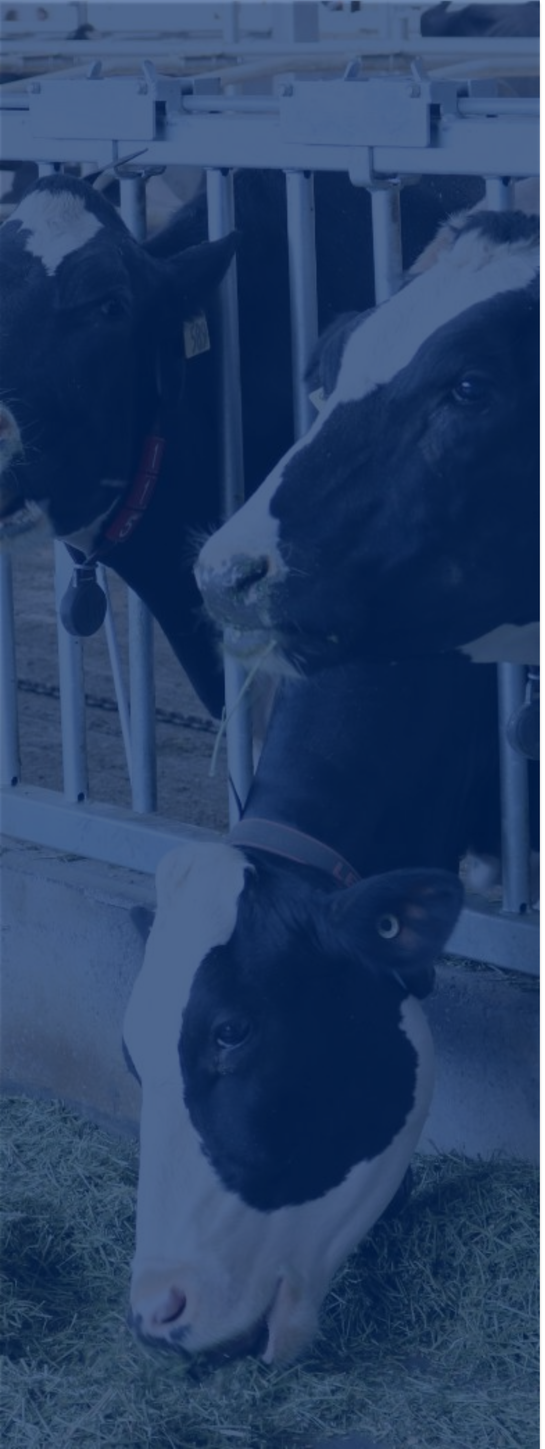

Milk Cooling - Past

Early Methods of Milk Cooling: *Ice-bank bulk milk tanks*

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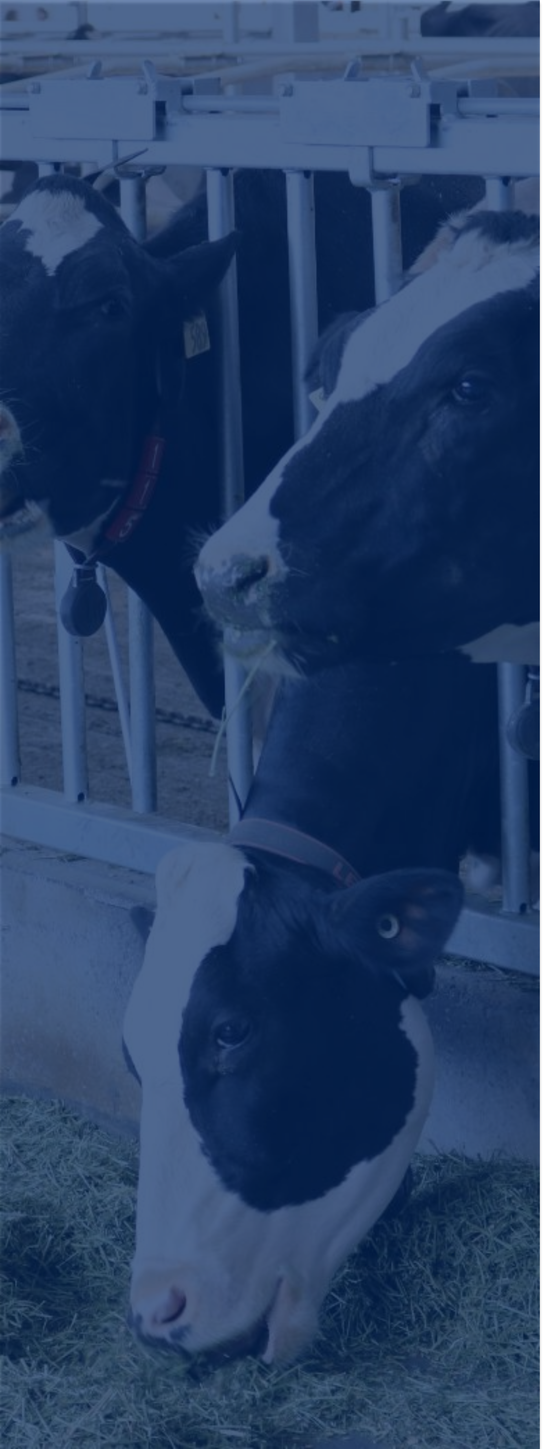

Milk Cooling - Past

Early Methods of Milk Cooling: *Flat-top bulk milk tanks w/ DX refrigerant*

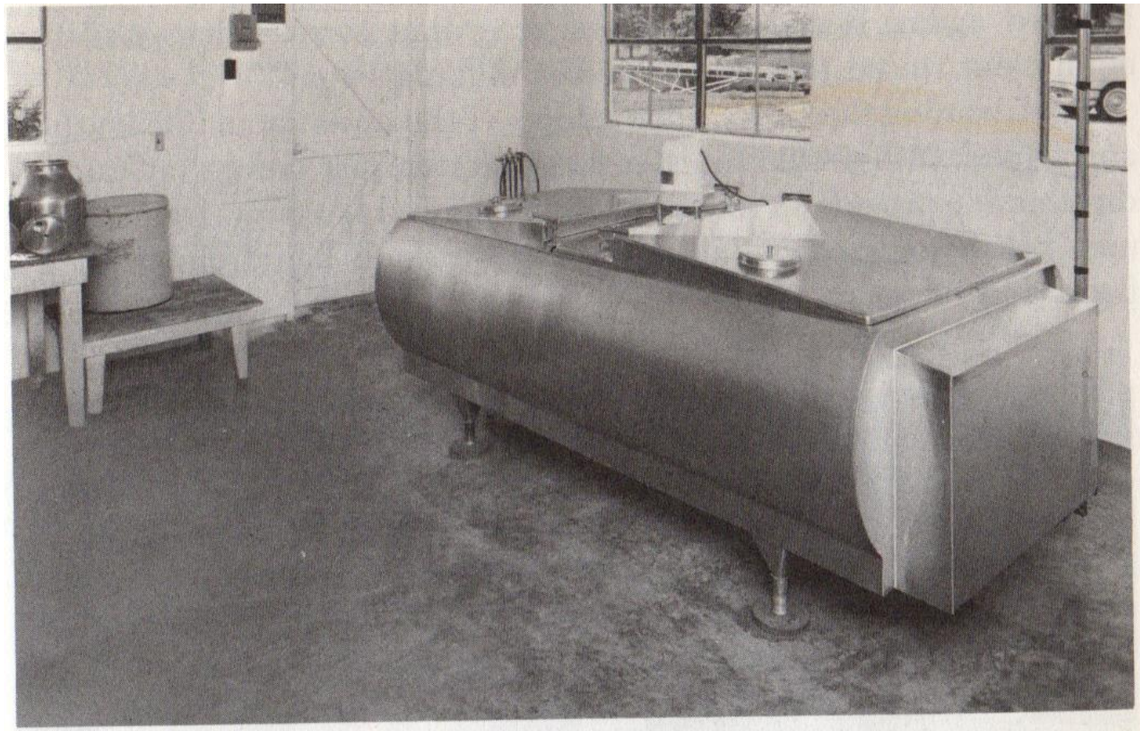

FIGURE 20-10. The bulk tank is washed, disinfected, and rinsed after the milk is removed. Notice the cleanliness of this milk room. (Mignard photo. Courtesy Paul Mueller Co.)

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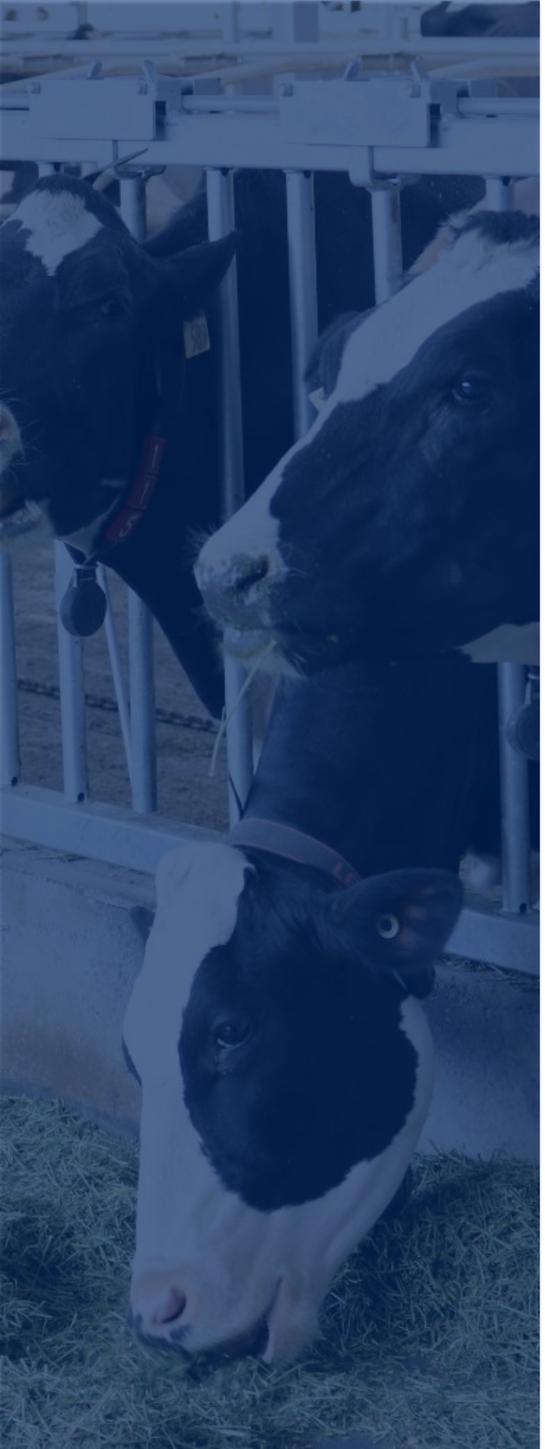

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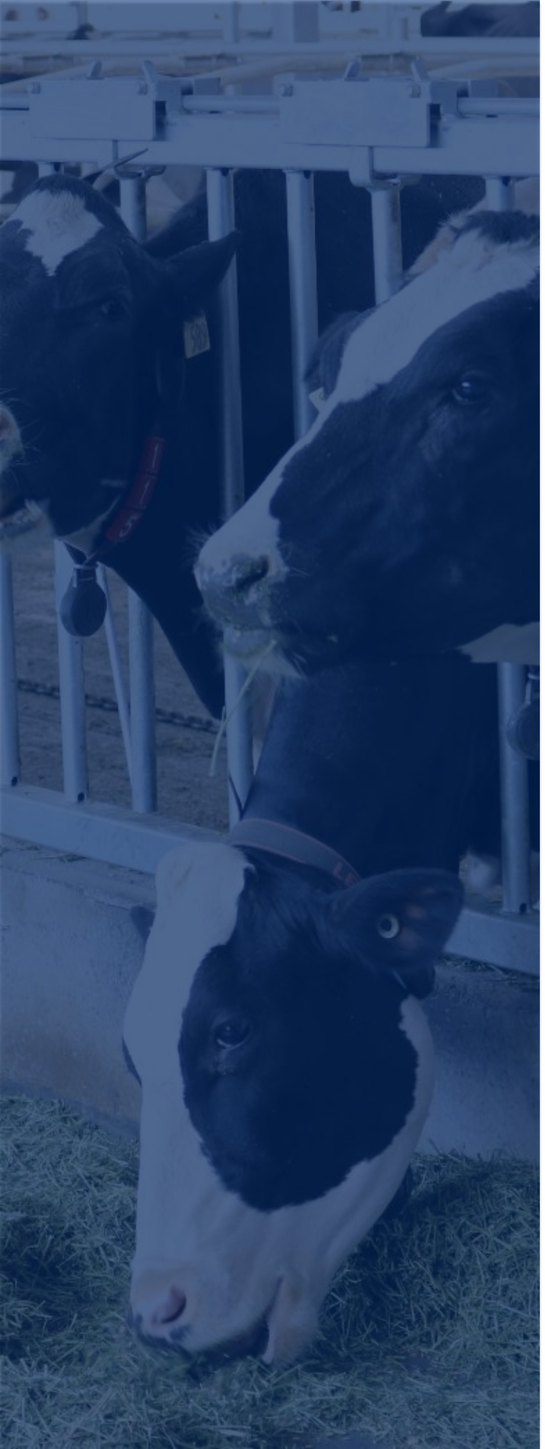

Milk Cooling - Past

Early Methods of Milk Cooling: *Flat-top bulk milk tanks w/ DX refrigerant*

- Flat-top low height design to simplify pail pouring of milk
- Simplified design for ease of manual brush-wash
- Direct-expansion refrigeration R-12 – However, production of R-12 or CFC-12 was halted by the Clean Air Act January 1, 1996.
- The market started going towards closed top milk tanks for improved product protection against environmental contamination.
- Dairies becoming larger requiring larger bulk storage and floor-space considerations.

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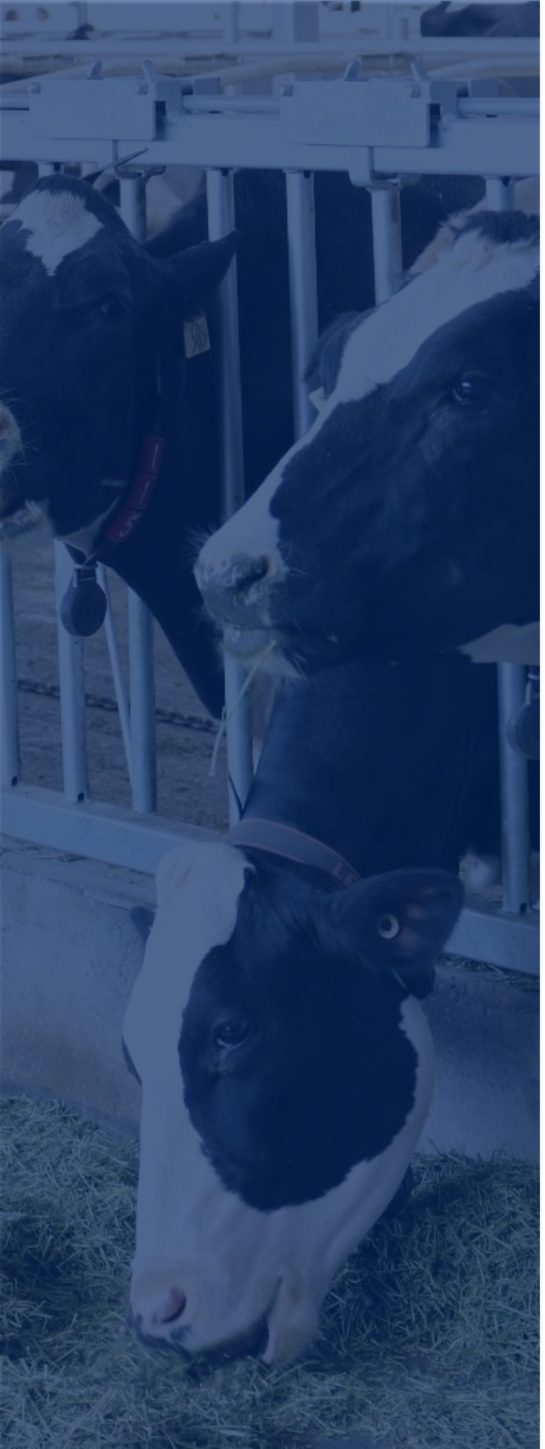
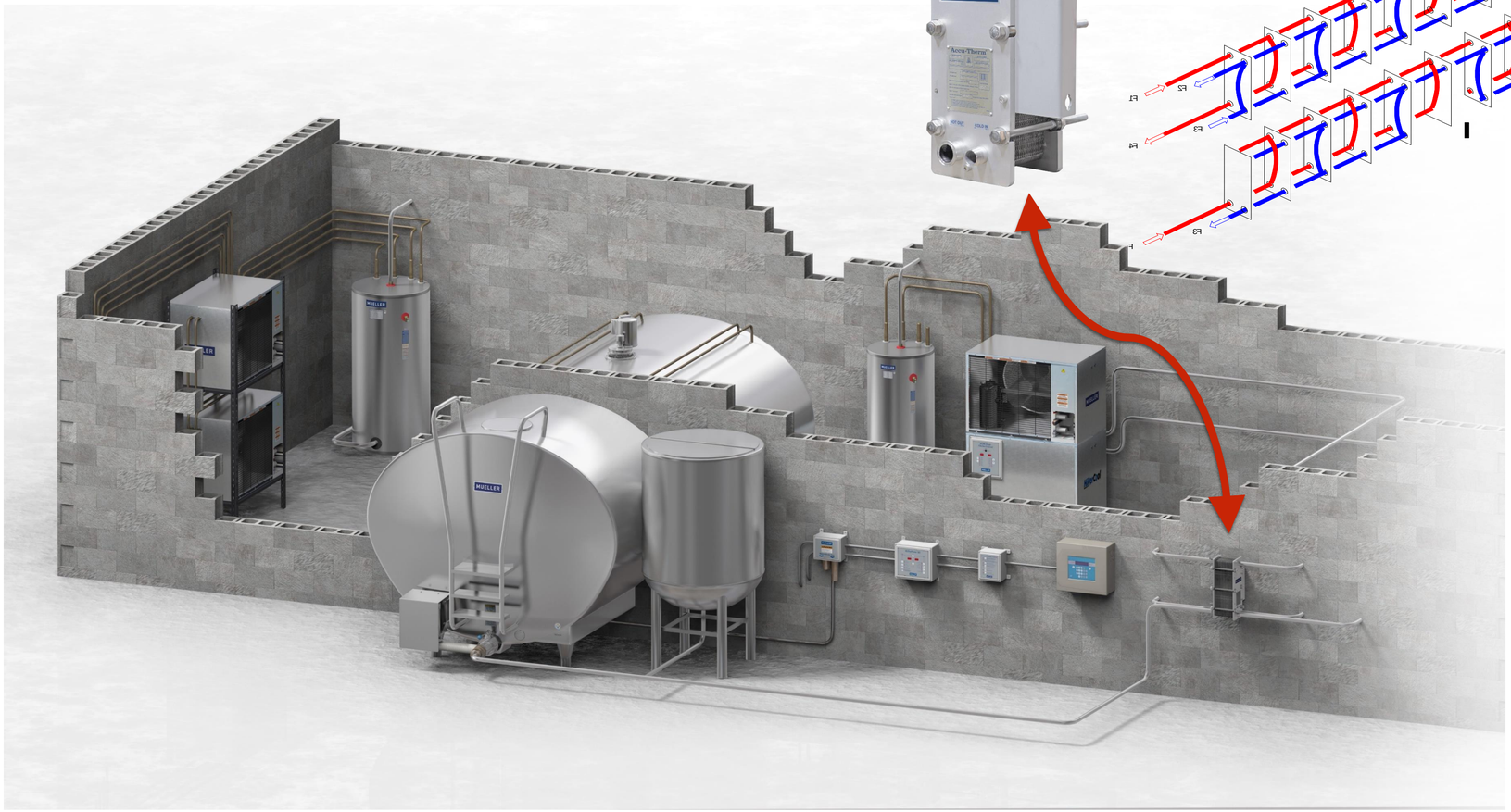
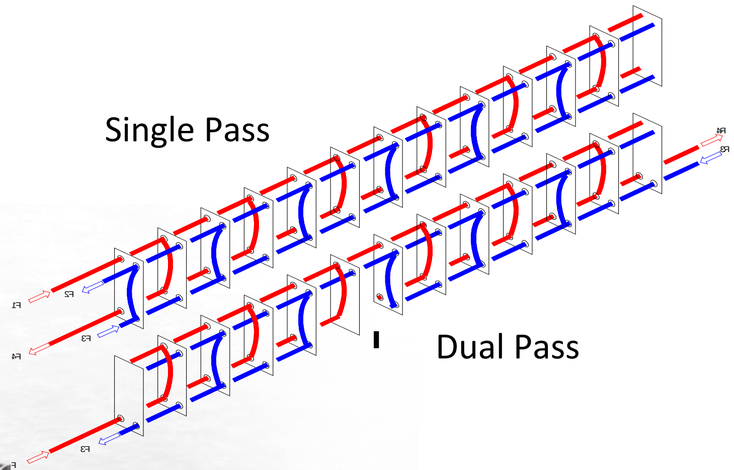


Milk Cooling - Present

Conventional Milk Cooling: *Milk coolers w/ pre-cooling and refrigeration*





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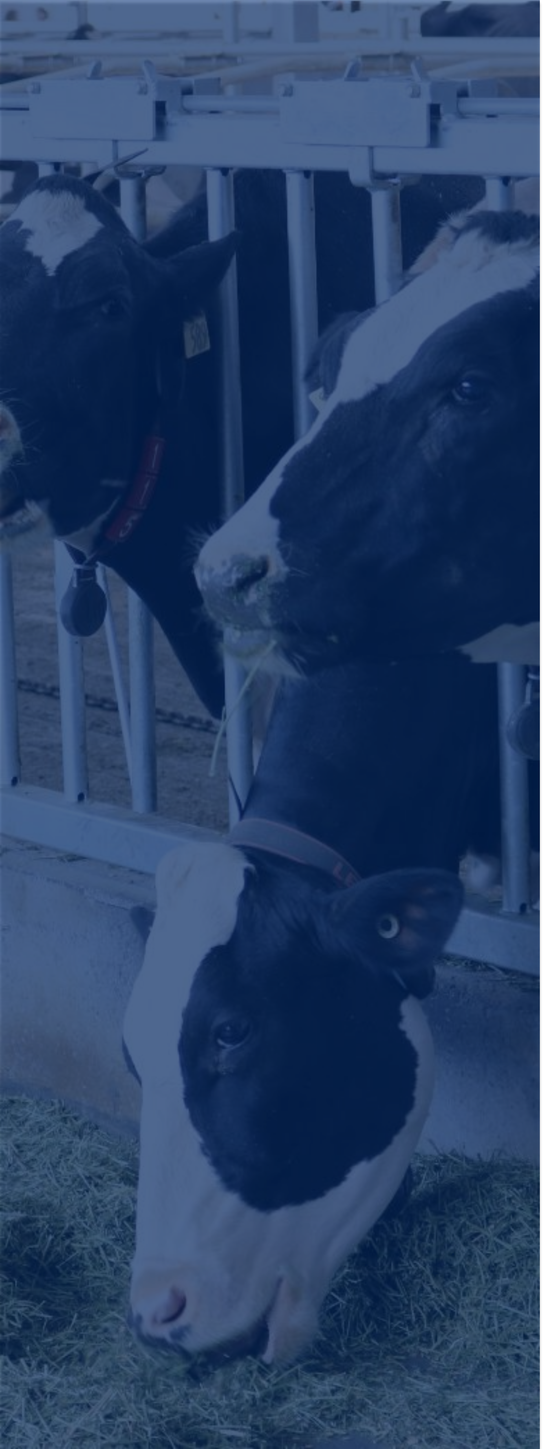

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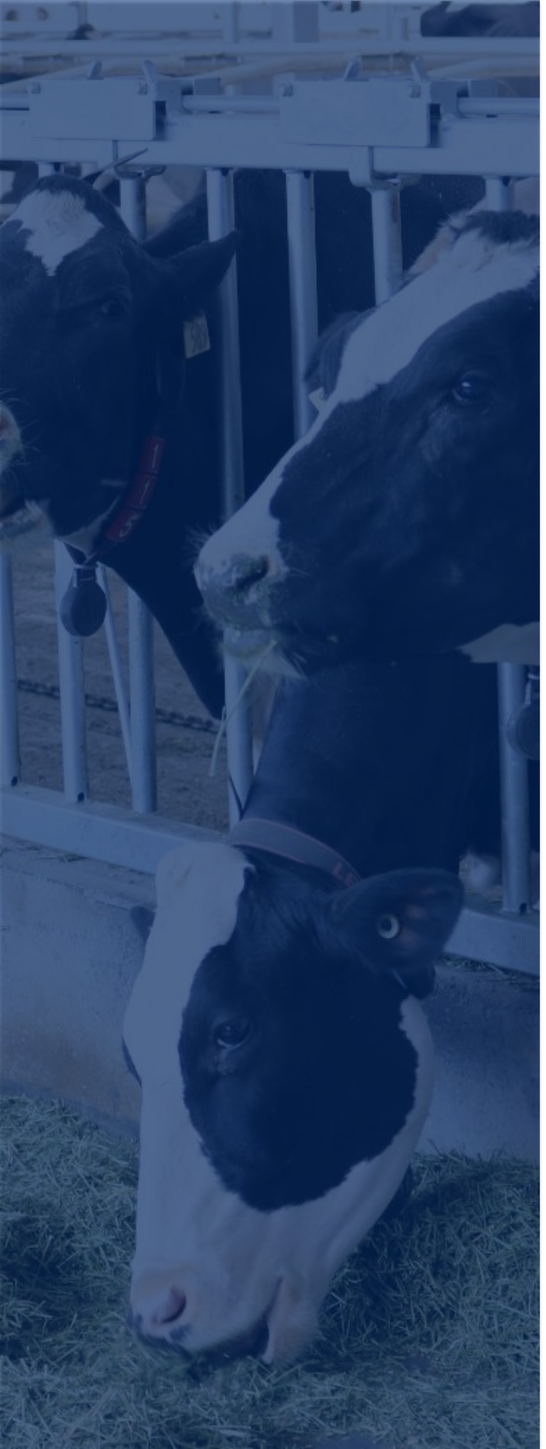

Milk Cooling - Present

Conventional Milk Cooling: *Milk coolers w/ pre-cooling and refrigeration*

- Enclosed tanks protecting product from the environment.
- Improved temperature control and insulation.
- Automatic CIP Washing with improved Cooling and Wash Controls.
- Higher efficiency cooling.
- Newer refrigerants that are more environmentally friendly.
- Greater volume capacities – through 8,000 gallon.
- Ability to cool and store a full tanker truck load.

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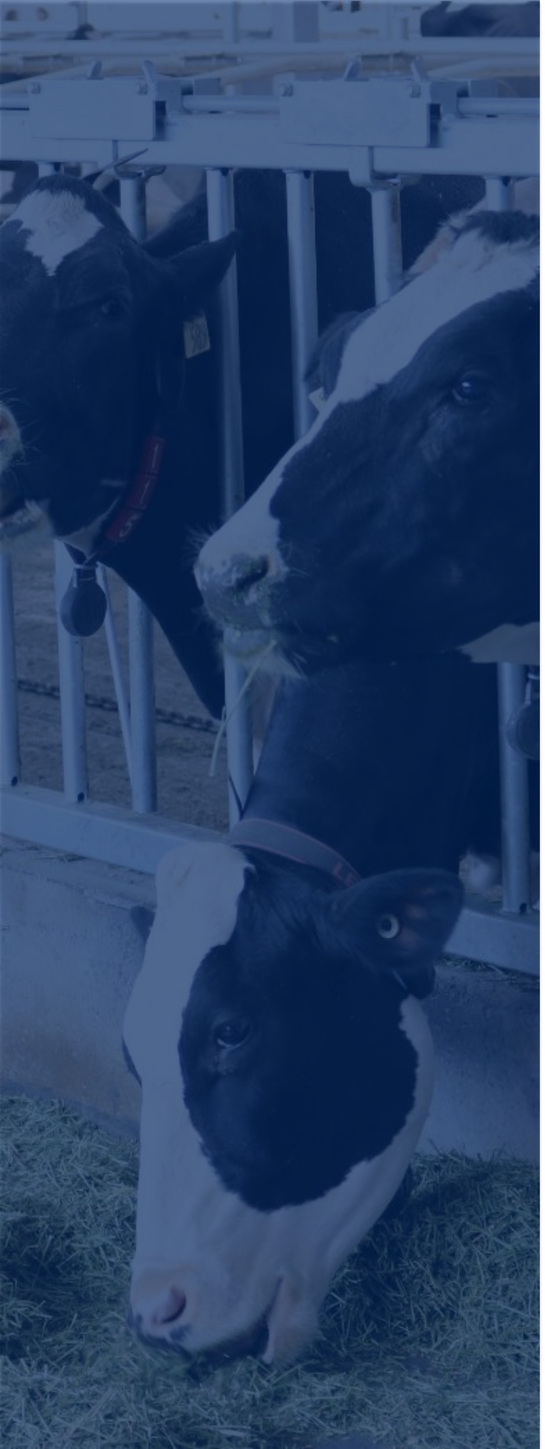

Milk Cooling - Present

Instant Cooling with on-farm storage: *Horizontal storage with chiller*

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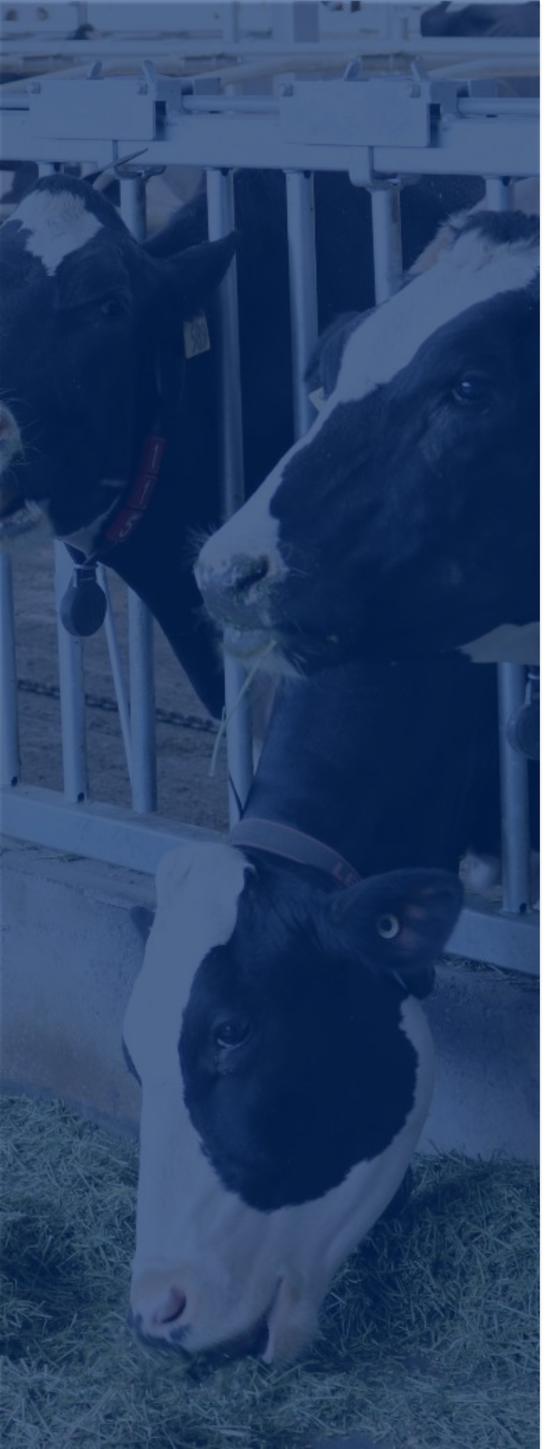

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Instant Cooling with on-farm storage: *Horizontal storage with chiller*

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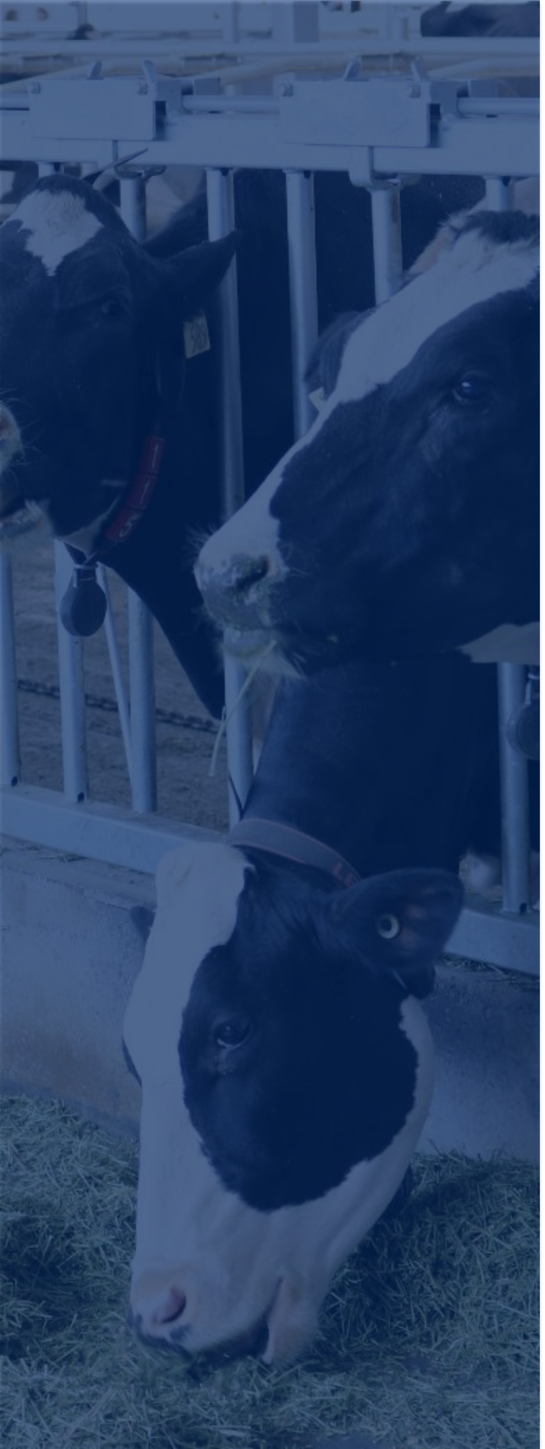

Milk Cooling - Present

Instant Cooling with on-farm storage: *Vertical storage with chiller*

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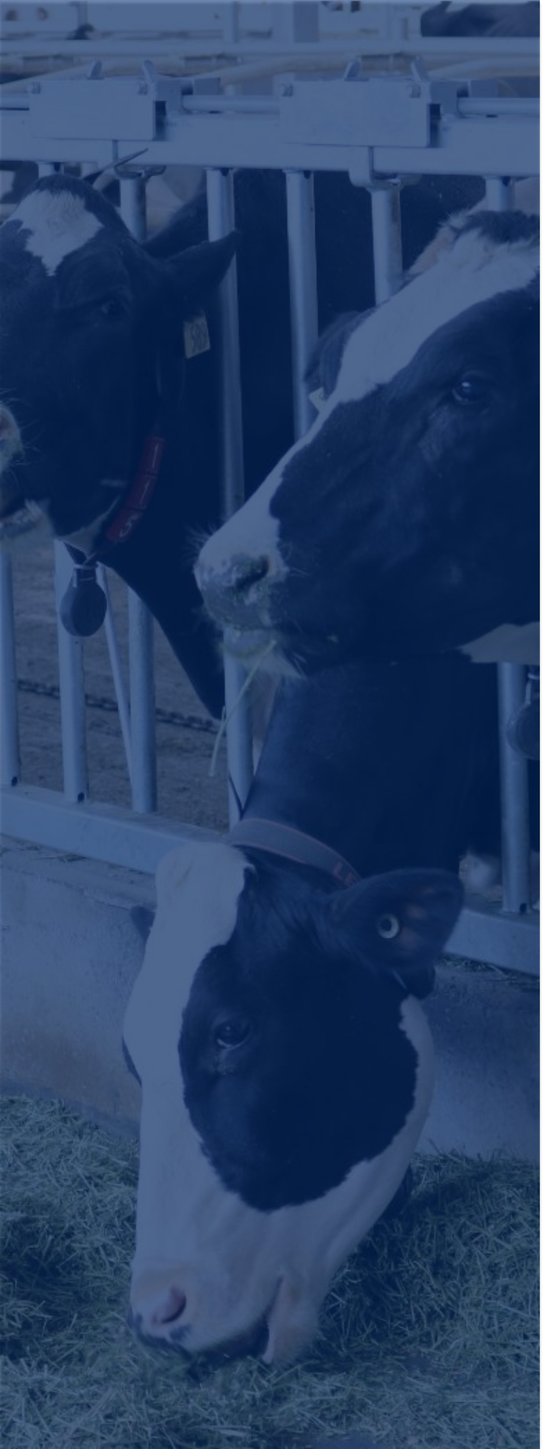

Milk Cooling – Present & Future

Instant Cooling with on-farm storage: *PHE, Chiller, and Heat Recovery*

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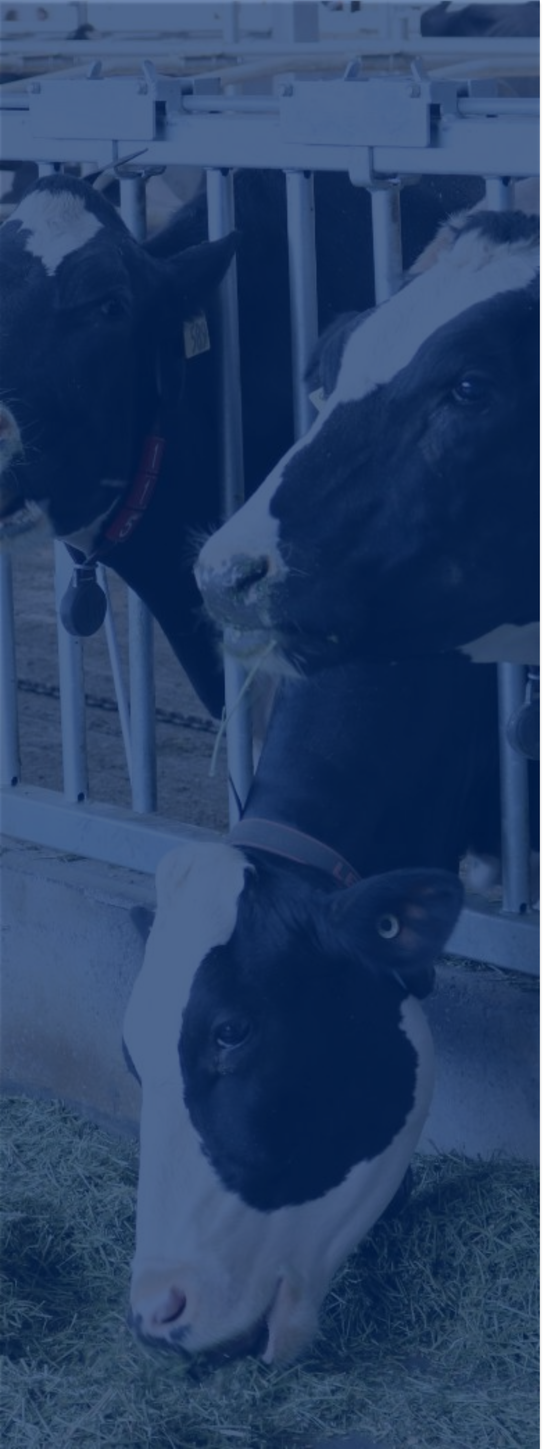

Milk Cooling – Present & Future

Instant Cooling with on-farm storage: *Chiller and Heat Recovery*

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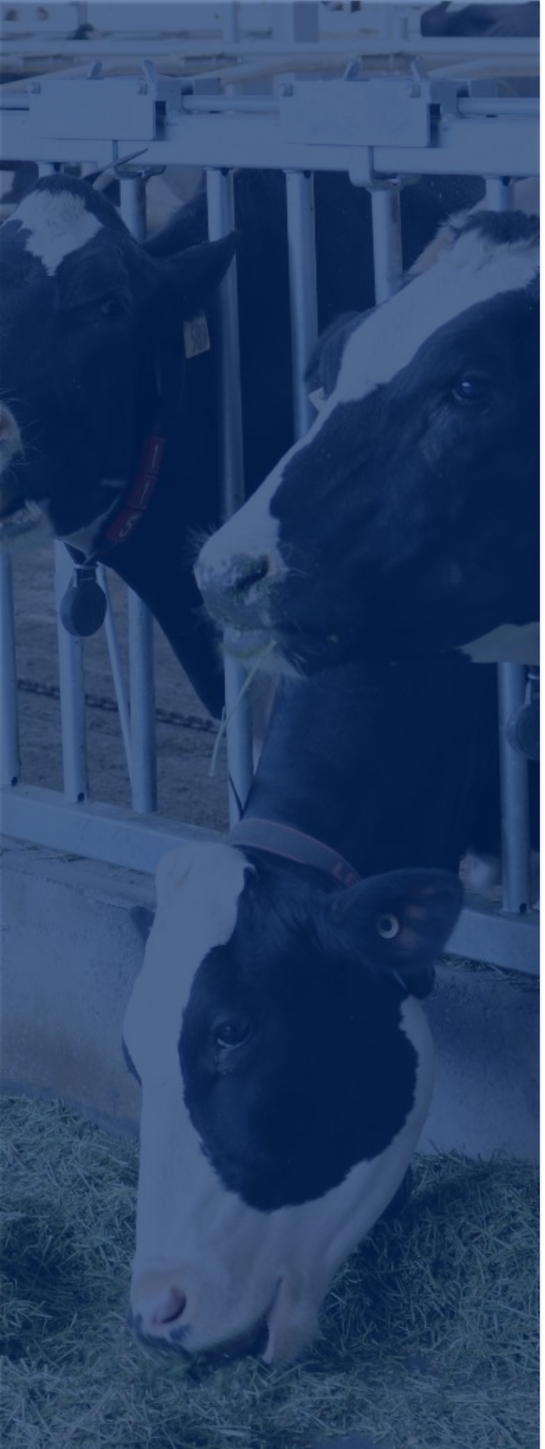

Milk Cooling - Present

Instant Cooling with on-farm storage: *Chiller & Heat Recovery*

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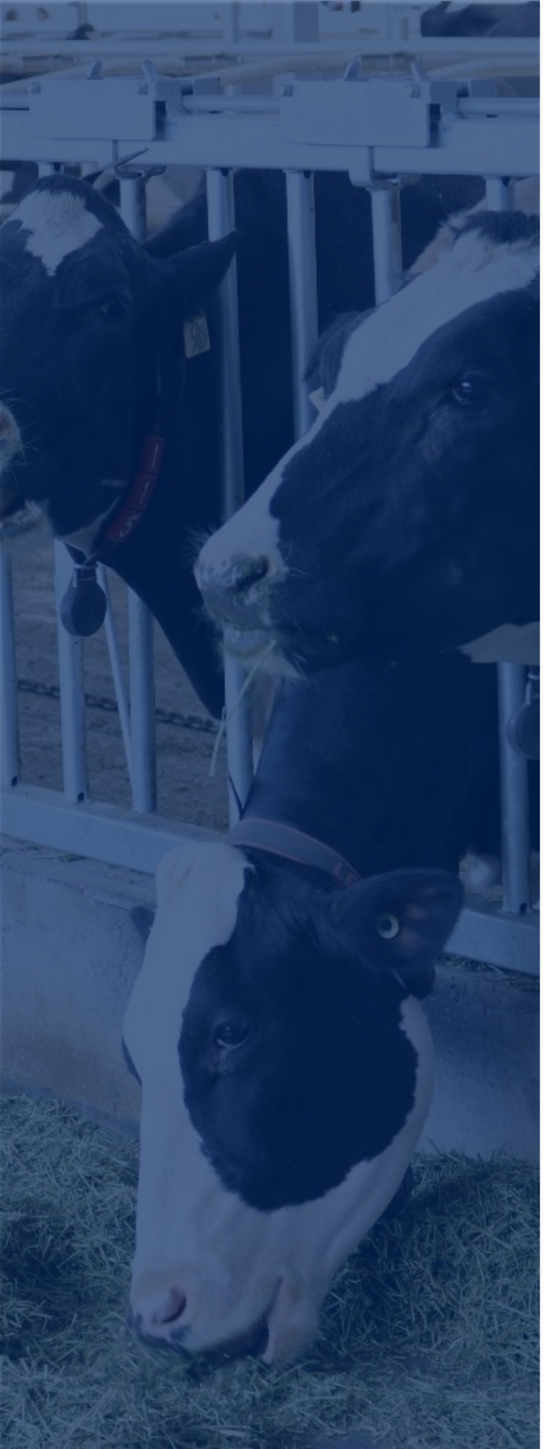
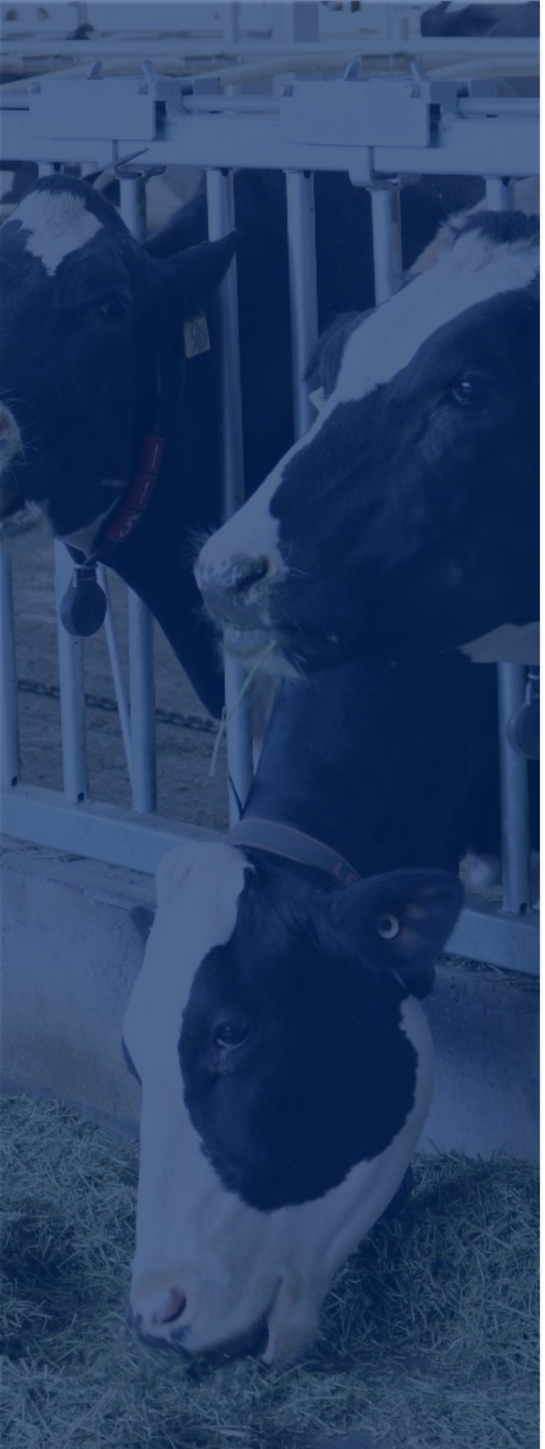


Milk Cooling - Present

Instant Cooling with on-farm storage: *Milk reservoir receivers w/ VFDs*



Milk Cooling - Present

Instant Cooling with on-farm storage: *Robotic barns with chiller*

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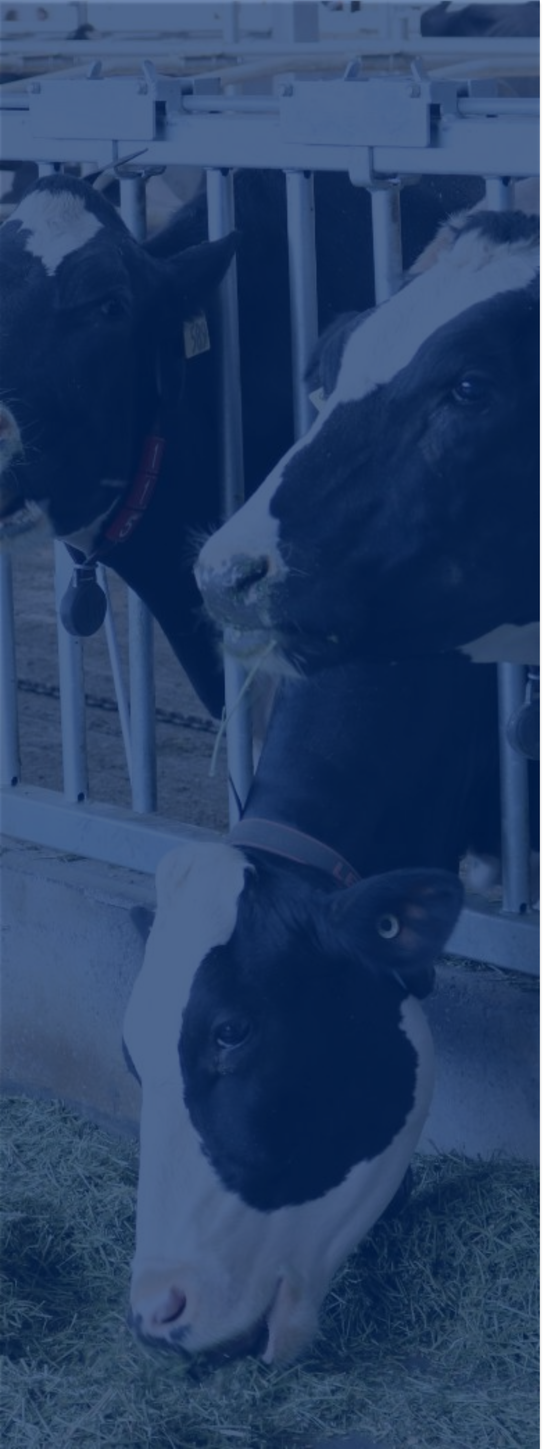

Milk Cooling - Present

Instant Cooling with on-farm storage

- Instant cooling for small or large volume milk flow rates providing higher overall milk quality.
- Small robotic barns benefiting from chiller installations, instant cooling the milk before the buffer tank and in many cases at the robotic stall, reducing free fatty acids and improved overall milk quality.
- Instant cooling with a chiller provides flexibility for larger high-volume flow rate dairies. Capability of utilizing larger refrigeration systems than technically possible on conventional milk tank evaporators.
- Storage can be horizontal or vertical designed tanks, allowing flexibility for specific installation site footprints.
- Capability of maintenance cooling on storage tank to ensure proper milk temperatures.

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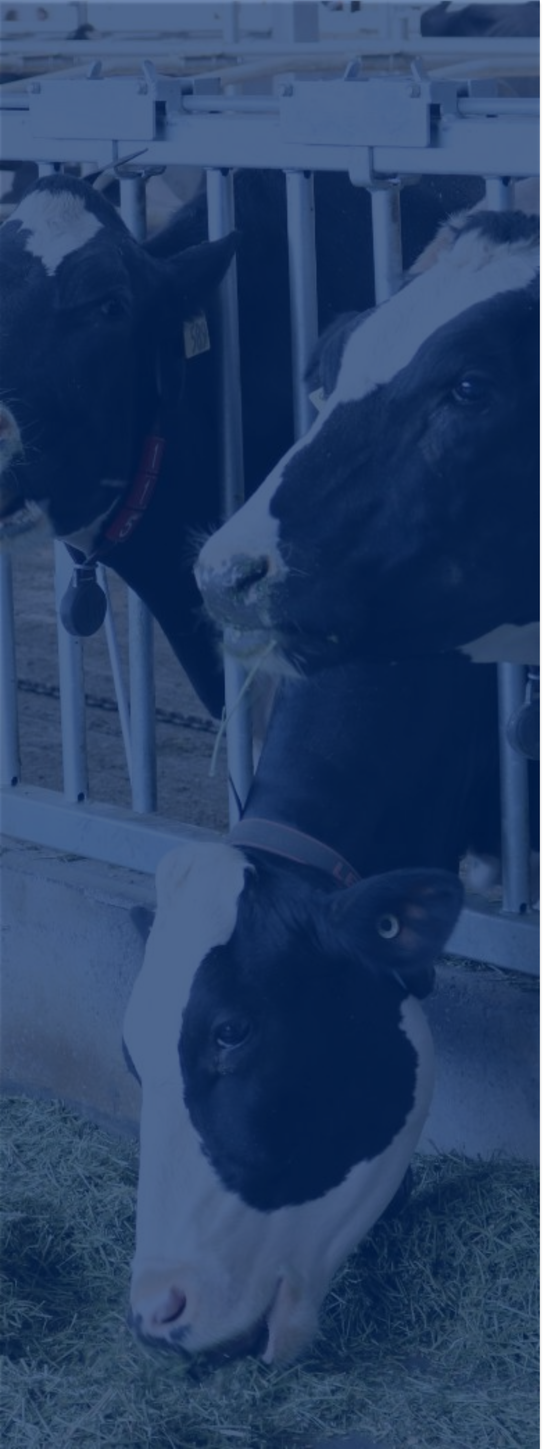

Milk Cooling – Present

Direct Load

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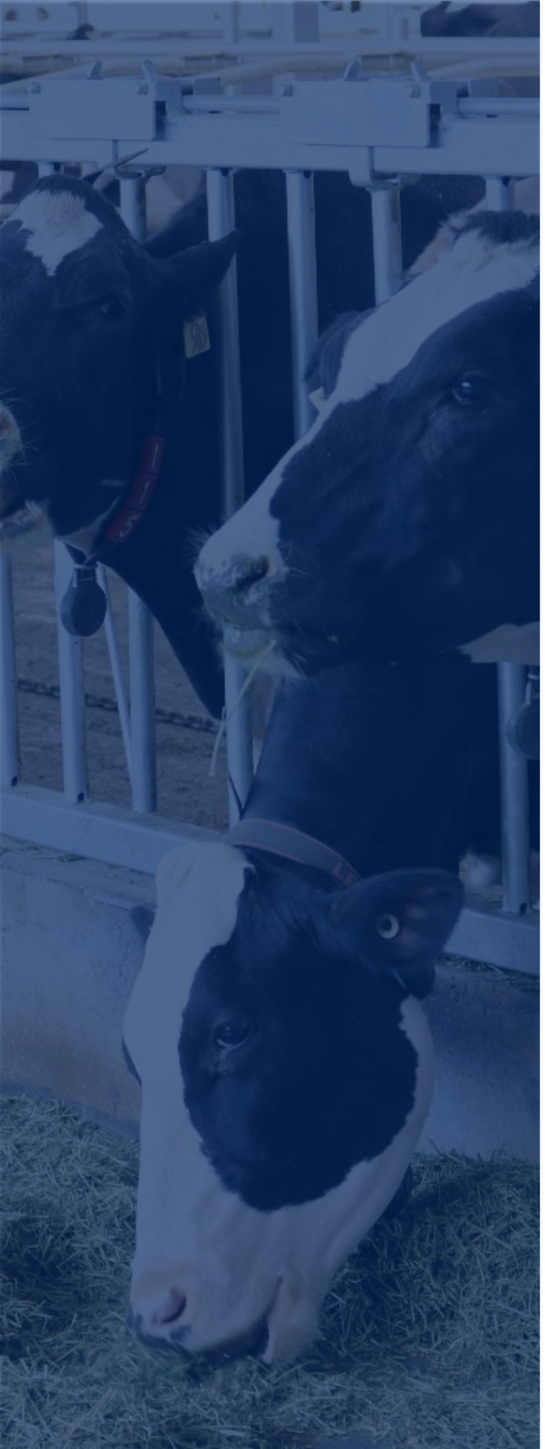

Milk Cooling – Present

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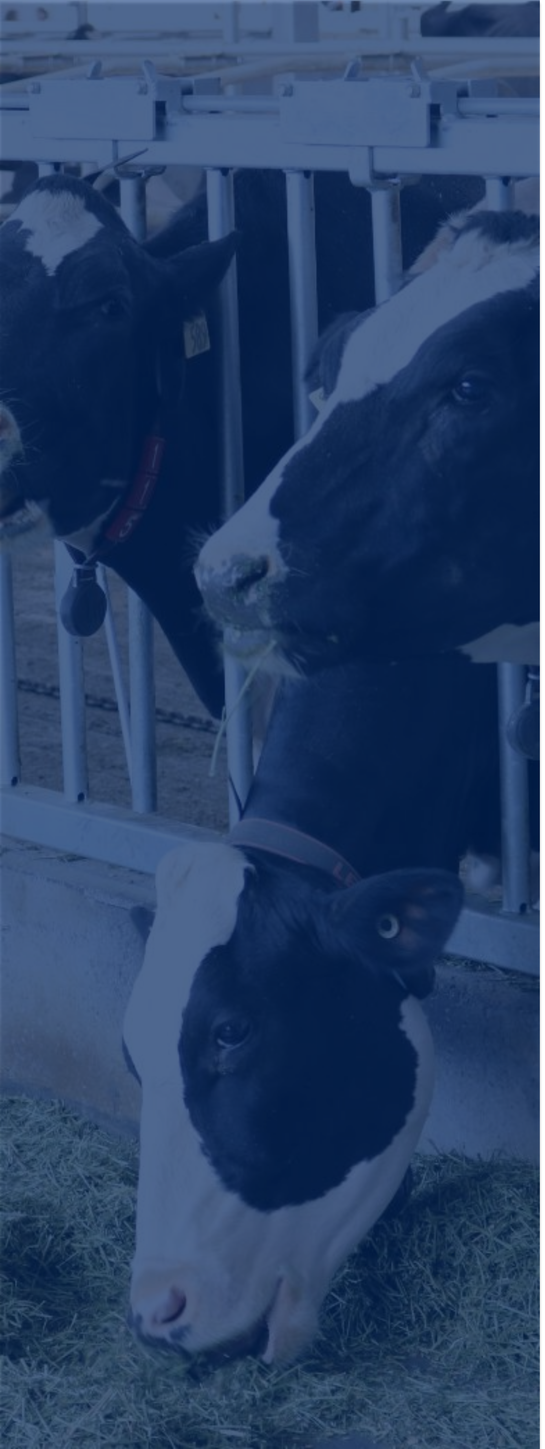

Milk Cooling – Present & Future

Direct Load

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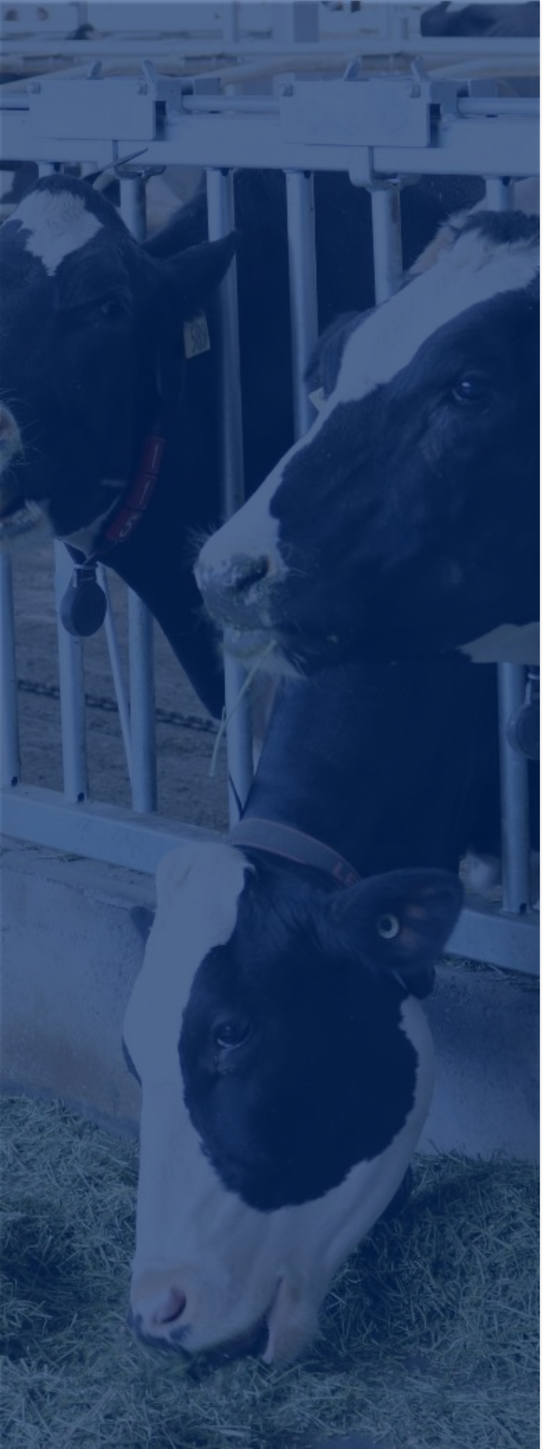

Milk Cooling - Present

Direct Load

- Milk storage ownership, maintenance and cleaning changes.
- Logistics – scheduling trailer locations at the proper times.
- Milk sampling challenges.
- No capabilities of maintenance cooling on tanker to ensure proper milk temperatures.
- No agitation on tanker to ensure blended and homogenized milk.
- More difficult to monitor volume and temperature as compared to on farm storage.

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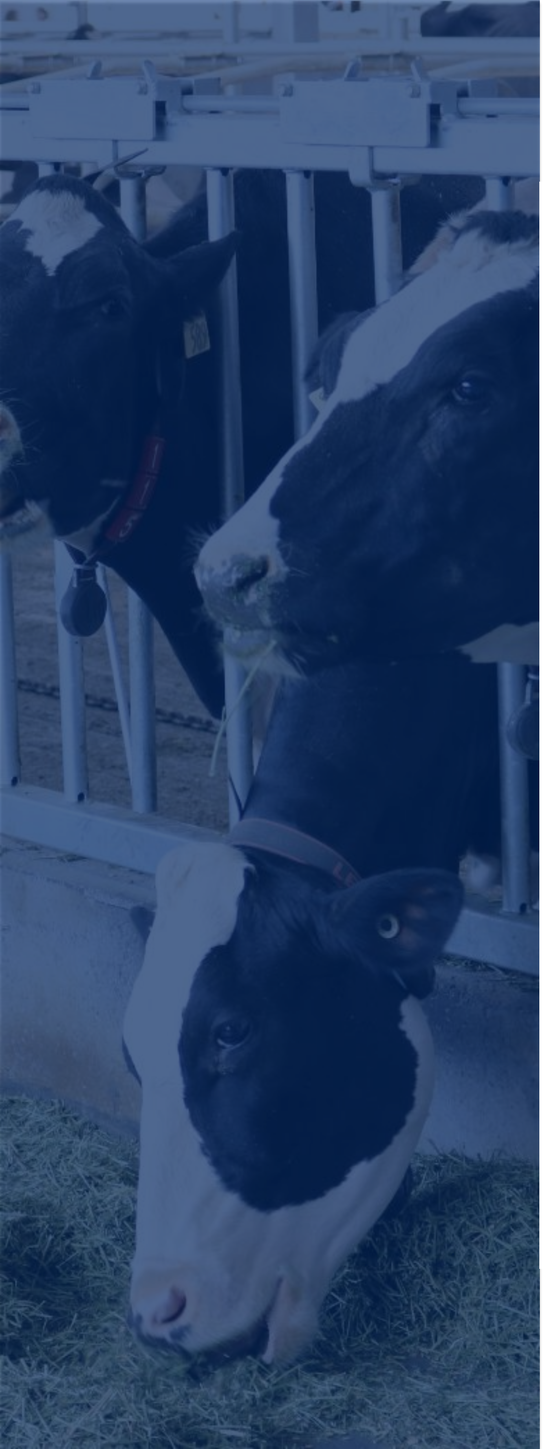

Milk Cooling – Today

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David Kolstad

U.S. NORTHWEST REGION

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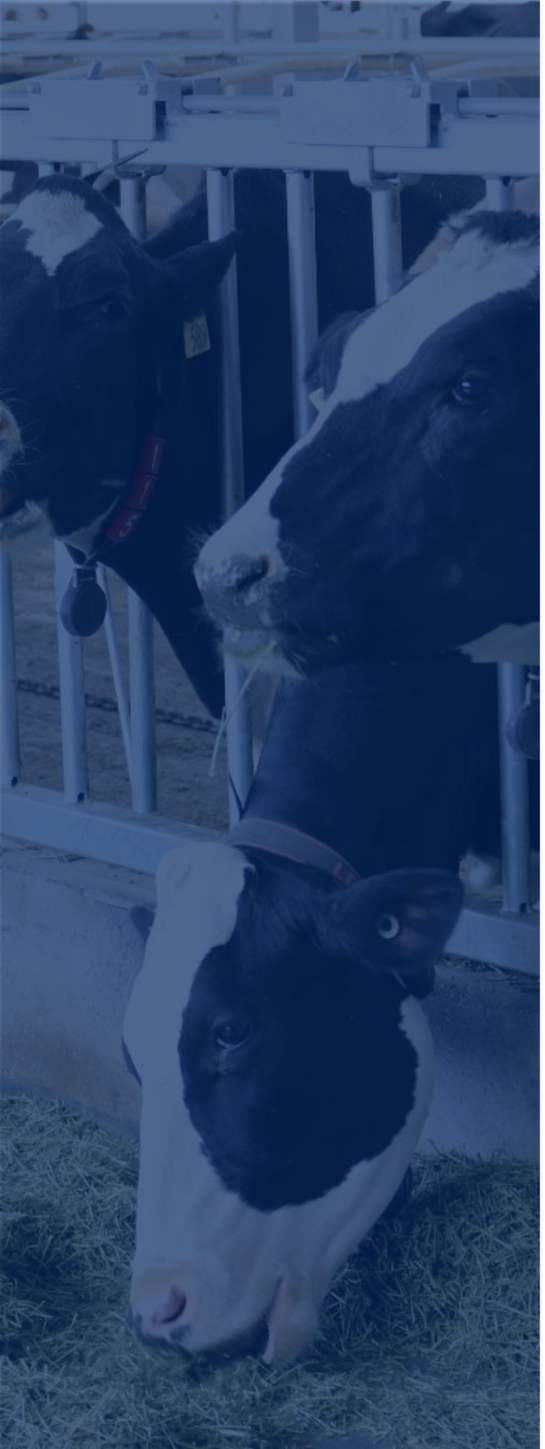
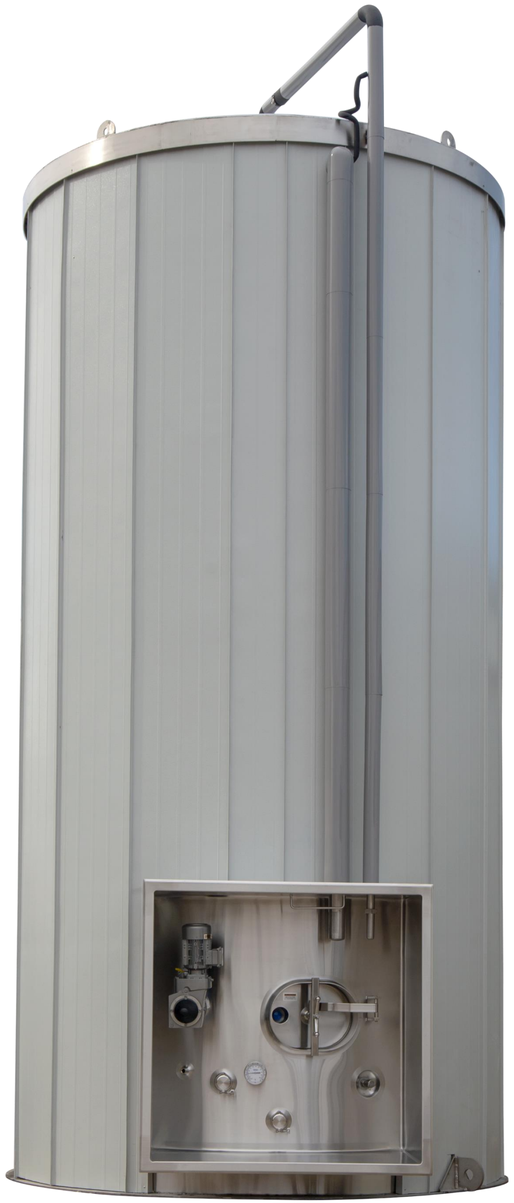


Milk Cooling – Today – Vertical Storage



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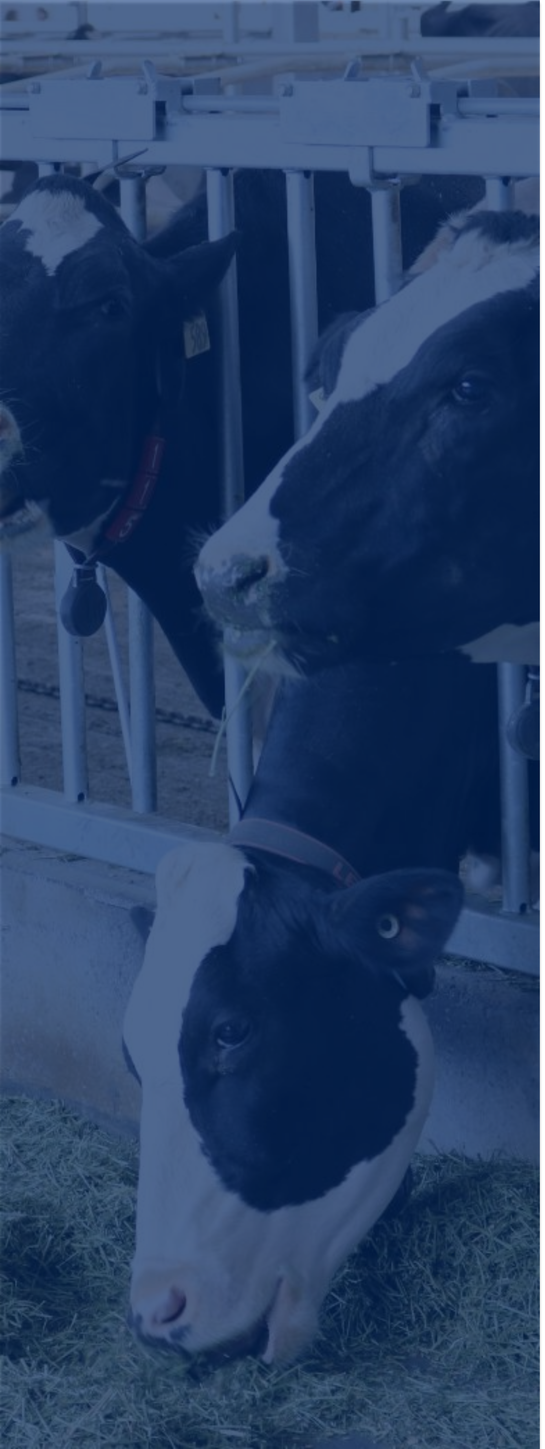

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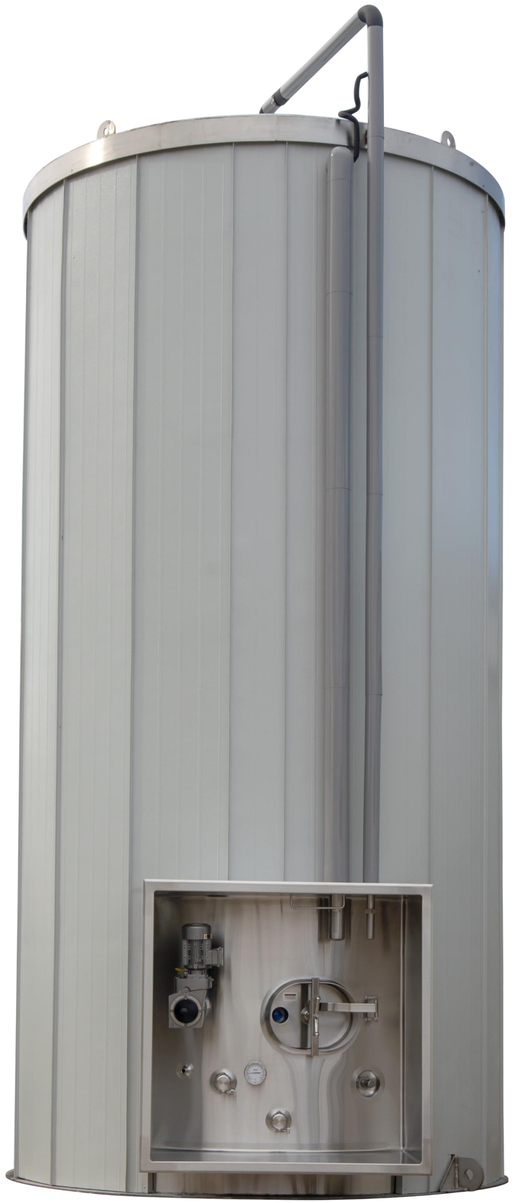

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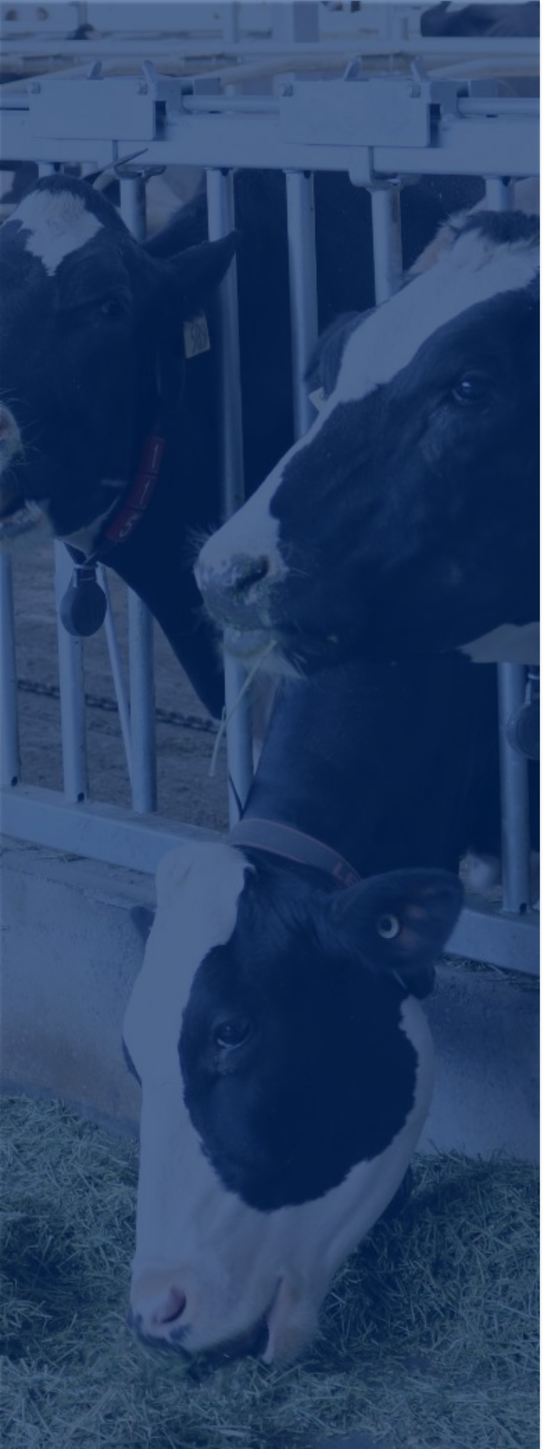

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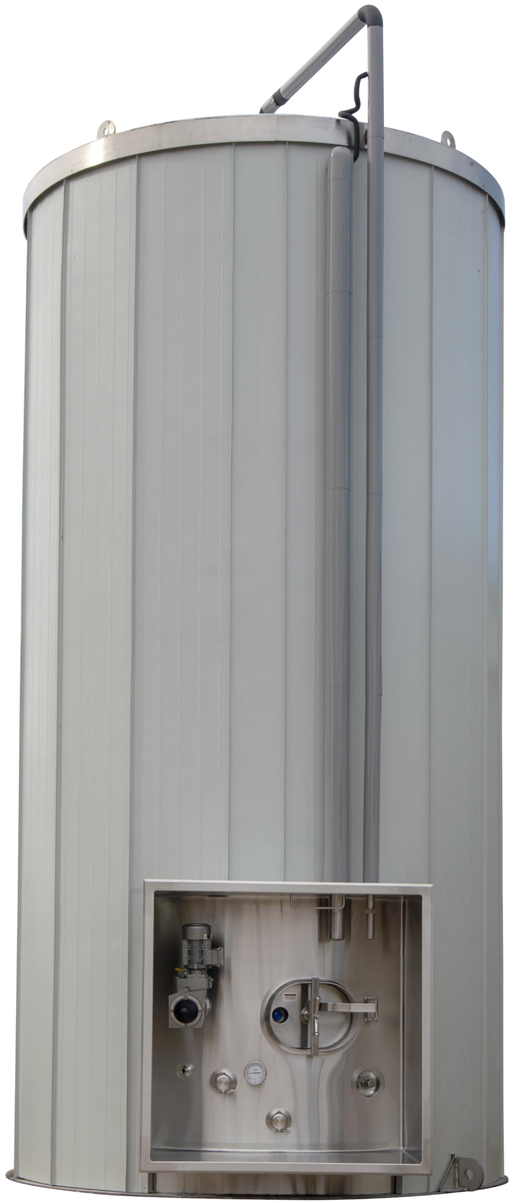

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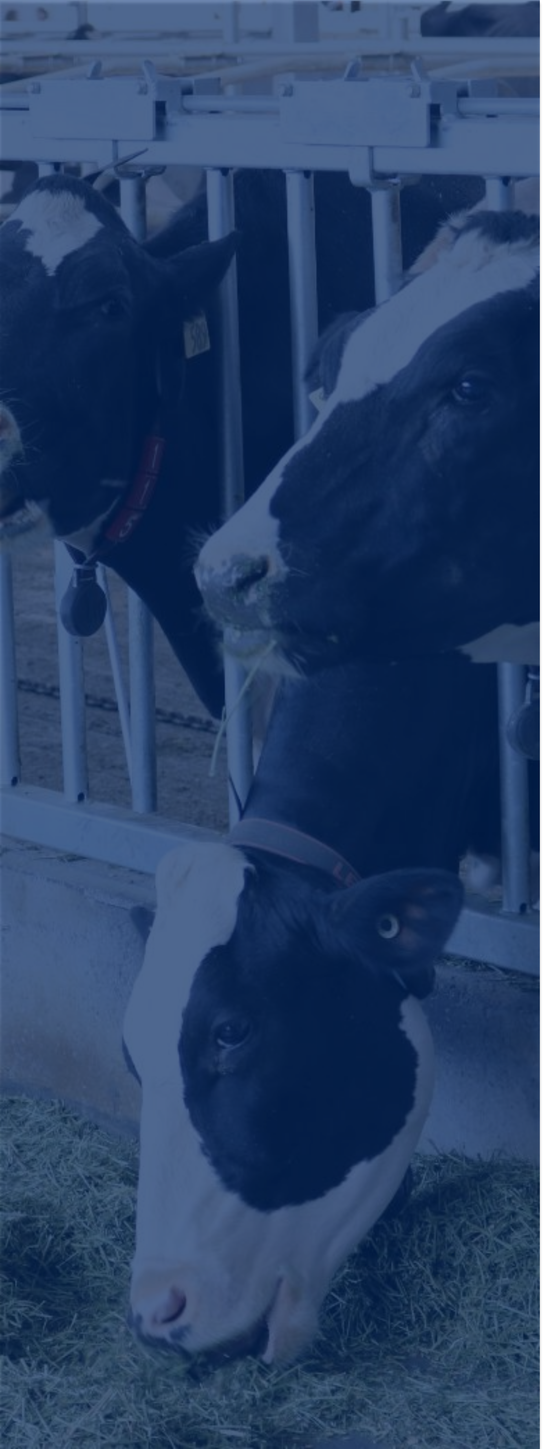

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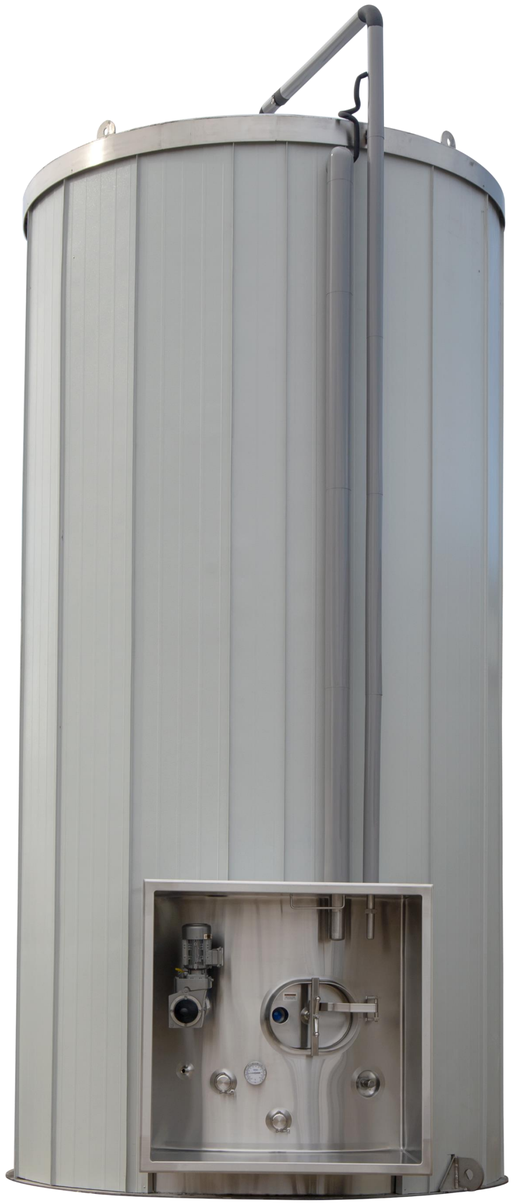

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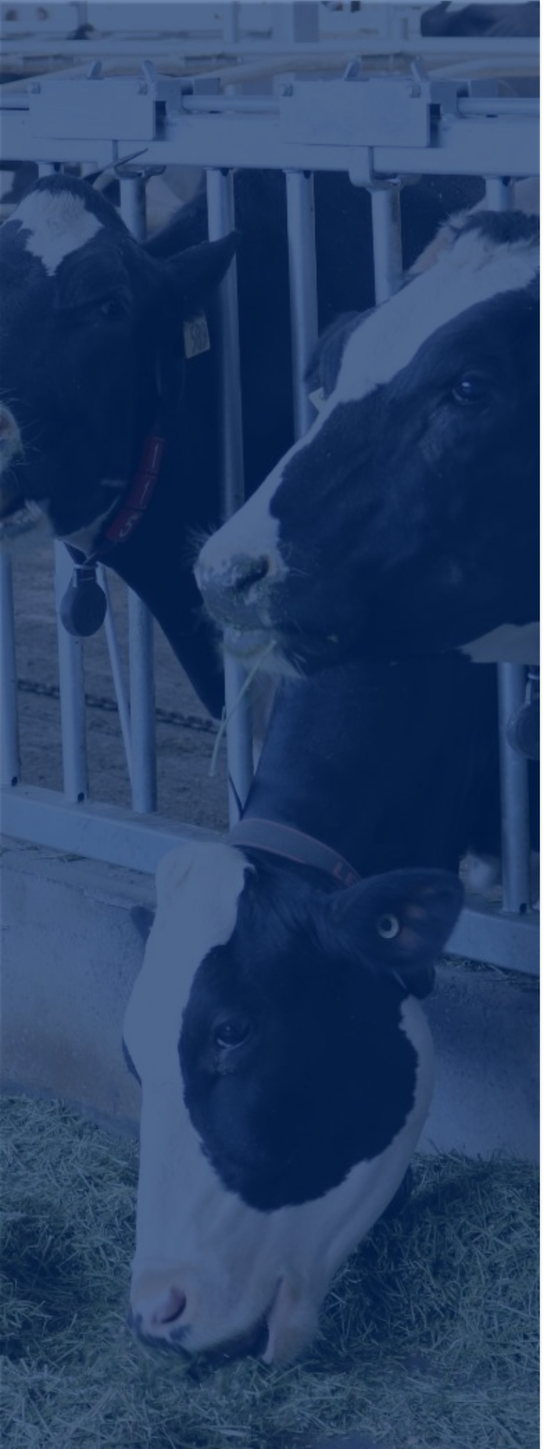

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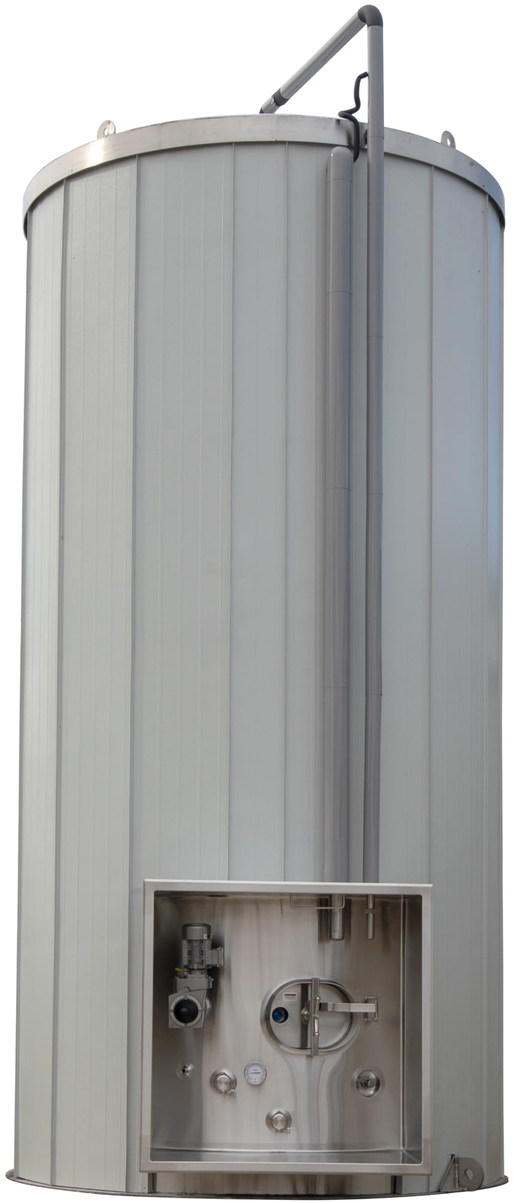

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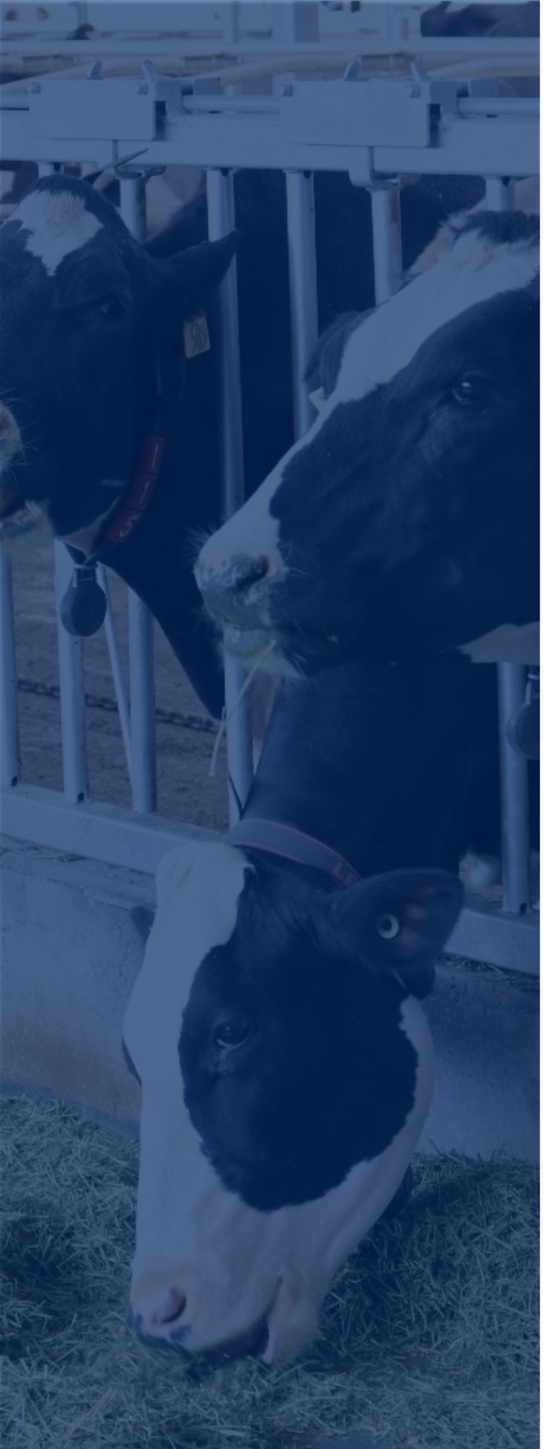

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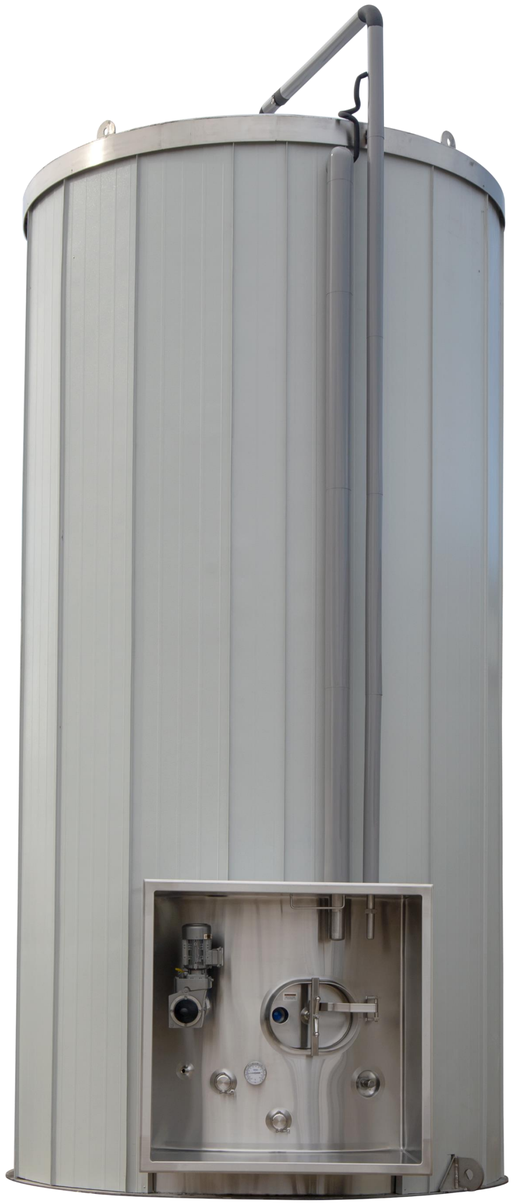

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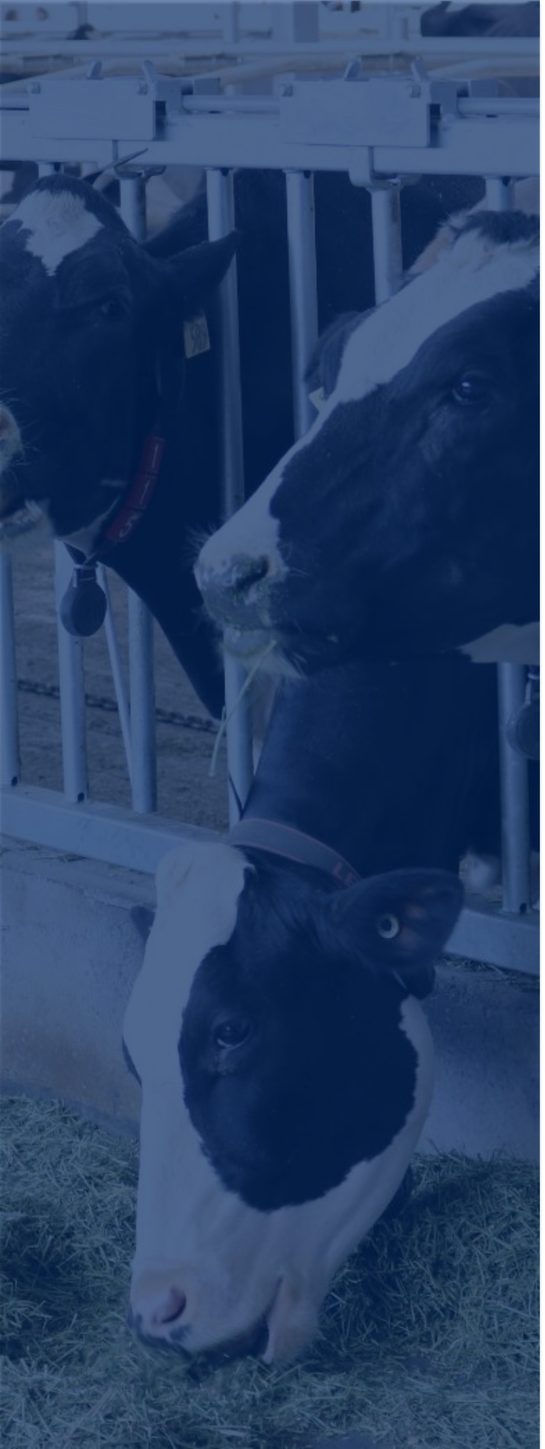

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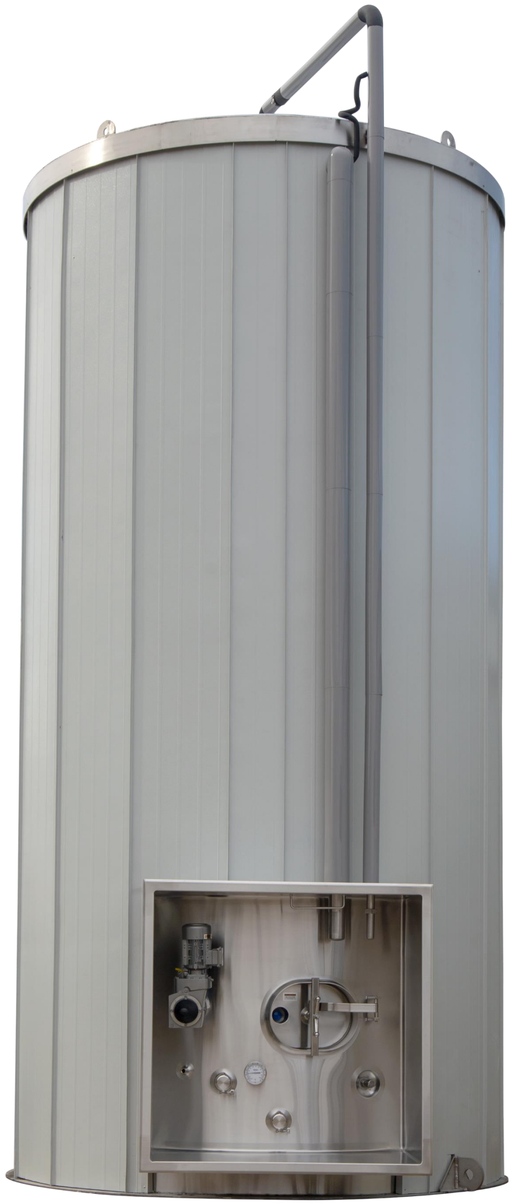

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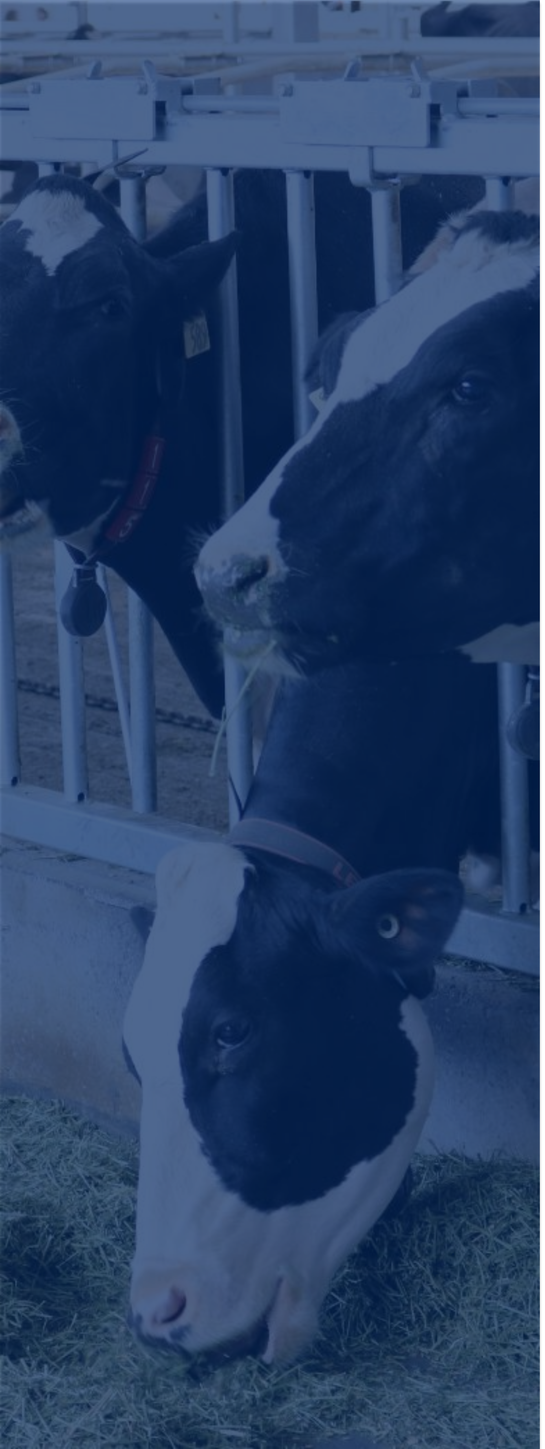

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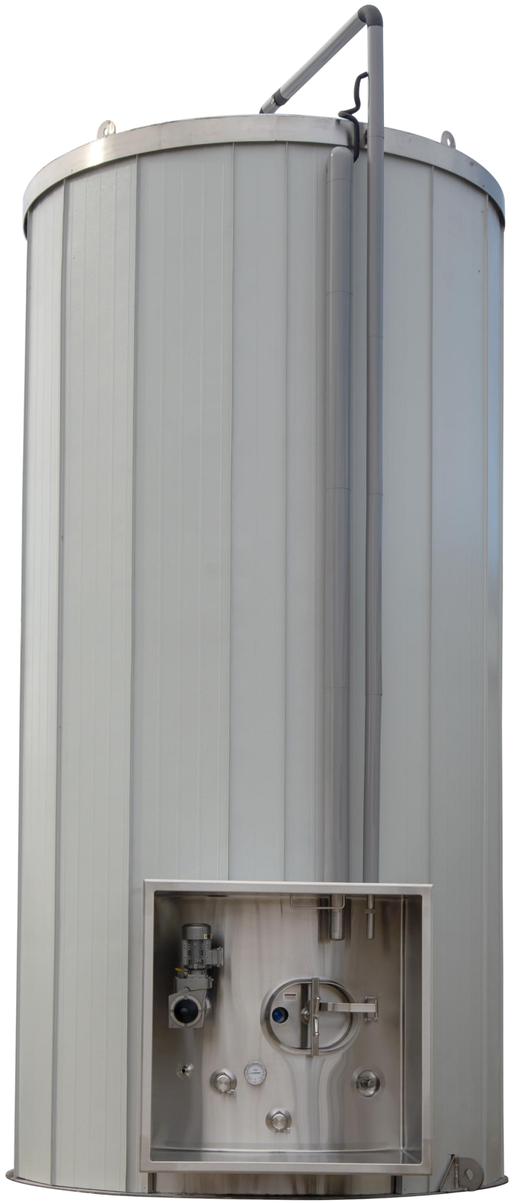

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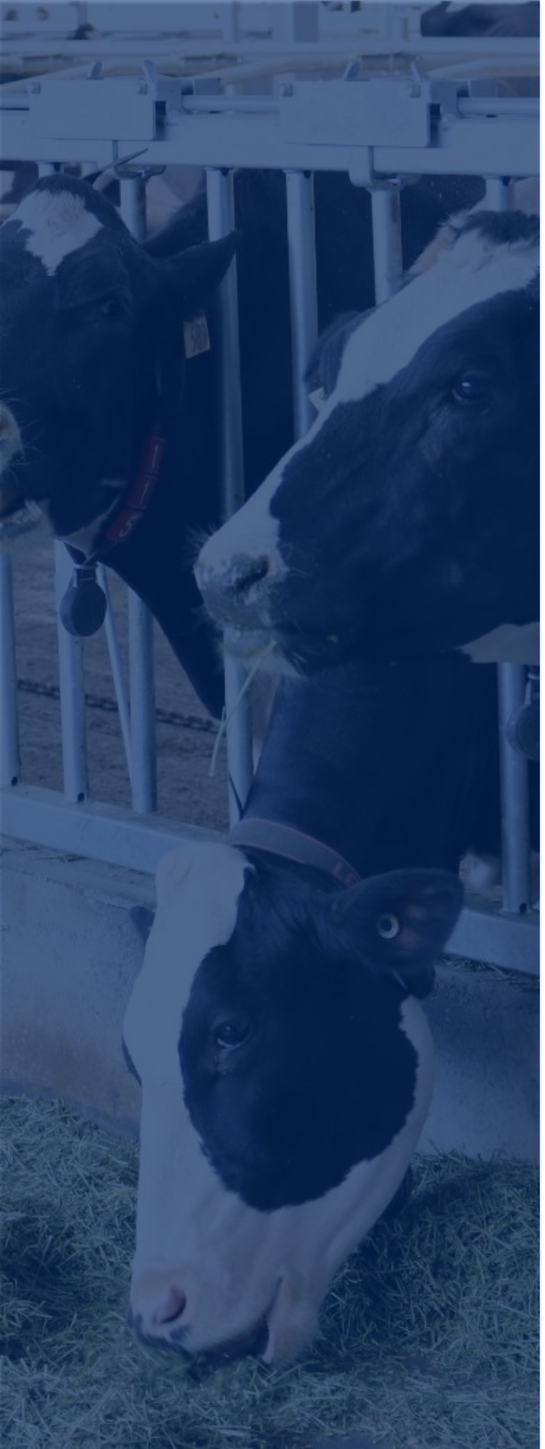
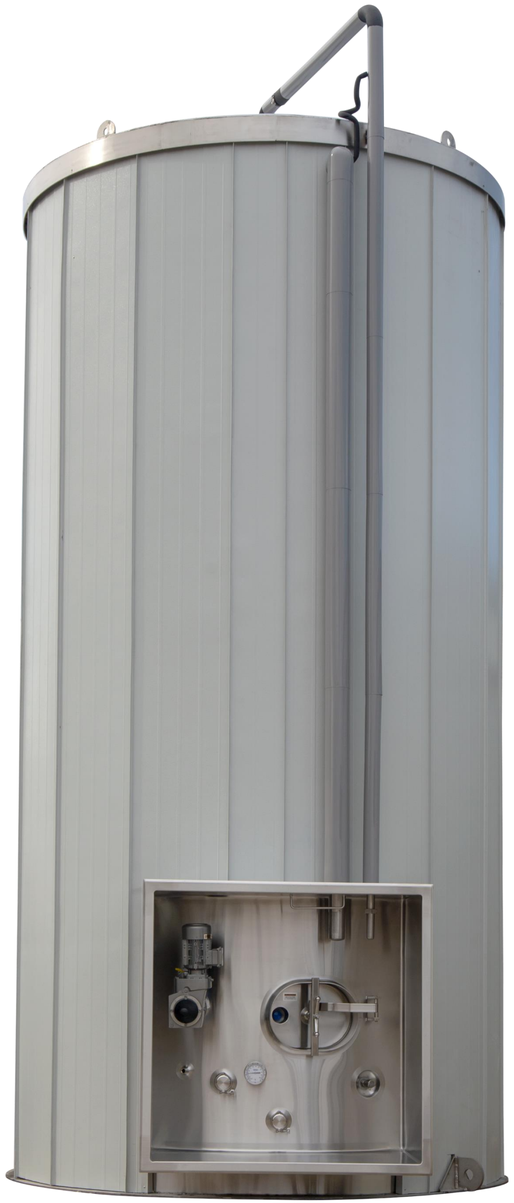


Milk Cooling – Today

- New designs specifically for dairy farm applications.
- Larger and higher efficiency cooling systems.
- New refrigerants reducing EPA and Global Warming concerns.
- Auxiliary cooling in storage
- Time and temperature recording of storage
- Agitated storage
- Aseptic composite sample - agitated storage
- Quick loading – large vents, large outlets, gravity working for you.



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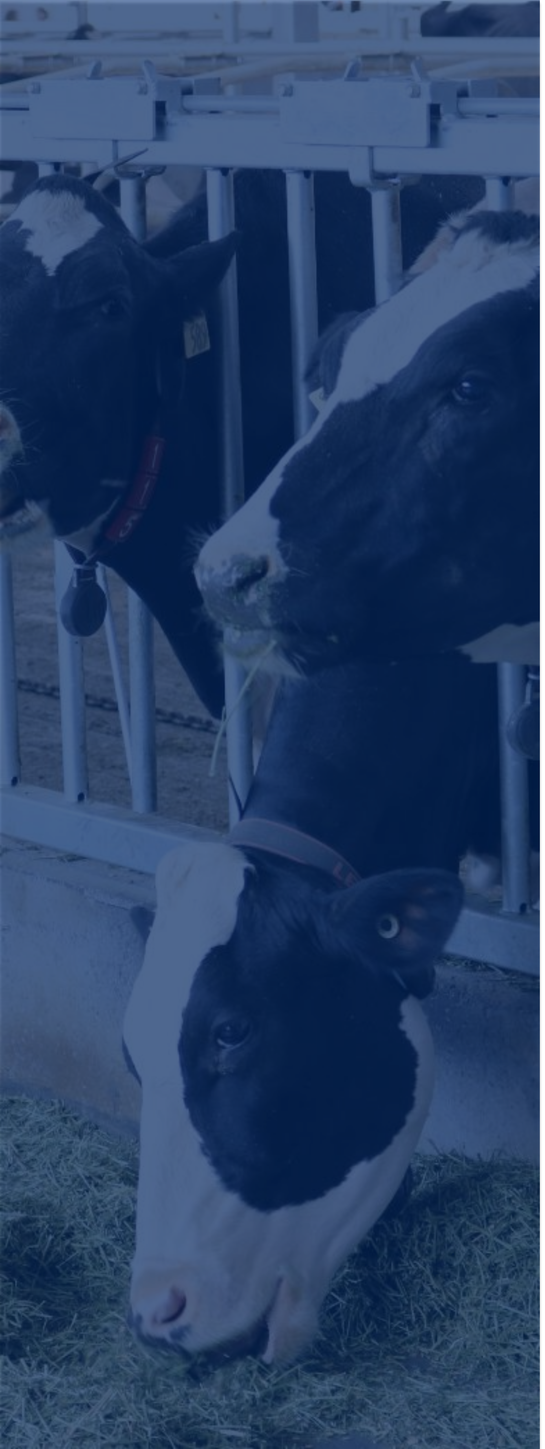
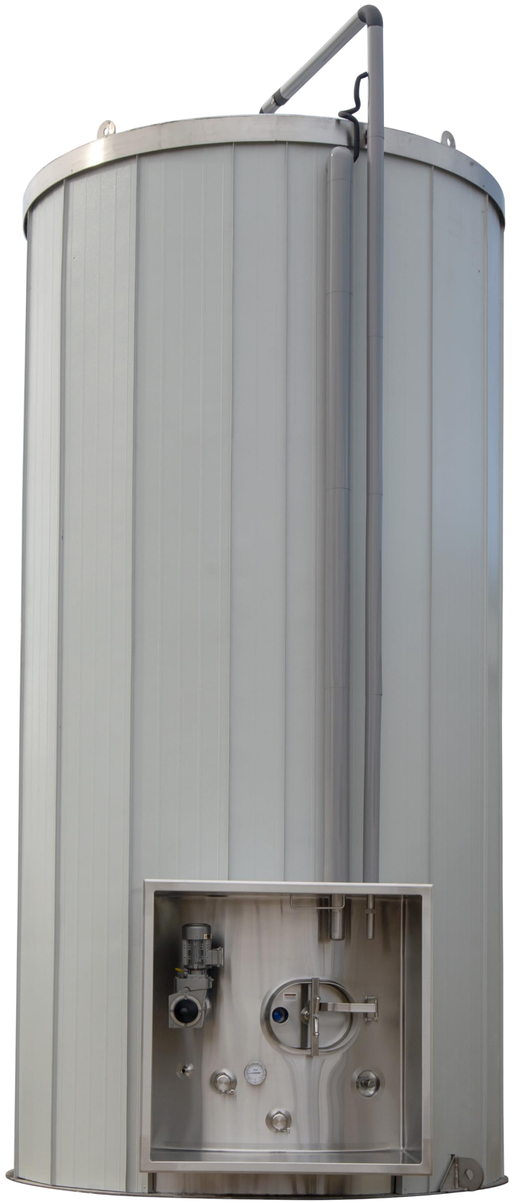


Milk Cooling – Today - Questions

- When unloading multiple loads from same vessel, what is acceptable time cycle?
- What is expected of manifold loop rinse/wash between loads?
- Separate inlet and outlet piping?
- Hoses versus SS manifolds?



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