



New Era of Milk Cooling Systems

Good-quality raw milk is required to make good-quality dairy products. Once raw milk is defective, it cannot be improved during processing, and defects often become more pronounced. Therefore, it is important that raw milk be produced and handled from farm to processor under conditions that do not reduce its quality or, consequently, the quality of the product. One of the largest issues facing milk quality in systems with low milk harvest volume is the refrigeration system's current inability to modulate with the load.

Milk cooling loads from common types of milking systems such as pipelines and parlours are fairly easy to deal with, mainly because the milk being harvested enters the bulk milk cooler in large quantities. This makes for fast evaporator plate coverage, allowing for full use of the entire capacity of the refrigeration system.

Robotic milking systems and sheep/goat milking systems however create a different cooling load. Both offer very low amounts of milk entering the tank. This becomes an issue as we need to get the milk down to storage temperature as fast as possible to maintain the highest quality product. At the same time, we do not want to freeze any of that milk as we end up changing the composition of the product. Rancidity is caused by a chemical development, which continues until the milk is pasteurized. It involves lipase and other enzymes, which react with the milk fat to form free fatty acids. The key to prevention is to have intact membranes around milk fat globules. Causes of rancid flavour are such things that result in weakened or broken milk fat globule membranes such as freezing raw milk against evaporator cold plates in bulk milk coolers. When milk is frozen, the milk protein becomes destabilized and you may see changes in the "texture" of the milk. A portion of the fat globules that compose the milk end up breaking down, resulting in a more rancid product and raising our freeze point which results in a penalty and poorer end product which processors pride themselves on.

Many different systems have been developed in the past to deal with trying to get the milk as cold as possible yet not freezing it. A lot of systems are effective but not perfect. Freeze protection thermostats are the most cost effective control you can utilize on an existing system which will turn the refrigeration system on and off based on the temperature of the evaporator plate. This is primarily advantageous during the time from an empty tank until the evaporator plate is covered.

Another method of cooling the milk quickly and gently is to use a chiller and secondary plate heat exchanger to cool the milk down to storage temperature before it gets to the bulk milk tank. This is one of the gentlest ways to cool the milk down to temperature for the highest quality of product. Milk is never frozen and it is agitated the least with this method of cooling. The negative side of this type of milk cooling is the initial cost.

With current improvements in industrial refrigeration controls, there is a new alternative to cooling low volumes of milk without freezing issues or complex set up.

The development of a fully modulating condensing unit with electronic regulation monitors and regulates the temperature of the evaporator plate, utilizes stainless steel electronic expansion valves for the highest efficiency available in the dairy industry, and full compressor protection against any flooded starts, which is a major cause of compressor failure in the dairy industry. (Flooded starts happen after bulk milk cooler wash. Refrigerant will automatically migrate to the coldest point in the system. When a tank washes, most of the refrigerant will migrate into the accumulator and compressor if the crankcase heater is not working. The result is a flooded start. Washing bearings and smashing valve plates in piston style compressors.) The systems are designed specifically for the dairy industry, utilizing scroll compressors, variable speed condenser fans, electronic controls, digital readout on condensing units for any alarms and full indication of current evaporator plate temperature. These condensing units will work with any tank control system and are able to be used on any bulk milk cooler on the market. These units are fully rated for outdoor and indoor use in all climates.

The ability to modulate capacity at such a wide envelope based on evaporator temperature allows these condensing units to be used on all applications, meaning the sizing of the evaporator plates on milk coolers to the proper hp condensing unit is also a thing of the past. The condensing unit will run at full capacity, even if it is oversized for a small tank. When the milk gets close to product temperature the condensing unit will start to modulate back so that the cold plate does not get too cold and negatively impact your product. Eventually we could see this technology replace all condensing units on the market in the dairy industry as one condensing unit will cover all tank applications and give cooling capacity, efficiency and reliability a new benchmark in this industry.

Another benefit to this style of condensing unit is they are fully programmed before they are shipped. This is important in the dairy industry as a large amount of refrigeration equipment is installed by personnel that do not have a lot of experience in the refrigeration trade. The connection of two pipes, main power to the condensing unit and a low voltage contact is all it takes to install. All the proper settings have been implemented and tested for these units.

The condensing units are manufactured in Ontario and are available across North America.

For your local distributor or more detailed information please email Ben Kungl at Oxford Refrigeration Inc manufacturing. Links to this company through Oxford Energy Solutions Inc at oxfordenergy.ca