

## A COOL IDEA

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*American start-up Promethean Power Systems offers novel thermal energy-based rapid chilling solutions to dairy farmers in India.*

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Twice a day, most dairy farmers in India's villages milk their cows and bring this liquid to a collection point from where it goes to the market. But in a tropical country like India, spoilage is a major concern and a part of the production is regularly lost.

A company based in Somerville, Massachusetts, has come up with an innovative technology that is changing the face of dairy production in India.

Since 2013, leading dairies have been installing Promethean Power Systems' rapid milk chillers, which lower the temperature of the liquid from around 35 degrees Celsius to 4 degrees Celsius in a few minutes. This rapid cooling keeps the milk from getting spoiled and preserves its top quality. The best part is that Promethean's rapid and conventional chilling solutions don't use a single drop of diesel—they are thermal energy-based.

The chillers, mostly purchased by dairy processing companies, are placed in villages. This lets farmers cool their milk quickly after it's derived, instead of having to transport it to some centralized collection point—a journey that could take several hours and increase the chances of spoilage.

Till now, it had been prohibitively expensive to place a cooler in each village. Intermittent electricity supply necessitated a diesel back-up generator for each cooler, which turned out to be costly as well as polluting.

But the new system works with as little as four hours of electricity supply per day.

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The novel part of Promethean's technology is its patented thermal storage system—a closed, round container, typically a little more than a meter high and a meter across, containing a water solution that acts as a sort of high-efficiency battery for cold temperature storage. The water solution a proprietary mixture developed with support from the U.S. National Science Foundation and other funders, is much more efficient at holding the cold than ordinary water.

The cold water that gradually collects in the bottom of the container is sent through the jacket of the cooler to quickly lower the temperature of the milk.

“In many areas where we've installed the system, milk production has gone up by 50 percent or more because farmers have more confidence that the milk will get to market,” says Jiten Ghelani, Promethean's chief executive officer. He adds that the higher quality of the fast-cooled milk has allowed some dairy companies to start producing higher value products like various cheeses and ultra high-temperature (UHT) milk, which have a shelf life of six to nine months.

Promethean, which was founded in 2007, was originally created to market a new type of solar power microgenerator, which focused the sun's heat to create steam to run a generator. The company won second place in the 2007 MIT \$100K Entrepreneurship competition energy track, a business plan competition sponsored by the Massachusetts Institute of Technology (MIT).

The company founders used the \$10,000 (approximately Rs. 6.9 lakhs) prize money to travel to India in 2008 to seek customers for their solar power generator.

But, they soon realized that the device was too complicated to maintain. They also discovered the pressing need for a low-cost technology to chill milk. For the next few years, they worked with crucial support from several U.S. foundations, to develop their thermal storage system.

“We ended up following a trail of inventions and discoveries that ultimately led to a technology that would solve a big problem—a problem we didn’t even know existed” when the company started, says Sam White, company co-founder and co-director.

Promethean is a social enterprise – it is a for-profit business created to meet the economic and social needs of millions of small dairy farmers. The company has now sold over 1,000 milk chilling units at about \$10,000 each to

over 20 customers, mainly dairy processors, including Mother Dairy, amul and Hatsun Agro.

Promethean also offers a solar add-on option to complement the thermal storage system and eliminate the use of diesel genset at the chilling or collection center. The Promethean Solar Pack, accompanied with a small battery bank, can meet the energy needs of small miscellaneous loads at the centers. Thus, the milk tankers don’t need to wait for milk collection even if there is no grid power at the collection centers.

Promethean is now developing new products, including a cooler for fruits and vegetables. What has “really kept me motivated,” says Ghelani, “is to see how we can make more technology and products adapted for the rural market in a country like India.” □