



**NatureCool™ 2000  
Immersion Cooling Fluid**

**Immersion cooling technology has existed for decades, but within the last several years it has started to see wider adoption in commercial applications. As chip density continues to rise and the amount of data generated continues to grow, computing and data center needs will also continue to increase globally.**

As a result of increasing computing power and the amount of data generated, data center power use has gone from several hundred kilowatts just 10 years ago to several hundred megawatts today, an over 1,000 times increase. This means more servers and more heat generated.

## **From Plants to Processors: Cooling the Data Mining Landscape with Immersion Cooling**

And while 35-percent of the total energy bill in an air-cooled data center is used just for cooling, the industry is seeking a more efficient solution as tighter renewable energy and greenhouse gas emission goals are established.

Companies that operate large data centers, such as Google, Microsoft, Amazon and Facebook are examples of likely adopters of immersion cooling, but anyone who operates a data center, accesses data in the cloud or at an on-site data center and cryptocurrency miners are also key end users.



**IMMERSION COOLING IS THE LATEST APPLICATION FOR PLANT-BASED TECHNOLOGY FOR CUSTOMERS LOOKING TO IMPROVE THEIR OPERATIONAL PROCESSES AND REDUCE THEIR ENVIRONMENTAL IMPACT.**



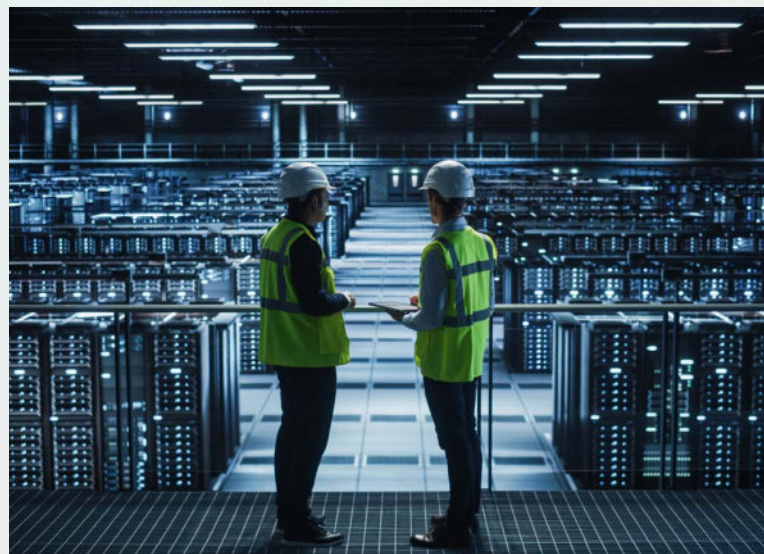
Kristin Anderson is the business development manager for Cargill's global bioindustrial cooling solutions sector. She is responsible for new product development including market and industry research, channel management and marketing. Prior to Cargill, Anderson held similar roles at Honeywell, AMEC and Colder Products Company. She holds a mechanical engineering degree from the University of Minnesota.

**AS CHIP DENSITY CONTINUES TO RISE AND THE AMOUNT OF DATA GENERATED CONTINUES TO GROW, COMPUTING AND DATA CENTER NEEDS WILL ALSO CONTINUE TO INCREASE GLOBALLY.**

As the generation and use of data continues to grow exponentially, more data centers and cryptocurrency mining centers that use massive amounts of power are needed. Data centers account for nearly 3 percent of the global electricity used and over 2 percent of total greenhouse gas emissions, as much as the carbon footprint generated by the entire airline industry.

As these businesses look for ways to reduce their energy use and support corporate social responsibility goals, they are turning to immersion cooling methods to replace conventional air-cooling systems. In addition to data centers, this technology can be applied to electric vehicle charging stations and other complex electronics.

Even beyond data centers, immersion cooling applications can be found in other areas, such as electric vehicles and other computing sectors as manufactures seek a more sustainable and efficient solution.



*Large data centers are turning to immersion cooling to offset massive energy demands*

**AS A RESULT OF INCREASING COMPUTING POWER AND THE AMOUNT OF DATA GENERATED, DATA CENTER POWER USE HAS GONE FROM SEVERAL HUNDRED KILOWATTS JUST 10 YEARS AGO TO SEVERAL HUNDRED MEGAWATTS TODAY, AN OVER 1,000 TIMES INCREASE.**



*Computer processing equipment submerged with immersion cooling fluid*



### **Understanding Immersion Cooling**

Electronic components within computing hardware are submerged in the dielectric fluid that transfers the heat from the electronics to the coolant, which then circulates to a heat exchange chamber. The cooled fluid is cycled back to the electronics in a continuous process that greatly reduces energy consumption.

This does not damage the electronics because the dielectric fluid and electronics components are designed to work together. In fact, using immersion cooling instead of air cooling typically prolongs the life of the electronic components by keeping them cooler and free from airborne contaminants like dust.

This cooling method has more than 1,000 times more cooling capacity than conventional air cooling and uses significantly less power by removing fans and large air conditioning systems, requiring up to 60-percent less energy.

Compared to conventional air cooling with HVAC systems, immersion cooling submerges servers in a bath of non-conductive liquid, allowing thermal heat generated by the computer components to be transmitted into the fluid and cooled. This method greatly reduces energy use, extends the life of the equipment, supports higher chip densities and lowers the overall operating cost.



**COMPARED TO CONVENTIONAL AIR COOLING WITH HVAC SYSTEMS, IMMERSION COOLING SUBMERGES SERVERS IN A BATH OF NON-CONDUCTIVE LIQUID, WHICH REDUCES ENERGY USE, EXTENDS THE LIFE OF THE EQUIPMENT, SUPPORTS HIGHER CHIP DENSITIES AND LOWERS THE OVERALL OPERATING COST.**

**A Renewable Alternative**

Cargill has been innovating in the bioindustrial space for many years. Given its deep agriculture and technology resources, it's working with customers around the globe to bring plant-based solutions to meet a variety of manufacturing and construction needs – from dielectric fluids to renewable asphalt, adhesives, coatings and plastiziers.

Immersion cooling is the latest application for its plant-based technology for customers looking to improve their operational processes and reduce their environmental impact.

The Minnesota-based company's newest bioindustrial product, NatureCool™ 2000, is the first plant-based dielectric immersion cooling fluid on the market for use in data centers, cryptocurrency mining and other advanced applications that allows for a more sustainable and efficient way to cool electronic systems.

The fluid, made from more than 90-percent vegetable oil, a renewable resource, along with performance-enhancing additives, allows for over 1,000 times more cooling capacity and up to 60-percent less energy usage compared to conventional air cooling. Plant-based solutions like this take the benefits of immersion cooling to another level by creating an even more sustainable method.

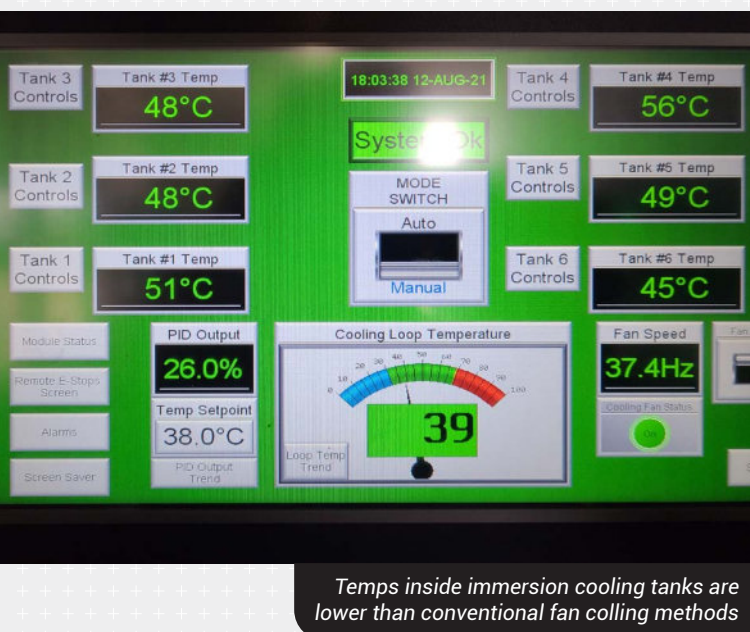


*Plant-based innovations offer a renewable solution for common industrial applications*



*Cargill's NatureCool™ 2000 is the first plant-based immersion cooling fluid available*

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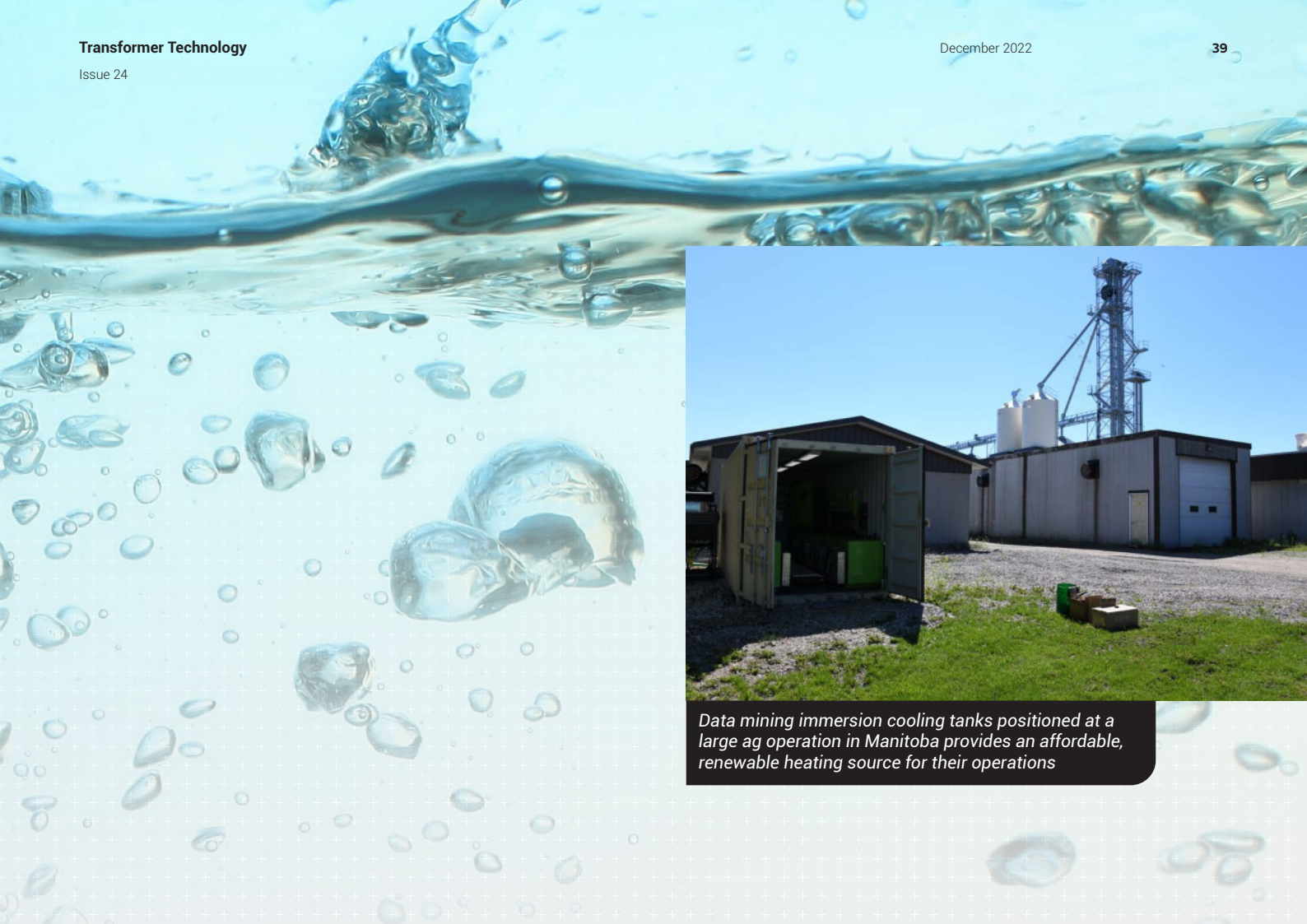


The fluid is CO<sub>2</sub> neutral with a Global Warming Potential of zero, helping make applications adopting the fluid more sustainable. It has a 10-percent higher heat capacity than leading synthetic immersion cooling fluids, making it higher performing. It also provides a superior level of fire safety with a very high flash point of 325°C and unlike synthetic fluids, it doesn't self-ignite and flames out after the heat source is removed.

"Immersion cooling is the new frontier of technologies that allows for more efficient, higher performing systems that also help make the IT industry more sustainable," said Kurtis Miller, managing director of Cargill's Bio-industrial business. "In just the last 10 years, data center power usage has increased from several hundred kilowatts to several hundred megawatts, an over 1,000 times increase. As chip density continues to rise and the amount of data generated seems endless, we need to find more efficient and sustainable ways to operate these complex systems."

### **A Self-Contained Cooling and Heating Solution**

Immersion cooling, while still a relatively new technology, is quickly becoming the preferred method for cooling power-hungry electronic equipment as data generation and online activity continues to skyrocket. What's more, immersion cooling is serving as a source for heating



*Data mining immersion cooling tanks positioned at a large ag operation in Manitoba provides an affordable, renewable heating source for their operations*

buildings in colder climates without needing conventional electric or gas heat sources.

Mindful Energy Solutions, Inc., based in Manitoba, Canada, is using NatureCool™ 2000 fluid in modular data mining tanks positioned at large farming, greenhouse and industrial facilities near Winnipeg. The fluid provides a source to cool the data processing equipment and the thermal energy stored in the fluid is then upcycled as an effective and affordable heat source for warming those facilities nine months out of the year.

Mindful Energy is conducting its own crypto currency mining in these locations and is currently working with large Canadian corporations on decentralizing data mining in the same manner to reduce energy costs and power outage risks for a more efficient and renewable solution.

“We were seeing businesses with huge losses on both ends of the energy use spectrum – from inefficient cooling of processors upfront – to not having the ability to capture and reuse generated heat on the back end,” said Stephane Gauthier, partner and CEO of Mindful Energy Solutions, Inc. “Now, by utilizing the heat held in the immersion cooling fluid, we’re seeing some customers cover 100 percent of their annual heating cost in facilities that are over 10,000 square feet, representing huge savings while being more sustainable.”



*An employee with Mindful Energy Solutions, Inc. monitors tailored immersion cooling systems at an agricultural customer site*

Photo: Cargill, Shutterstock



For more information about Cargill's NatureCool™ 2000, email Kristin Anderson at [Kristin\\_Anderson@cargill.com](mailto:Kristin_Anderson@cargill.com), or visit [naturecool.com](http://naturecool.com)