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## Two-Phase Immersion Technology

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Dodecafluoro-2-methylpentan-3-one— $\text{CF}_3\text{CF}_2\text{C}(\text{O})\text{CF}(\text{CF}_3)_2$ —is not a new fluid. It was manufactured by 3M Corporation under the name 3M Novec 649 Engineered Fluid and is now marketed by Standard Fluids Corporation as SF649. **What is new is how it could radically change the economics of the multi-trillion dollar data center market.**

Often, tech happens by finding a new application for an old invention.

SF649 is a magic fluid. It is a liquid at room temperature but boils at 120 degrees Fahrenheit. It has a low dielectric constant of 1.8 (air is 1.0), meaning that electronic components can be immersed into the fluid and can expect to operate normally. But the semiconductors in computer server boards that normally have to be slowed down when they get too hot, will not get much hotter than 120 degrees as long as they remain immersed in the fluid. The servers can be run at a higher performance level, they will not suffer degradation over time due to heat, and the heat can be removed from the vapor by means of a condenser system using water loops, which is much less expensive than using air-conditioned air blown over heat sinks. Moreover, the computer server boards can be packed in more tightly into tanks containing SF649, which can make a data center far more compact.

Many details concerning the construction of the tanks filled with SF649 must be engineered. Computer server boards must avoid plasticizers. But immersion technology

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is feasible and could lead to trillions of dollars in savings in data center construction, energy costs, server performance levels, maintenance, and server board refresh cycles. Data center providers have recognized this technological breakthrough. Among those pursuing this technology, [Standard Fluids Corporation has recently announced a partnership](#) with [E3 NV, LLC](#), to bring SF649 and 2-phase immersion technology to the data center market.