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Software to Fireproof Wine

● A Napa vineyard's custom AI system was able to tweak winery controls to account for a fast-approaching wildfire

As helicopters rescued people and their pets off Atlas Peak in Napa, Calif., one night amid October's fires, Christian Palmaz was nearby battling his own flames. His task: to save his family's winery, Palmaz Vineyards.

Alone, he walked past the doomed acres of unpicked grapes to the winery, a series of caves dug 18 levels down into the side of Mount George, where 90 percent of his wine, more than $10 million worth, was fermenting in tanks. It typically requires constant human monitoring to maintain precise temperatures for the wine, among other things. Palmaz confirmed the backup generators were running and able to keep things cool, but as the tech guy without the savvy of his head winemaker, who was stuck on the other side of the fires, he had every reason to fear the wine could be ruined. By the time he checked the generators, the guest house was on fire. He hosed down embers as they flew off the frame.

Yet the winery survived the worst disaster in the history of California's wine country unscathed, because Palmaz wasn't alone, exactly. He had artificial intelligence on his side.

Felix is the nickname for the Fermentation Intelligence Logic Control System (Filcs), software Palmaz engineered to analyze and, eventually, help micromanage the vineyard's 36 winemaking tanks. Using technology developed by the petroleum industry, Felix gathers data 10 times a second from temperature and density sensors in the tanks and uses an extensively tested algorithm to adjust settings to maintain equilibrium. The web-based system had been online since 2014, its Amazon-hosted database growing by gigabytes a day, but it was always a backup, a curiosity. The head winemaker had always been there, so it had never run solo.

Palmaz bumped up the system's "aggressiveness," giving it more leeway to add glycol or warm water as needed, just as the missing cellar crew might do. Felix also watches hundreds of valves to quickly spot any blockages and predict and test possible problems with fermentation. The system managed the tanks seamlessly with zero human input. "It was never designed to do that," he says. "It saved the wine."

◀ Most of Palmaz's unpicked grapes wound up tasting like ash after the October fire, making them a loss

Palmaz, whose dad invented a type of coronary stent, has a techier background than the average wine seller. A business management major at Trinity University in San Antonio, he also studied computer and earth science, learning about remote sensing and regression modeling. In 2007, when he joined the family business bought by his parents a decade earlier, he tried to bring that technical expertise to bear. The staff spent much of their time babysitting the fermentation process, testing the tanks' aromas, tastes, and textures firsthand. To free them up from constantly monitoring temperature and density, Palmaz developed a way to visualize those characteristics. He spent the next two years tinkering with liquids and algorithms in his garage.

Temperature, an indicator of yeast health, and density, which shows how much alcohol has been converted from sugar, became his measurements of choice. He hired Emerson Electric Co., a consultant on gas pipelines and refineries, to make a custom two-pronged density meter for the tanks. "We told Chris it would be a challenge, because of the grape skins and stems, and that we hadn't done it before," says Dave Schratz, senior sales engineer at Emerson. Palmaz had

COURTESY PALMAZ VINEYARDS

them make the sensors anyway for $12,000 to $14,000 apiece, then made his own sieves to keep the skins and stems out. “That was the riskiest thing I did. They were crazy expensive,” he says, though he’s fuzzy on the exact numbers.

All told, the setup cost the Palmaz family millions—a huge investment for the boutique winery, which produces fewer than 10,000 cases a year. Felix’s success under pressure has silenced its doubters. Dozens of companies have come by to check out the operation, and E. & J. Gallo Winery, which has thousands of fermentation tanks, has begun testing Emerson’s meters. Palmaz isn’t focused on profiting from his innovation, saying it should be open source and its data available to anyone. “Felix should become a teaching tool,” he says, one that can help explain the reasons for wine’s subtle variations. “I want to get as much information out of it as possible, and the best way to do that is to open it up to the world.” —*Larissa Zimberoff*

THE BOTTOM LINE Palmaz says his homegrown temperature-tweaking AI at his family’s vineyard saved at least $10 million worth of wine during October’s Napa Valley fire.

▲ The Filcs system, nicknamed Felix, tracks and analyzes minute changes in the wine tanks and adjusts settings to maintain equilibrium

● At risk was 90 percent of Palmaz Vineyards’ wine, worth more than

$10m