Mark Seifert says he has found a way to save a lot of cold cash by applying heat to his vineyards.

Agrothermal Systems, based in Napa, California, has pioneered the use of Thermaculture treatment services, a new methodology for managing crops through the application of heat with substantial, proven results, the company said. Applied to plants by their trademarked Agrotherm XT, a tractor pulled machine, the heat treatment can be applied at various stages throughout the growing cycle.

Seifert, vineyard manager of Foley Family Wines and Sebastiani Vineyards in Sonoma, California, has found success in Thermaculture trials at two of his vineyards. The results: fewer pests and more grapes at a lower cost.

“We measured increased numbers of berries per bunch, increased bunch weight, increased Brix, clean fruit, and improved phenolics in the grape
juiced measured in the lab,” Seifert said.

The idea of applying heat to grapevines is relatively recent. The concept was developed and patented by Florencio Lazo, a Chilean grower, in 2006. Lazo came up with an idea to apply heat for frost control then began to experiment with the notion as a potential tool for pest control.

That’s when Marty Fischer stepped in. Fischer, who now runs Agrothermal Systems, says he heard about Lazo’s work and started working with the Chilean grower to develop applications for the idea on commercial ranches.

“Thermaculture...is used for numerous grape crop benefits, including increased fruit set, creating higher levels of phenol and antioxidant, drying off vines after rains,” Fischer says. “Some of our growers have experimented with pest control for both insects and fungus – using heat by itself, and in combination with fungicide. The results have been quite encouraging, and we have begun more scientific examinations of the pest control benefit and protocol experimentation.”

Fischer notes that it has become clear that the heat blast at 300-350 degrees Fahrenheit increases plant surface temperature instantaneously and this leads to a form of thermal shock. The result is higher levels of phenol and antioxidant in the wine.

“These chemicals/compounds are the flags that the heat has activated the natural self-defense system of the plant,” said Fischer. “At the same time, the heat level is way beyond what insects can withstand if they are in the open parts of the canopy. They heat up and, in some cases, either are damaged or just leave. The smaller the insect, the more it heats up, so tiny insects like mite and thrip populations cease to find their homes in the canopy. Those insects that are large or are protected by bark or other cover are not affected.”

Fungal control is a bit more complex, but some growers report success controlling powdery mildew, especially in rotation with sulfur compounds, Fischer notes.

“This has resulted in some producers being able to cut 50% or more of their fungicide use. We believe that the heat and natural plant self-defense component work together to accomplish this resistance.”

Heat Treatment Saves Cold Cash?

Heat treatment can save growers money, although how much can vary according to grape variety, weather conditions, and other factors. Fischer said, in general, the technology leads to more grapes at harvest time.

“Typically, if you add up the cost of the propane, the cost of the machine depreciated over 100 acres and five years, the cost of labor, the cost of depreciating a tractor and the cost of diesel – and you’re assuming you’re doing 100 acres, it ends up about
$30 (per-acre) for everything,” Fischer said. “That would compare to much larger amounts of money for a pesticide treatment because of the cost of the materials. We use roughly three gallons of propane per acre. That’s $5-6 per acre. If you contrast that with the cost of pesticide, you’ll find a very big price difference. And again, it depends on the pesticide you’re using. Sulfur is quite inexpensive, but some of these other [chemicals] are costlier. It’s cheaper per pass. Historically, we’ve done eight to 10 passes per season.”

In addition heat treatments have added about 24% more berries per bunch during the fruit set period, and the average yield is about 16% more.

“So, if you’re a typical vineyard and you’re doing three tons per acre, you could pick four tons – that’s about 15 percent more revenue,” said Fischer.

Seifert says he’s not yet sure about the cost savings, however, he notes, that’s not a “big-picture” consideration. “I think when all things are said and done, there may not be much cost savings, but we had disease-free plants and fruit that rivaled plants that had conventional pesticides applied, and we increased yields and improved wine quality without the use or potential dangers or side effects of chemicals.”

The idea of applying heat to plants might seem discordant to a novice of the treatment system. It’s a relatively safe procedure though, Seifert said.

“The only danger of using heat on the plants might be if the machine operator stopped forward movement of the equipment and were to scorch the plants, or if the operator were to use too high of temperature,” he said.

Seifert also warns that Thermaculture might not fit every ranch in every climate; he only knows that it has worked for him. “We are told that if there are plants that have insects this technology is a good erradicant,” he said. “Fortunately, we have not been able to prove that as of yet because we don’t have too many insect problems.”
Fischer acknowledges that heat treatments might not be an ideal fit for all growers. Not yet, anyway.

“I don’t know where we’ll ever get to the point where it’s 100 percent of a solution for either insects or fungus. If you try to treat fungus in an environment on the East coast or in Canada, where they get more rain, it’s much more complex than trying it in the West coast, where it’s drier. So, there’s much more work that needs to be done,” said Fischer.

Heat can kill insects instantly, but it doesn’t prevent another wave of pests from doing damage. “We don’t leave any killing residue, so if it’s a highly mobile insect, it might come back a second time,” Fischer said.

A Sustainable Solution

Thermaculture is a sustainable system that is suitable to a variety of scenarios, including organic production.

“I think the use of this technology can be expanded in the agriculture industry – not just limited to wine grapes – as it becomes more widely used and experimented with. Because it is a clean technology, there are no known side effects. I would tend to believe there would be no problems in certified organic situations,” Fischer said.

Potentially growers applying heat could get healthier or stronger plants because of the stress response mechanism in the plants as they are heat shocked.

“If anything, I think this technology can be used in a lot of colder climate locations or in years when the weather is cooler than normal to promote growth,” said Fischer.

Seifert believes that Thermaculture will find wider use across the industry, even if it doesn’t push pesticides out of the picture.

“In the end, this is another very valuable tool in the toolbox,” said Seifert.

Besides those going on at Seifert’s vineyards, sev-
eral trials of Thermaculture are underway this sea-
on, Fischer said.

“Buoyed by grower experiences, we have initiated several trials this season to evaluate pest-control effects from Thermaculture. These are under the management of well-respected scientists. Thus, we hope to develop effective protocols whereby the effects of heat shock in combination with fungicide can improve overall pest control and with lower levels of pesticide use. In the meantime, our grow-
ers are also developing experience with their own experimentation,” said Fischer.

Another Sustainable Option

Heat treatments are not the only so-called “sustain-
able” option for growers. Joe Haslett, horticultural-
ists and client services director for Arroyo Grande, California-based Organic Ag Products, says their product “Exicute” is an ideal organic material for fighting insects.

“We recommend one of our products to grape growers for the control of mealy bug, leaf hoppers, mites and others,” he says. “This is made from plant-derived oils and is approved for organic farming systems.”

Exicute, a mixture of natural plant oils, also con-
trols chewing insects and fungal diseases like pow-
dery mildew, rust, and Sigatoka.

Traditional Tools Also Employed

Meanwhile, other growers across the U.S. say they are implementing an array of pest control tools. In New York, Cornell University Extension has pub-
lications on integrated pest management that prove useful, Bill Smith, owner of Serenity Vineyards in Penn Yan, New York told The Grapevine Magazine.

“It covers insects, sprayers, weed control and chemicals, longevity and effectiveness, whether they’re restricted, what they do control and what they’re not sure about, and they have a section on first sprays, pre-bloom, post-bloom and the timing of the berry moth,” said Smith.
The most nettlesome insect in Smith’s area seems to be the grape berry moth, followed by leafhoppers, he says. He also notes that Japanese beetles are a “bit of a nuisance.”

“The multicolored Asian ladybug is kind of coming into our area new,” Smith said. “They like soybeans, and when the beans start turning yellow, they migrate into vineyards and burrow into grape bunches. You could have 30-40 pounds of grapes in a basket and have 10-15 lady bugs. When they’re disturbed, they let go a nasty smell, and it can taint your grape juice, so if you have soybeans around your vineyards, you look out for them.”

Some growers are less susceptible to insects than others, due to geographical and climatic factors. Jon Verbitsky, owner of Golden Leaves Winery in Fairplay, California, told *The Grapevine Magazine* that his six acres of vineyards are less vulnerable to pests than are some of his neighbors in California’s Napa Valley. “I think a lot of that has to do with where you’re at,” said Verbitsky. “The thing is, we’re in the foothills of California and we don’t really have the pressure like they do in lower areas, like in Napa and the valley. We don’t have the mildew problems like they do or all those kinds of things.”

Mites can be a problem in his area, Verbitsky said, however, they’re not common.

“I don’t think I’ve sprayed for mites in two years,” he said. “It’s one of these things that hit and miss. If it’s super dry, you might have a tendency to get mites, and if you get too many, you do your preventative sprays.”

Japanese beetles and “little grape leafhoppers” are the bane of Bill Sherman’s crop at Vincent Road Vineyards in Clayton, New York, Sherman said, but these pests are highly controllable by spraying them a couple times a year with Sevin.

Mark Hauser, vineyard manager with Healdsburg, California-based, Alexander Valley Vineyards, monitors his vineyards regularly and takes plenty of notes.
“What I do is I have sheets I fill out. I go out and look two days a week, at so many blocks, looking for pest and field infections. If you have a 10-acre block and hit four corners, if you check two or three spots, it should be relatively the same unless you see a problem. I look for pest problems, mildew problems and write it down on a piece of paper I can file,” Hauser told The Grapevine Magazine.

Hauser says his operation is “certifiably sustainable.” That requires meticulous record-keeping.

“Part of that is keeping track of field inspections and other things you do in the vineyard,” said Hauser.

Hauser also limits pest invasions by putting in a buckwheat cover crop – a strip every 10 rows – to attract beneficial bugs, which helps them rely less on chemistry to control the pests.

“They hang out there in the white flowers when they bloom - mites or leaf hoppers before they turn into a flying bug and spread around to lay eggs. The larvae love to eat these guys. You draw good bugs to combat the bad ones,” Hauser said.

There’s no point in spraying for flying insects however.

“You don’t spray when you have a lot of the fliers; you wait until they lay their eggs. When...all they do is crawl, [then] you spray,” said Hauser.

Hauser, who is transitioning to 30 acres of organic grape production for 2018, was asked whether heat treatment would be effective in his regimen. He says he’s familiar with the process.

“If you have organic vineyards, which I do have, they use propane and raise the temperature to about 108 degrees and blows this heat and it has a fan, and most bugs will congregate under the leaves because they’re shaded. These fans turn the bottom side of the leaf up, and those young soft-body bugs will succumb to that temperature. That’s an organic application for pest control.