CHAPTER 27

PRACTICAL EXPERIENCES WITH ALCOHOL PRODUCTION

In the fall of 1982, I traveled 1600 miles through California and Oregon visiting alcohol fuel producers. My companion and chronicler was Matt Farruggio, a skilled technical photographer. Our team also included a film crew from KQED-TV to record our trip for one of the segments of my television series.

This chapter is comprised of interviews we conducted with students of my workshops and with others. These men welcomed us to their plants and generously shared their experience to benefit those who will follow.

The conditions these pioneers in modern fuel alcohol production faced were much tougher than those today. To begin with, there was just the sheer difficulty in finding good advice. Some did it before the government legalized alcohol production. There was no Internet to consult for information, and oil companies were in a full-court press to libel alcohol in the media. One thing that shines through in all these interviews is the persistence and ingenuity brought to all parts of the alcohol fuel process. We all need to remember that we possess these qualities, if not individually, then certainly collectively.

When my television series was canceled after its first airing, the greatest loss was the first-person stories on tape of those we visited (destroyed by KQED). All of them carried a thread of hope and confidence that proved we could provide solutions without government help. It's difficult to capture what's exhibited on tape in a book. I've done my best to give you a good picture of a few of the people and alcohol plants we visited.

This is a slice of history, so I would ask that you go back 25 years and pretend you're leanin' on the side of my truck, listening in.

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PAOLA CORSO

Fig. 27-1 NOPEC alcohol fuel facility. *KQED filming Ian Crawford at the NOPEC alcohol fuel cooperative.*

FLOYD BUTTERFIELD

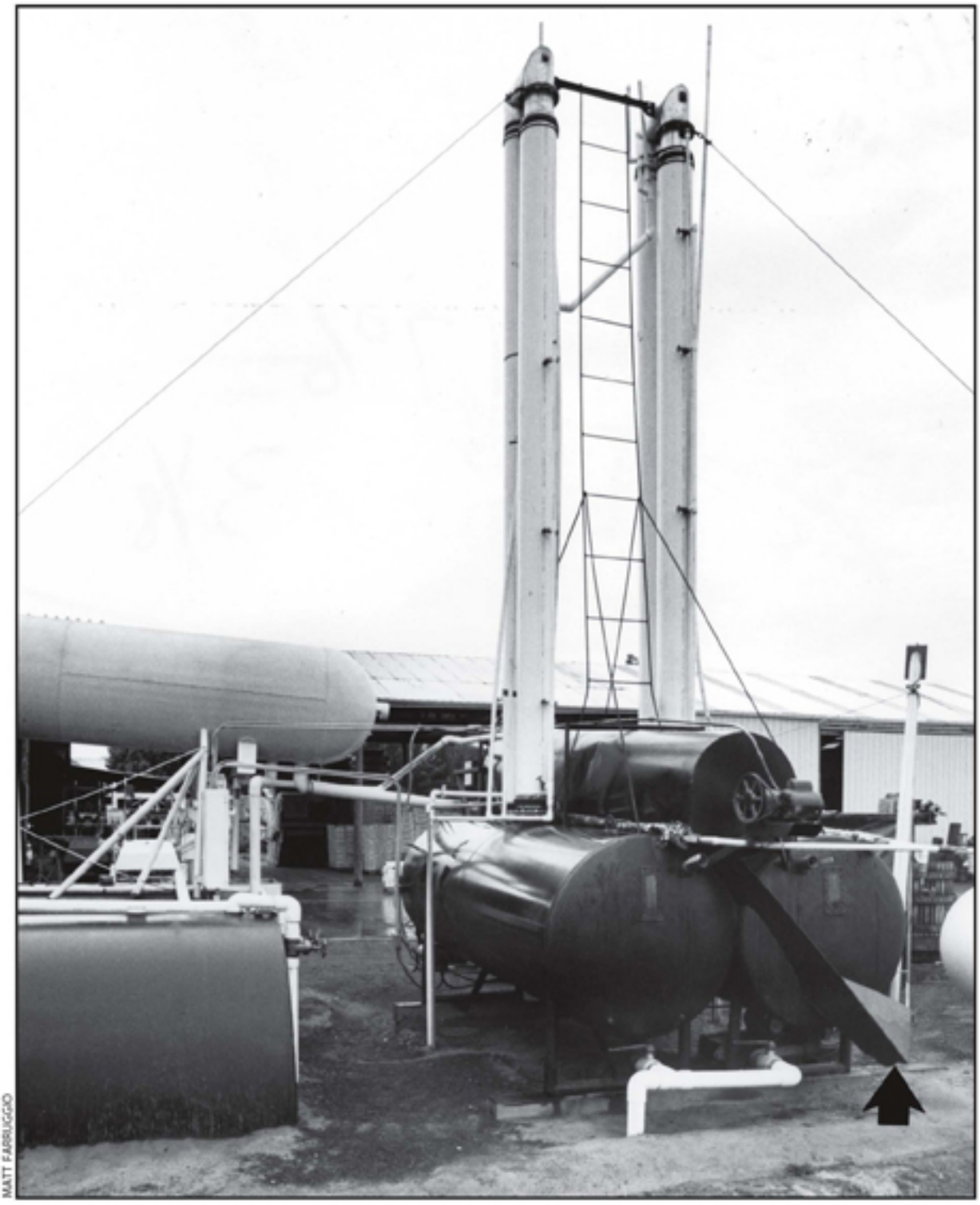
Floyd's farm is way off the highway and just above the floodplain of a nearby river. Matt and I headed

rubber collars normally used to connect clay pipe for underground applications. They look very much like large no-hub couplers, often used with smaller-diameter cast-iron pipe in buildings.

Hot water from their heater circulates through 150 feet of ¾-inch copper tubing heat exchangers in the distillery tank. It takes a little over 20 minutes to bring the temperature up to boil. Reflux control is accomplished with a cold-water coil in the top of the column.

Their still uses ⅜-inch-diameter copper tubing for control of the column using cool water. A single, tightly wound, long coil in the top of the column allows them to control the proof manually—they had no problem getting the still to settle right down at 190+ proof (typical of a distillation under vacuum).

The mash in the still is heated with hot water through a heat exchanger in the tank. With the kind of water heater the Heintzes use, running on



MATT FABRUGGIO

Fig. 27-5 Rear view of the Heintz plant. *Twin distillery tanks with feed dryer mounted between them. Note the chute (see arrow) where dried feed drops from the drum to the truck loading auger, which lifts up and away from the tank.*

MATT FARRUGGIO

Fig. 27-6 The Heintz alcohol plant. *Working from right to left, fruit goes up the elevator into the large hopper and is transported a few feet to the hammermill (see arrow). Shredded fruit drops from the hammermill into half-buried fermentation tanks. The vacuum pump behind the distilleries draws a vacuum in the two 20-gallon-per-hour, eight-inch column stills, which subsequently pulls the ripe mash in from the fermentation tanks. After distillation, spent mash is drawn up into the white tank. From there, it flows into the separator (far left), and then to the tumble dryer on top of the stills. A feed auger (upper far left) takes the dry feed and drops it into a truck when the plant is running. Dave, Kent, and Thurly are standing around the small* **flash heater** *that runs the distilleries and feed dryer.*

natural gas, a lot of waste heat issues from the flue—Kent guesses about 60,000 Btu per hour. So they've ducted this heat beneath an inclined, rotating, perforated drum, and they use it to dry their animal feed byproduct. Their roller drum is mounted on top of and in between the two distillery tanks, so it picks up a bit of the heat radiating from the tanks, as well. This inexpensive version of extremely expensive rotary drum dryers used by the grain industry works especially well, since high-speed drying isn't necessary in an alcohol plant of this size.

The sharing of information on alcohol production was really important to the Heintzes. Thurly told us, "When we went looking for fruit shredding equipment, we were told by three different hammermill factory salesmen that anything over 40% moisture wouldn't work and would load up on the hammers. Finally, we talked to a guy with some real experience, and he told us that stuff with 80% moisture, like our fruit, is self-washing and would run right through. He was right—it works like a champ."

When the brothers found a used hammermill, they bought a 40-horsepower electrical shredder. "It cost us $3500—a real good price for a shredder that size, and we were really surprised at how fast it grinds fruit. We can go through more than 20 tons in two hours." They know now that their hammermill is about twice as powerful as it needs to be for their type of feedstock.

Kent and Thurly don't cook their fruit at all. Since the already washed fruit comes from a sanitary refrigerated storage area in the cannery and is fermented quickly with a strong inoculation of yeast, there aren't significant problems with bacterial contamination. Their pulp floats a bit, while solids such as pits drop to the bottom of the tank. (Peach pit remainders may become a saleable byproduct as an attractive red "gravel" for gardens, yards, and dirt roads—the brothers have already taken orders from some of their neighbors.)

Thurly is a strong supporter of the alcohol fuel movement. (He did a simple conversion on his motorcycle, a Triumph Bonneville.) He warns, "Too many guys who make alcohol think that patenting some little new process or device is going to make them rich. They hoard information that could be helpful to a lot of other folks who are struggling to just become self-sufficient. If anything is going to damage the alcohol movement, it won't be the oil companies—it'll be that secretive attitude on the part of people in the movement."

THE GOODMANS

As Matt and I traveled north through the Central Valley, farmers were working at a furious pace to get their cotton harvested and under cover ahead of the predicted early rains. Paul Goodman, his brother Ron, and father W.L. took the time to talk to us about making and using alcohol fuel.

Paul uses a batch vacuum still that he purchased from a Midwest company. He gets about eight gallons an hour out of it, although it was advertised to produce ten gallons an hour. The still came equipped with electrical heating elements for boiling the mash.

The Goodmans use the vertical stainless steel agitator that came with their cooler. They've installed a temperature log (see Figure 27-7) to record the variation in temperature over a several-day period, and plan to use this information to optimize fermentation techniques for some new feedstocks they're thinking of trying.

W.L. Goodman, a lifelong farmer, is a vocal advocate of alternative energy, and more in touch than most urban dwellers with the Earth's sensitivity to chemicals

The feedstocks that they've worked with have been liquid. Since molasses is fairly easy to work with and the price per ton was low when we visited in the fall, molasses was their choice for winter processing.

In summer, the Goodmans have an amazing resource available to them. Melon growers take their culls to a collection area, not far from the Goodman farm, where pulp, rinds, and seeds are separated to be fed to cattle. The melon juice is pumped into an enormous lake, where it's allowed to go through a bacterial decomposition.

Paul's experiments with juice taken from the lake have been disappointing, since the extremely high bacteria level so overwhelmed his yeast that fermentation was stopped. He's negotiating to salvage some of that juice before it's dumped.

The Goodmans run two old tractors on their alcohol fuel. The old-style carburetors on their tractors utilize a single jet, and simply enriching the mixture has been enough to achieve smooth running.

W.L., a lifelong farmer, is a vocal advocate of alternative energy, and more in touch than most urban dwellers with the Earth's sensitivity to chemicals. "For years they told us DDT was safe, and I've been soaked in it plenty of times. When the truth came out, we all stopped using it. No one around here has dropped dead from the stuff, but we know we may not live as long."

W.L. said that "nuclear waste is another thing altogether. A meltdown up there [at Rancho Seco near Sacramento] would be the end of everything around here." In fact, Rancho Seco has since had such a dismal safety record that it had to shut down its reactor and switch to generating electricity with fossil fuels.

Jim Hall's a grain farmer. He became interested in renewable energy and ways of dealing with grain for multiple markets back in 1978.

JIM HALL

It was close to sunset when we arrived at Jim Hall's farm and alcohol plant. His place is in one of the most beautiful areas of California, Mount Shasta's backyard. A storm the day before had made the mountain look like Mt. Fuji. The snowpack is what makes this otherwise arid region of the state an agricultural wonder. Most of the soil here is volcanic, alluvial, and therefore extremely rich. We drove into the farm and up to a barn with a boiler flue rising out of the north wall.

Jim's a grain farmer. He became interested in renewable energy and ways of dealing with grain for multiple markets back in 1978. "Since then, grain prices haven't gotten any better," he told us. In fact, that week, wheat had just hit a five-year record low—a result of the oversupply of two bumper years.

"Alcohol seems to be the way to get our fuel and still market the grain. I have these local dairies just

MATT FARRUGGIO

RIGHT: ***Fig. 27-9*** ***Jim Hall.***