THOSE DAMN’ SMUDGE POTS!

(70 YEARS OF ORCHARD HEATING IN EL CAJON)

I had yet to arrive in El Cajon on the morning of February 1, 1929, but I’ve been told that it had been a very cold night. It was cold enough that the men and women who tended the citrus groves had started lighting the orchard heaters, most often called ‘smudge pots,’ shortly after midnight. Though tired and covered with black soot, they were already preparing for a day of hard labor in anticipation of another frigid night. My father was among them, working in spite of a toothache, while my mother had been painfully occupied with another kind of long labor at Mercy Hospital in San Diego. I, unaware that the next 23 years of my life would be influenced by orange groves, was struggling to breathe and adapt my body to a new environment.

That cold February night was just one of many that impacted the citrus industry in the El Cajon Valley throughout its seventy-year history (1890 – 1960). Generally speaking, its climate was a little cool for growing lemons on a large scale, but the Valley offered a variety of rich soils, mild weather, and usually sufficient water to support orange and grapefruit groves. Against those assets, however, one would have to list pocket gophers who feasted on tree roots, the uncontrollable water-stealing, deep-rooted Bermuda grass that was beginning to spread across the Valley, and the dozen or so cold winter nights each year that could damage new growth and destroy immature fruit. Measures against the threats of freezing temperatures included the most spectacular aspect of citrus fruit production . . . orchard heating.

The protection of crops against frost damage is complicated; a combination of intuition, luck, art, and science. In the case of citrus fruits, the variable factors of ambient temperatures, internal fruit temperature, the percentage of sugars in the fruit juices, the length of time the fruit will be exposed to low temperatures, and the means available to protect trees and fruit are crucial. For example, the rule of thumb was that maturing oranges could withstand a temperature of 26-degrees F (3.3 degrees C) for four hours without significant damage. This was an excellent observation, but the questions remained: when should that four hours begin and how mature is the fruit? (See article by Milman Youngjohn, Heritage, July 2013.)

The groves are gone now, but it’s easy to see that the lands suitable for citrus production in the El Cajon Valley lie at elevations ranging from the valley floor into the surrounding foothills, which can be classified as ‘micro-climate’ zones. These zones are observable when the valley is foggy or smoky, and the temperature layer or ‘ceiling’ upon which the clouds are spread becomes visible. The coldest temperatures occur at the lowest levels (the western portion, largely occupied by the city), and rise with each foot of altitude until reaching the hopefully-named ‘frost free’ hillsides. The object of orchard heating, of course, is to raise or stabilize the temperature between the ground and the ceiling, and to
provide a safe environment for the ripening fruit.

During the 1920’s, many theorists believed that smoke from any heat source in the orchards would lower the ceiling, reduce the volume of air to be heated, and surround the trees with its warm moisture and heat. This was a flawed assumption, but for many years, the growers, relying on the information available, made no attempt to eliminate the heavy ‘smudge’ produced by coke or oil heaters. In any case, it was incumbent on the grower use any available method to provide heat for his grove, ignoring unhealthy respiratory consequences.*

While some thrifty growers still burned stacks of old tires, the majority turned to the coke-burning units (‘smudge pots’) as they became available and later invested in the more efficient oil-fueled heaters. All methods of orchard heating are costly, not only in the price of the fuel consumed, but in the wages paid the manpower required for the operation and maintenance of the system. I recall that as a general figure it was estimated that fuel oil costs accumulated at a minimum of $50-per-hour (1939 dollars!) for every ten acres heated. The grower, his family, and perhaps some hired labor (usually at about 50 cents/hour) would be involved in each firing of the heaters. During World War II, the Citrus Association arranged for Mexican laborers (‘Braceros’) to work in the groves, and often made them available for heater firing and maintenance.

As to the heaters, the early commercial models were simple sheet metal stacks with a grate and air adjustment holes in the bottom. The fuel of choice was a mixture of coke briquettes and oil-soaked wood, purchased in large burlap bags, which was lighted from a hand-held torch containing a mixture of oil and gasoline. In theory, the lighted heater could be shut down by placing a cap on the stack. This was seldom effective and a lighted heater was usually allowed to burn itself out. The next day, the large bags of the coke/wood mixture, were stacked on sleds or stone-boats, which were dragged by tractor or horses through the groves and stopped to fill each heater in preparation for the next night. [Heaters were only placed between the rows of trees only during the winter. The rest of the year, they were stored next to the trees.]

The introduction of the oil heaters in the late 1920’s and 1930’s offered more efficient use of fuel and a greater production of heat. The unit consisted of a reservoir (bowl) at its base, a base lid (incorporating a fill orifice with a cap that included the damper or adjustable air vent) that supported the combustion chamber and stack. A hinged cap on the stack protected the heater from weather and assisted in the heater shutdown. The use of a liquid fuel required the grower to supply a large storage tank and a tank wagon to deliver the fuel to the heaters. [The modern ‘return stack’ feature was not a part of the heater at that time.]

The long-spouted torch, similar to those used by fire departments setting back-fires, was fueled with a mixture of half gasoline and half fuel oil. A lighted wick was maintained at the burning end and a firescreen installed inside the spout prevented the
flame from reaching the fuel. During the heater lighting, a splash of burning torch fuel was splattered on the open fill cap of reservoir; the rising heat drew the flame into the heater and ignited the heater oil and its vapors.

In the later years of the 1940’s some growers, like my cousin Earl Vanatta, experimented with ‘wind machines’ at his property on Third Street. In theory, the twenty-foot high windmill, could draw the warmer air down from the higher elevations and blow it across the orchard. This works if the higher air is truly warmer; if it is as cold, or colder, than the ground temperature, the propeller draws that frigid air down into the orchard. Furthermore, the breeze from the machine shakes the super-cooled fruit and may cause its juices to freeze and break down the cell structure from the inside.

Many growers also invested in a device popularly called a ‘frost alarm.’ Essentially a thermostat, it was installed on a post in the orchard and connected by wires to a power source and a bell by wires. When the temperature dropped to its ‘set-point,’ the bell rang to indicate that a firing of heaters might be necessary.

Beyond the purchase of heaters, fuel, and thermometers, the individual growers prepared to protect their groves by studying bulletins from Federal, State and County agencies. Severe freezing conditions during 1913, 1922, and January 1937 (the worst on record) emphasized the importance of the citrus industry and the necessity for its support. The establishment of County Farm Advisors by the University of California Cooperative Extension services added extensive research and published much-needed advice.

Pressure on elected representatives led to the authorization of the United States Weather Bureau to establish guidelines to prevent frost damage to crops. In 1917 the Bureau appointed Floyd D. Young, a hydrologist, to lead the research and establish a warning service. They had found the ideal man for the project, and with the support of grower associations, the Fruit Frost Warning Service was in operation by 1922. Reporting and recording stations were set up in the agricultural areas all over California, the data coordinated by Weather Bureau personnel, and transmitted to the Service headquarters in Pomona.

Anyone who remembers those days will recall the voice of Floyd D. Young, himself, listing the agricultural communities and forecasting the expected overnight temperatures. Warnings, first broadcast on KNX and later on KFI; were presented every night at 8:00 P.M. from November 15 through February 15. Listening to those nightly frost warnings assumed some aspects of a religious ritual for citrus growers. When Mr. Young retired in 1956 after 39 years of service, he must have taken great satisfaction in the service he had founded.

Locally, the Weather Bureau employee, a Mr. Harmon in the 1940’s, had an office in the El Cajon Valley Citrus Association packing house, and set up field stations throughout the Valley. Milman Youngjohn mentioned one on Pepper Drive and one was
installed on my parents’ property near Third and Lexington. The station consisted of a white hutch-like structure and contained a Thermograph (a device that graphically recorded the temperatures for a week), a low-temperature recording thermometer, and in at least one station, a sling psychrometer (to determine relative humidity). The weather man would drop by once a day to take readings, and then return to his office to draw the local weather map and transmit his forecast to Pomona for broadcasting.

With all of the technical assistance in place, the grower had to translate theory into action. Large citrus ranches typically hired extra help during cold weather and had heaters and replacement fuel in place. While our property was comparatively small, the same principles applied.

My grandfather, Bert Vanatta, and his brother Elmer, having split twenty acres on the southeast corner of Third and Lexington in El Cajon, operated separately, but held some farming equipment in partnership. This included the Caterpillar ‘10’ tractor, a variety of cultivating tools and the orchard heating maintenance equipment. This arrangement passed to my grandmother, and then to my parents after my grandfather’s death in 1928. As might be expected, our earliest heaters were coke burners (“smudge pots”), and were refilled after use as described above.

By the time I was in grammar school we had switched to oil. My Uncle Elmer had a storage tank set up on his property and we had a tank wagon to pull through the orchard to fill the heaters. Labor was easy to find in those Depression days, and until I was old enough to help, my father hired men to fire and maintain the heaters.

When I was about twelve years old, my mother and father decided that I was old enough and the three of us agreed that we could save money by firing the heaters ourselves. We continued, however, to hire men to fill the heaters after the firing (My father was away from home every day, working for the County Road Department, and I was at school.).

Every night that there was a chance for frost, we listened to the radio voice of Mr. Young’s Fruit Frost Warning Service, and made our preparations accordingly. Most nights there was no need for worry, but when the frost alarm rang, my father would get up and assess the conditions. If it was early in the evening and the temperature appeared likely to drop into the danger zone, he would monitor it the rest of the night. Any time that the temperature dropped below 27-degrees F. (2.8-degrees C.), he would recheck the outdoor thermometers, perhaps inserting a thermometer into an orange to determine its internal temperature. If the temperature continued to drop, he’d wake my mother and me. We’d hustle into our clothes and soon be out the door and ready to fire the heaters.

Beginning with the heaters nearest the house, I ran ahead of my father, knocking the caps off the heater chimneys and opening a combination fill cap/lighting hole on the base of the heater with a special slotted wrench. My father would follow me with a torch,
light each heater, and rush on to the next. My mother would follow behind my father, closing the lower cap and adjusting the draft hole on the cap that controlled the air to the burning oil. A ‘rippling’ or ‘purring’ sound from the heater’s combustion chamber indicated that the air/fuel mixture was burning efficiently. When the heaters were all lighted, we backtracked, making sure that they were burning properly and a maximum amount of heat was being produced.

While running ahead, I would often see our neighbors to the east, the Cunninghams, lighting their heaters; and to the south, the men working for Uncle Elmer, with torches in hand, lighting and adjusting his. Soon, only the red glow of the lined-up smokestacks would show that the groves were protected, and that infamous cloud of black smoke was rising across the valley and hiding the stars.

As we waited for dawn, we drank coffee, ate some breakfast, and if there was any time for it, try to catch a little sleep. Sometimes, my father and I would walk over to the Cunninghams to talk about the price of oranges, compare temperature fluctuations, and speculate about what the new day would bring.

As sunrise approached and the danger of frost had past, all those heaters had to be shut down. Row by row, we reversed our process, closing dampers and popping the caps back on the stacks. The time had come to begin the day’s regular routine . . . and it might include a repeat of the same scenario that was just finished. [I have read that in 1937 freezing conditions occurred ten days in a row, to the extent that there was a shortage of heater oil in Southern California.]

Yes, the trees are almost all gone, and the hard work of orchard heating has gone with them. It was inevitable. The costs of citrus production exceeded the profits and finally forced the growers to abandon their groves, and the land use was shifted to housing and commerce. Like so many others, I miss the trees, the fragrance of orange blossoms, and the glorious flavor of a fresh-picked California Navel orange. I also remember the labor, the burning sensation of heater oil on my skin, and the choking black smoke that rightfully concerned the community. There was also a measure of pride that we citrus growers had ‘fought the good fight’ against the elements, we had saved a valuable crop, and, in my case, I had taken a step in the direction of acceptance into manhood . . . and there is no greater feeling than that,

- Orchard heaters and ‘smudge pots’ are not the same thing. The orchard heater is designed to deliver heat to the air around the trees until the temperature is stabilized or increased. A ‘smudge pot’ is designed to create a blanket of thick smoke as might be used to hide a military target. There are some authorities who still believe that the smoke is beneficial, as indicated by this explanation offered by Wikipedia: “The burning oil creates some heat, but more importantly, a lot of smoke, particulates, carbon dioxide, and water vapor. This artificial smog forms a
"blanket" that blocks infrared light, thereby preventing radiative cooling that would otherwise cause or worsen frost.”

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