Wind Machines

operating costs in field trials less than heaters but protection is limited

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Wind machines have permanent value to citrus fruit growers because of their low cost operation and freedom from smoke. This is especially true in the colder areas.

Data on the running cost of wind machines was obtained in a study made in Los Angeles County.

Formerly, when orchard heating costs were low and the income from fruit saved was high, the more certain protection of heaters was easily worth their greater expense. Today cheaper protection is wanted even though more risk is involved.

A protection pattern shaped like a doughnut was found to exist around a wind machine. Many thermometers were required for its measurement.

Across the drift the temperature rise was found to be equal on each side of the wind machine. With the drift there was more effect down wind, where a small area was warmed over four degrees.

A common observation among growers is an apparent protection pattern when no evidence of temperature rise could be measured by air thermometers. This is undoubtedly true and might be explained by the fact that circulation reduces differences in temperatures in and among trees.

Had a thermometer been placed in the fruit in that portion of a tree where fruit freezes first, there might have been a temperature rise indicated.

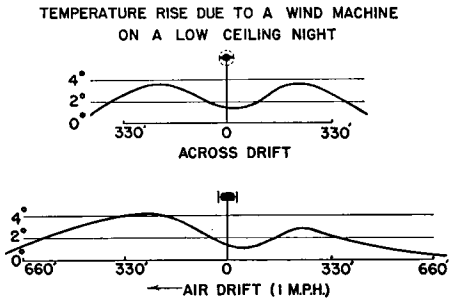
When comparing running costs of wind machines with orchard heaters, two factors must be kept in mind: *1*, their protection is not equal; *2*, machines are run probably twice as much as heaters.

Cost per acre-hour for operating heaters has been found to vary from $3.15 for oranges to $4.13 for lemons.

Cost per acre-hour for operating gasoline wind machines in the study was 55¢ for 100 hours, on the basis of one dual, Ford V-8 motor powered wind machine on 15 acres. Other installations will vary considerably in cost.

Although many wind machines have been sold as being able to substitute fully for all heating operations, it is now generally believed that a few supplementary heaters scattered in the grove are a good investment for those occasional nights of high ceiling.

The expected cost of operating a combination of heaters and gasoline operated wind machines is worth noting.



Suppose one-third of the heaters normally used were operating 10% of the wind machine running time. This would amount to one-thirtieth of the heater cost per hour to be added to the wind machine cost per hour. One-thirtieth of $3.60, an average acre-hour cost for heaters, is 12¢. Add this to the wind machine acre-hour cost of 55¢ per 100 hours. Sixty-seven cents is the calculated total cost per acre-hour of operating a combination of orchard heaters and wind machines under the conditions named.

With a 100-horsepower electric installation on 15 acres, the cost of operating an electric wind machine was found to be 67¢ per acre-hour for 100 hours.

This motor when overloaded 25%, a common practice, can deliver power to the propeller identical to that of a pair of Ford V-8 engines.

Some power companies prefer a minimum energy charge to a service charge. In one case, this minimum energy charge is 50¢ per horsepower month. That would be $600 per year for a 100-horsepower motor even if it were not turned on at all. Most electric companies are not anxious to sell power for intermittent use.

These estimated electric costs do not include the up and down item—the lead-in to the motor—which some growers think of as a dollar a foot.

The chief cause of failure of the gasoline motor is valve trouble. It is caused mainly by inferior gasoline. Good gasoline gets its anti-knock value from the nature of fuels blended in it. Inferior gasoline may have good anti-knock rating because of substances containing copper, lead and zinc. The oxides that form prevent proper sealing.

A Ford V-8 engine should not exceed 75 horsepower output nor 2800 rpm, a maximum which should require about six gallons per hour. Greater gasoline consumption indicates overloading and the motor should be checked immediately. If the intake manifold vacuum is less than 5½ inches, too much power is being developed and trouble can be expected. Such a vacuum gauge is cheap and easy to install.

Another must in safety devices is a switch that cuts out the ignition when oil pressure drops too low. Many garages have portable tachometers to check rpm.

Growers who want to make their own observations should: *1*, use many thermometers and keep good, frequent records of both air and fruit temperatures; *2*, keep records of a tower thermometer; *3*, make numerous trial starts on a cold night; *4*, keep data regarding air drift, ceiling, minimum prediction and dew point; and *5*, keep accurate operational data and all costs.

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The chart is based on information found by Dr. F. A. Brooks, Division of Agricultural Engineering, University of California, Davis, in experiments near Oxnard in 1948.

Cost of Operating Heaters
A.E.S. Cir. 111

	Oranges	Lemons
Interest and depreciation	$23	$38
Care and handling (no h't'g)	6	10
Oil and labor (20 hours)	32	..
Oil and labor (30 hours)	..	72
Extras	2	4
Total per acre	63	124
Cost per acre-hour	$3.15	$4.13

Cost of Operating Gasoline Wind Machines

Hours run per season	0	100	200
Interest (5%)	90	90	90
Depreciation (10%)	360	360	360
Gasoline and oil ($2.40)	0	240	480
Maintenance ($.75)	0	75	150
Labor ($.43)	0	22	86
Total cost per acre	30	55	78
Cost per acre-hour		.55	.39

1 dual machine on 15 acres.

Cost of Operating Electric Wind Machines

Hours run per season	0	100	200
Interest (5%)	107	107	107
Depreciation (10%)	430	430	430
Service charge (Edison)	375	375	375
Energy	0	100	200
Total cost per acre	61	67	74
Cost per acre-hour		.67	.37

100 h.p. motor on 15 acres.