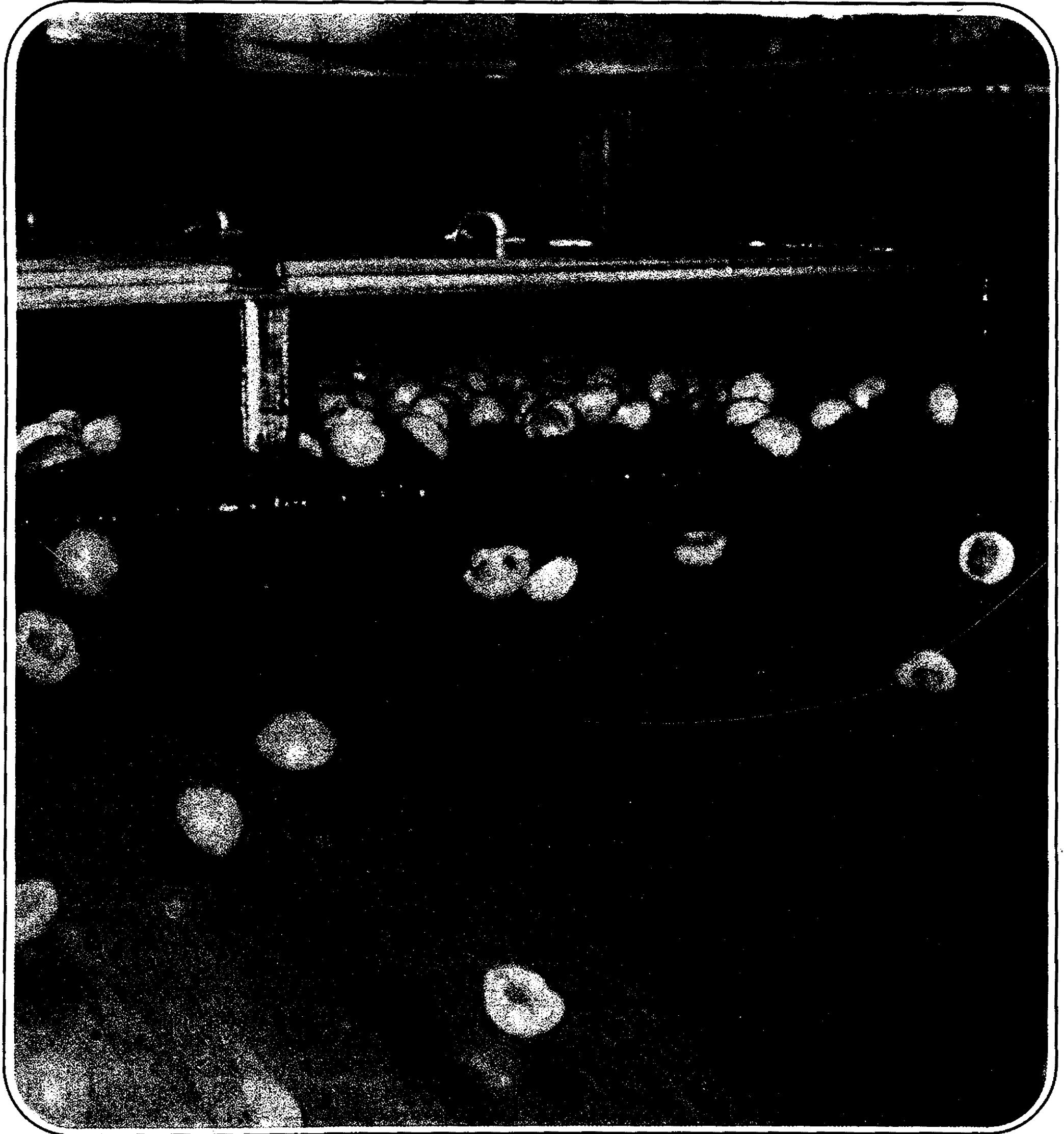


EPA
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CAPSULE REPORT

DRY
CAUSTIC
PEELING
OF
CLINGSTONE
PEACHES

U. S.
ENVIRONMENTAL
PROTECTION
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INDUSTRIAL
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EPA-625/2-73-005

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THE SIGNIFICANCE

The annual production of canned clingstone peaches in the United States exceeds 30 million cases. These peaches are canned during a season ranging from a few weeks to a maximum of three months. Since the wastes from canning operations are produced over such short time periods, they present problems in economic design utilization and operation of treatment plants.

Peeling is the largest single source of waste from fruit processing, accounting for as much as 10 percent of the total wastewater flow and 40 percent of the total biochemical oxygen demand. In conventional peeling, the peel is pre-softened by contact with dilute sodium hydroxide and then removed from the peach by high pressure sprays using large amounts of fresh, potable water.

Water from the peeling operation therefore contains essentially all of the removed peel.

Dry caustic peeling in which mechanical rubbing is used to remove the softened peel was originally developed for the potato processing industry; however softer fruit such as peaches required the development of a new process.

The modified dry caustic process discussed in this report uses rapidly rotating rubber discs to mechanically wipe the caustic treated peel from clingstone peaches. A final rinse to remove the last traces of peel and caustic is the only fresh water use. During this EPA demonstration grant with the Del Monte Corporation water usage in the peeling operation was reduced from 850 gallons of water per ton of peaches to 90 gallons per ton by dry peeling.

The dry caustic peeling process also allows for collection of the peel as a pumpable slurry. This slurry may have potential value as an animal supplement or in reclaiming marginal farm land. Because the peel is not carried in the wastewater flow, the total organic and suspended solids loading of the wastewater from the peeling process is reduced by about 60 percent. Peach quality was judged to be equal to that of conventionally peeled peaches.

This report covers two seasons of evaluation during which the dry caustic peeling system was operated in parallel with a conventional peeling system at the Del Monte, San Jose, California Plant #3.

Discs rotate at a speed of approximately 325 RPM. The rotating action also transports the fruit.

The length of peeling time is controlled by adjustment of the upward slope of the rotating disc unit and the length of the peeling unit section. A tank beneath the discs collects the peel and caustic residue as a slurry, which is pumped to a solid waste hopper.

Following the disc unit, peeled peaches are dropped into a rinse tank and removed from the tank by a flight conveyor. In the demonstration unit, three manifolds of fresh water sprays mounted above the elevator conveyor remove residual peel and caustic residue, and provide make-up water for the rinse tank. Each manifold has four spray nozzles, delivering approximately one gallon of fresh water per minute per nozzle. Water level in the rinse tank is controlled by an automatic sensing device. A bleed stream from the rinse tank, equivalent in volume to the nozzle flow, is the only effluent from the unit. Rinsed fruit is conveyed to an inspection station and then to the next stage in canning.

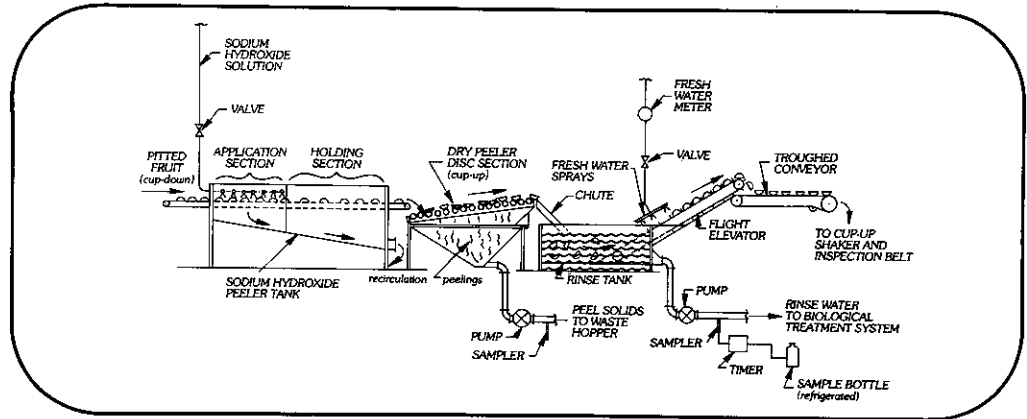


Figure 1. Schematic-dry caustic peeler

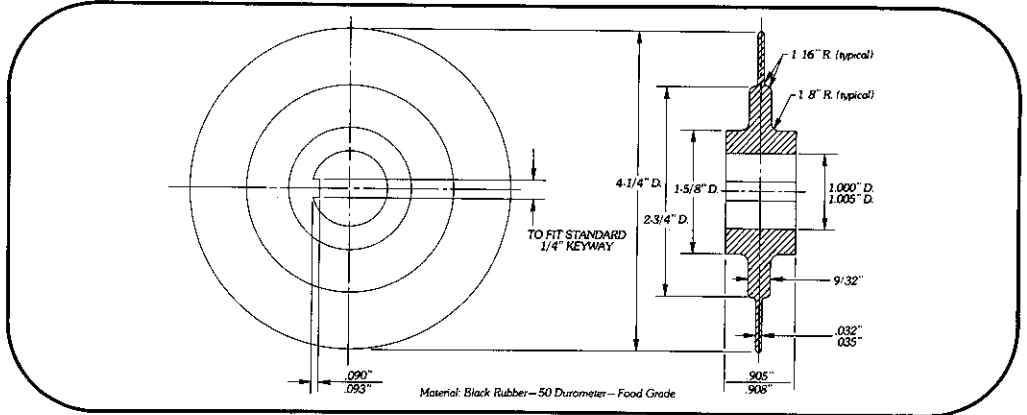


Figure 2. Flange Disc Detail

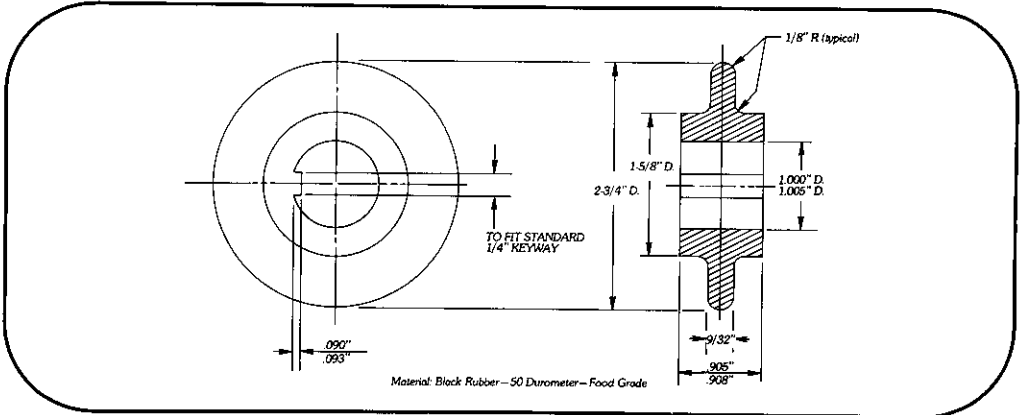


Figure 3. Stub Disc Detail

The most striking result of the commercial tests of the dry caustic peeler is the 90 percent reduction in water use as compared to the conventional caustic peeler. Significant pollution parameters can be reduced by approximately 60 percent. Table I illustrates the average wastewater volumes and pollution loadings for each process, based on 24-hour composite samples taken on each of the 21 days of the demonstration period.

Table II summarizes the characteristics of the peach peel solid wastes. The relatively high pH of the slurry and the low pH of the rinse water indicate that most of the caustic is removed with the peel.

TABLE I

Comparison of the Average Liquid Effluent from the Del Monte Dry Caustic Demonstration Project with Conventional Caustic Peeling

All units in lbs/ton of peaches unless otherwise noted.

	Conventional Caustic Peeling	Dry Caustic Peeling
Water usage	850 gals/ton ¹	90 gals/ton
COD	10.8 (1500 ppm)	4.2 (5600 ppm)
BOD ₅	6.7 (940 ppm)	2.8 (3700 ppm)
Suspended Solids	5.6 (790 ppm)	1.9 (2500 ppm)
Total Solids	17.8 (2500 ppm)	4.0 (5300 ppm)
pH Range	6-9	4-6

¹ Assumes countercurrent rinse. Without a countercurrent rinse, this number could be as high as 2000 gals/ton peaches.

TABLE II

Composition of Peach Peel Solids

(lbs Total Slurry) (Ton Peaches)	153
% Total Solids	7-11
pH Range	9-11

conventional peeler at the Del Monte, San Jose, California plant. During these two operating periods, capacity and performance of the dry system has been continually improved. Additional operation may further enhance the economics.

Not included in these economics is a reported 1-2% loss of canned peaches due apparently to over peeling in the dry system. This problem, indicated in the first season was attacked by reducing the concentration of caustic spray and by adjusting the belt drive to give increased throughput (from 12 TPH to 20 TPH). At the end of the second season, however, there was still a reported loss.

The following numbers can be used for comparison with either existing conventional peeling costs or new installations. The canner must factor in his local surcharge and obtain a cost (or credit) for solids disposal at his locality for his specific comparison.

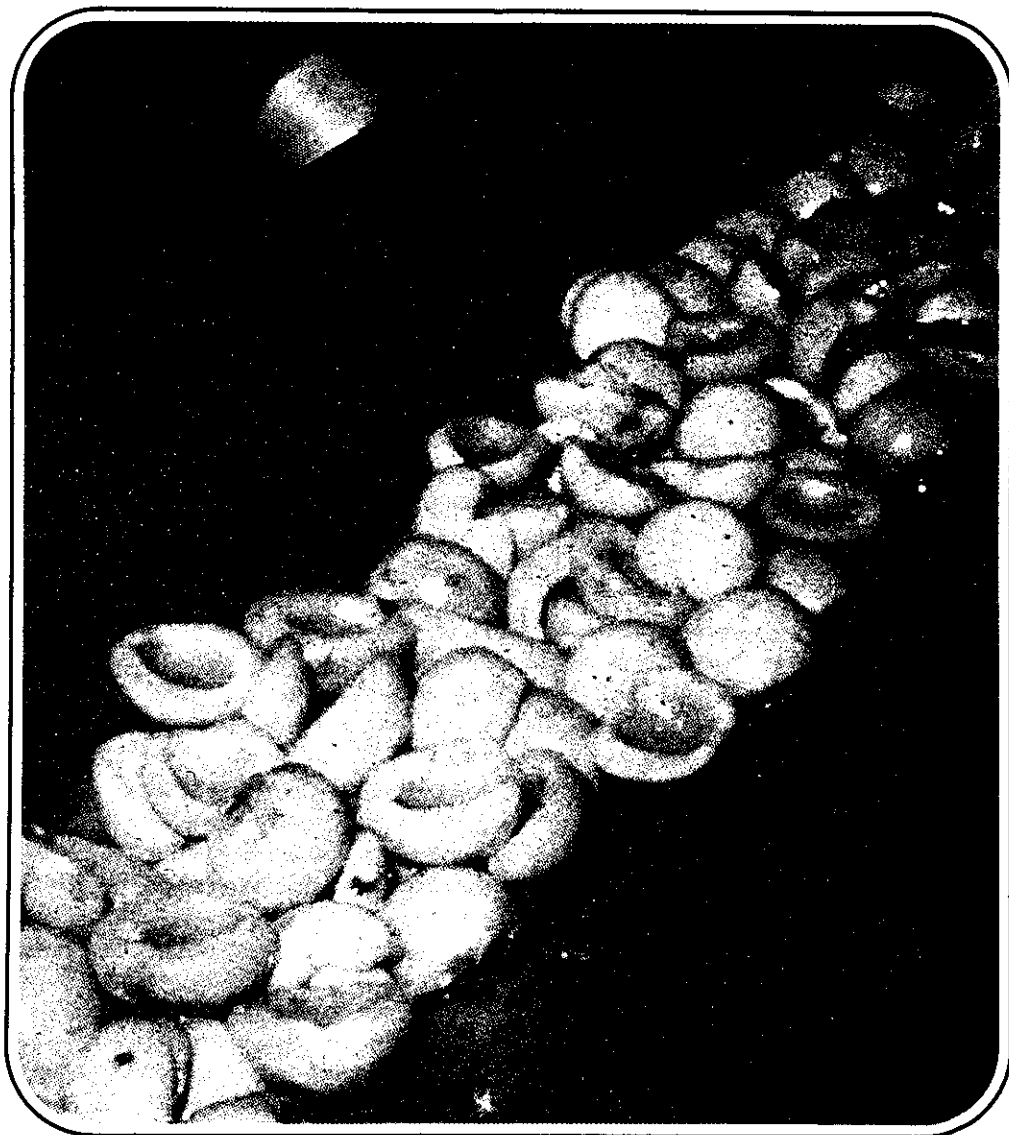
ECONOMICS		
Dry Caustic Peeling of 20 Tons/Hr of Clingstone Peaches		
Total Investment		\$32,000
*Including Installation and Stainless Steel Construction		
Operating Costs (All Costs in \$/hr)		
I. Wages (1 operator @ \$4/hr)		4.00
II. Electric Power (14.5 hp @ 10 mills)		.11
III. Maintenance (@ 3% of Investment)		1.00
*Basis of 960 hours operation		
IV. Lab (Included in Overhead)		
V. General Plant Ovhd (@ 100% of operating labor)		4.00
VI. Materials		
Water (1800 gallons @ 25¢/1000 gals)		.45
Chemicals (52 lbs NaOH @ \$40/ton NaOH)		2.08
for peaches		
TOTAL Materials		3.53
VII. Sewer Charges (Assumed rate)		
Base @ 75% of water billing		.34
Surcharges: BOD @ 1.5¢/lb above 300 ppm		1.50
SS @ 2.5¢/lb above 350 ppm		
TOTAL Sewer Charges		1.84
TOTAL OPERATING COSTS		
		14.48
Fixed Charges (Basis of 960 hours operation)		
Depreciation @ 15 yrs. straight line		2.22
Interest @ 8%		2.67
Taxes/Insurance @ 5% of Investment/Yr		.17
TOTAL Fixed Charges		5.06
Total Operating Plus Fixed Costs Per Hour		19.54
Dry Peeling Cost/Ton Peaches		.98
*Represents a \$3.80/hr estimated saving over water costs for conventional peeling		
*Represents a \$4.02/hr estimated saving over sewer charges for conventional peeling at the assumed sewer charge schedule		
*Solids disposal costs or credit is not included		

A commercial dry caustic peeler operated successfully on freestone peaches during the 1972 season at Delmar Foods in Watsonville, California.

The same equipment manufacturer has sold two additional peelers which will be operating in the 1973 season on freestone peaches.

There is additional economic incentive for use on freestone (as opposed to clingstone) peaches, since the mechanical action of the wiper effectively removes bruises and decreases the higher cost of hand inspection associated with freestone peaches.

Two additional equipment manufacturers have also sold dry peelers for freestone peaches which will be in operation in the 1973 season and are now offering dry caustic peelers for clingstone peaches.



Dry Peeled Peaches to Inspection Station

