UNIVERSITY OF FLORIDA
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CITRUS EXPERIMENT STATION

Harvesting and Handling Section

PACKINGHOUSE NEWSLETTER

No. 4 March, 1966

MECHANICAL SEPARATORS FOR COLD-DAMAGED ORANGES

A quite detailed study was made of the operation of frozen fruit separators following the 1957 freeze.[1] The results were put into a scientific paper which is summarized briefly here to bring out the points that might be of most help to packers now separating fruit.

Three types of separators are in general use. These include two types of water separators; one in which the fruit drops in and separation depends upon both how deep the fruit sinks and how fast it rises; and a more common type of water separator which delivers the fruit under water and separation depends only on how fast it rises. The third type of separator is the chemical or oil emulsion separator which uses an emulsion of oil and water whose specific gravity is adjusted to be between that of the good fruit and the frozen fruit. In all these, of course, separation is based on the fact that the specific gravity of the frozen fruit is typically less than that of the non-frozen fruit.

No marked differences were found in the efficiency of these three types of separators. Instead, the wide differences found were usually accounted for by one or more of these three factors:

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[1] W. Grierson and F. W. Hayward. " Evaluation of mechanical separators for cold-damaged oranges.", Proceedings of the American Society of Horticultural Science, Vol. 73, 1959, Pages 278-287.

1. Convenience and ease of operation of equipment.
2. An intelligent operator giving his full attention to sampling of fruit and adjustment of the machine.
3. A well-arranged sampling station convenient to both fresh and cannery fruit lines, with the controls of the separator convenient to this position for systematic and nearly continuous adjustment.

To make such adjustments effective, the controls should not only be accessible from the sampling position, but should have some form of marking (on mechanical controls) so that settings could be recorded and reused. A great deal of bad fruit separation resulted while operators were trying to readjust controls to a previously known position. Also, a continuous written record should be kept. This is not only useful for management, but also enables the operator to do a much more efficient job. For water-type separators, the control on the selector vane can be on an arc with numbered holes. For emulsion-type separators, the hydrometer reading substitutes for a mechanical setting position on the controls.

No one can keep accurate records without some special setup. Fig. 1 shows a simple sampling station that is very inexpensive to make and it will pay for itself in a very short time. Note that it is at a position at which both the cannery line and the packinghouse line can be sampled simultaneously. Fruit should be taken alternately from one line or the other until a sample (usually 10 fruit from each) has been taken. Then, when the fruit are cut for sampling, the "cap" cut off the stem end is set aside and when the grade is known it is put in the appropriate tray. Once the samples have been all cut, then the operator can dry his hands, count the caps and record on his sheet. This devise is very simple, but it is extremely helpful. We urge that everybody running a separator make such a sampling station.

A great deal of unnecessary mess, waste and inefficiency has been observed in the operation of emulsion separators. These can be most efficient, but we advise the following measures. To eliminate excessive carry-over of emulsion (which is expensive as well as messy and may be a serious fire hazard in a wooden house after the water has evaporated out of the oil):

1. Chutes should be made of spaced rods with trays underneath to drain back and reclaim the emulsion.
2. Belts carrying fruit wet with emulsion should have wipers of neoprene or similar material on the underside to wipe emulsion into a reclamation system.
3. Water eliminator rolls can also be used for emulsion reclamation.
4. Reclaimed emulsion should be drained back through a strainer system, usually the strainer at the side of the machine can be used.
5. Fruit should be thoroughly rinsed before going into the house.
6. A special warning is offered against allowing this oil emulsion to get into any other solution, especially Dowicide A-hexamine or equivalent. This could result in excessive residues of fungicide and perhaps a fruit burn.

Specific Gravity Control for Emulsion Systems

The system of pumping out into barrels and then pumping in emulsion or water is difficult to control, messy, wasteful and inefficient. A very simple control system was devised consisting of a centrifugal pump, separate from that used for the circulation of the emulsion, and six valves. This is shown in Fig. 2. Note that two storage drums or two storage tanks are used, one of which starts partially filled with the concentrated emulsion and the other starts partially filled with water. Emulsion is pumped from Y to Z

and then from X to Y to raise specific gravity. It is pumped from Y to X, then Z to Y to decrease specific gravity. This is done by the operator standing at the sampling station. This "switchboard" need not be in close proximity to the separator tank. We stress that it should be near the sampling station.

Such a system was given an extensive test by Orrin Ward at Blue Goose Growers in Clermont and found very satisfactory for separating not only frozen fruit but also sunburned 'Murcotts,' granulated 'Temples,' etc. Another such setup has been used by Morris Varn at Lake Wales to run crops late last season that it would otherwise have been almost impossible to grade.

Dr. S. V. (Jerry) Ting is now combining his laboratory observations on fruit quality with further study on these separators. We urge that any packinghouse approached, give him their fullest cooperation. We hope to develop the operation of this emergency equipment to the point where it may be useful for many uses other than separating frozen fruit.

COOPERATOR NEEDED

Mr. John Coffee, 5885 Fruit Ridge, Grand Rapids, Michigan, has informed us that he would be happy to find a cooperator interested in working with him to experiment on the use of his apple storages for storage of citrus fruit in summer. He has both regular and controlled atmosphere storage and if any shipper cares to take him up on this, we will give all the help and advice we can. We have already had one cooperative venture with the Department of Horticulture at Michigan State University and expect that they would also give help and advice from their end.

If anybody is interested in cooperating with Mr. Coffee, we suggest that they write to him direct with a carbon copy to us.

W. Grierson, Head
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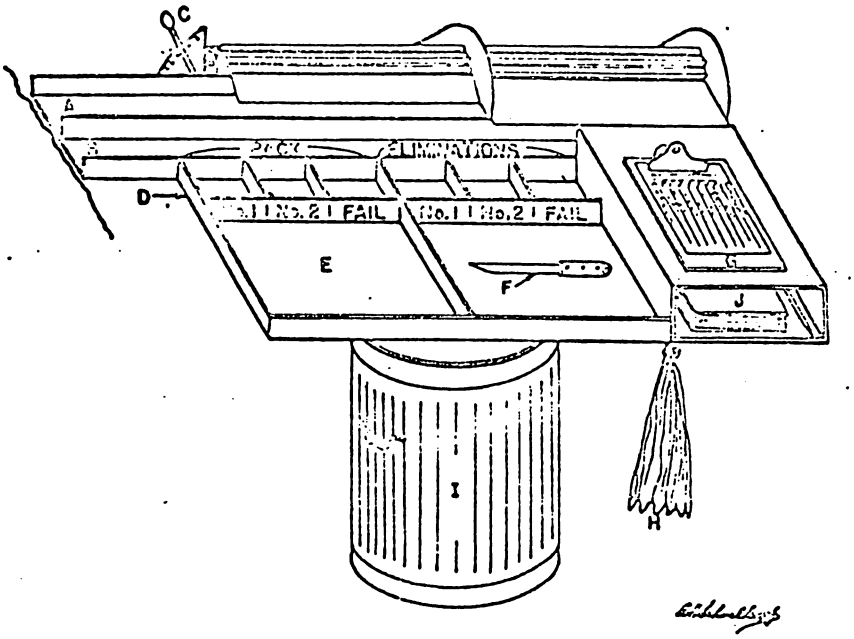

Fig. 1 Design for an efficient sampling and regulating station. "A" Packinghouse line. "B" Eliminations. "C" Remote control on selector vane with numbered settings. "D" Trays for tops off fruit kept as tally. "E" Cutting board for fruit from packinghouse line. "F" Cutting board for fruit from elimination line and sharp knife. "G" Clipboard with record sheets. "H" Towel for operator to wipe hands before recording data. "I" Garbage can (or cull chute) for cut fruit. "J" cupboard for supplies (record sheets, pencils, hone for knife, etc.).

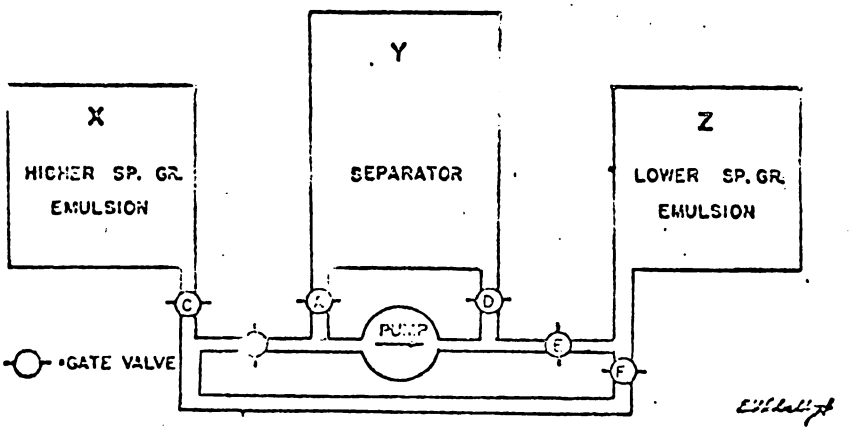

Fig. 2 An efficient apparatus for emulsion regulation. To raise specific gravity:
1. Open only A and E, pump emulsion from Y to Z.
2. Close A and E, open only C, B, D, pump emulsion from X to Y.
3. Close B, open A and D and separator is then on recirculation.

To lower specific gravity:
1. Open only A, E, F, C pump emulsion from Y to X.
2. Close A and C, open only F, E, D, pump emulsion from Z to Y.
3. Close F and B, open A and D and separator is then on recirculation.