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FROZEN FRUIT SEPARATION WITH OIL SEPARATORS
FEBRUARY 1981 -- Revised August 1997

There are two basic types of separators in use; the water type and the oil type. Each has its advantages and disadvantages. Two of these are that a water separator costs 3 to 4 times as much as an oil separator and that there is a disposal problem with the spent oil from an oil separator. Both types of separator require skillful operation. The main difference in results from either type seems to be more closely related to the skill of the operator than to any other factor.

The "oil" of oil separators: is usually based on 'Odorless Mineral Spirits', which is a highly refined petroleum product with an API between 54 and 55. It is modified with emulsifiers so that it will form a relatively stable emulsion with water. The designation "oil", is appropriate as this material has specifications that place it right in the middle of those for kerosene (coal oil), and between the specifications for Fuel Oil No. 1 and Fuel Oil No. 2. This means that extra care must be exercised when using a separator fluid in order to avoid causing a fire hazard.

When mixed with water there is little danger of a fire hazard but upon standing the emulsion can separate with the oil on top. This is true of both the fluid in the tank and any fluid that may have run down into a drain or under equipment. Open flame and welding around a separator tank should be discouraged and spills should be flushed away with plenty of water.

The cost of operating an oil separator may be kept down if a few simple rules are observed:

1. Dirty fruit will quickly contaminate a separator tank. Clean the fruit before separating and remove broken and decayed fruit.

2. Use a bacterial or 'Odor inhibitor to keep the tank from stinking. Check with your supplier for these.

3. Fruit will carry out one gallon of dilute fluid per 10-20 boxes of fruit separated. Allow sufficient conveyor after the separator to drain the excess fluid from the fruit, drain this back to the separator or into a reservoir for later addition.

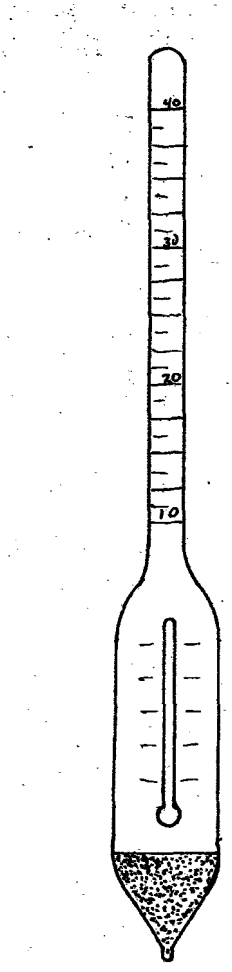
4. Wet fruit will dilute the separator fluid. Keep the incoming fruit as dry as possible and keep a constant check on the gravity of the fluid.

5. Carefully price the separator fluid purchased. The price paid must be related to the API gravity of the fluid. The theoretical maximum for separator fluid is about 54+ API. If the API number is lower than this the fluid will not 'go' as far. Use the chart "Separator Fluid BLENDING CHART" to determine the relative strength of the fluid by placing a straightedge from the upper left hand corner to the lower right hand, then follow the vertical line representing the fluid purchased down to the straight edge and then follow the horizontal line to the right. The percent by volume figure there will be equivalent to the usable strength of the fluid. Use this value for calculating the comparative price of this product with other products. There does not seem to be any superiority of one product over another except on relative price and services provided.

Some products on the market have an API gravity near 40, this has given rise to the notion that oil separators are not suitable for separating Grapefruit. The fact that grapefruit usually requires an API higher than 40, means that it is only these products that are not suitable.

FROZEN FRUIT SEPARATION
WITH OIL SEPARATORS

A PROCEDURE FOR DETERMINING FLUID DENSITY TO USE:



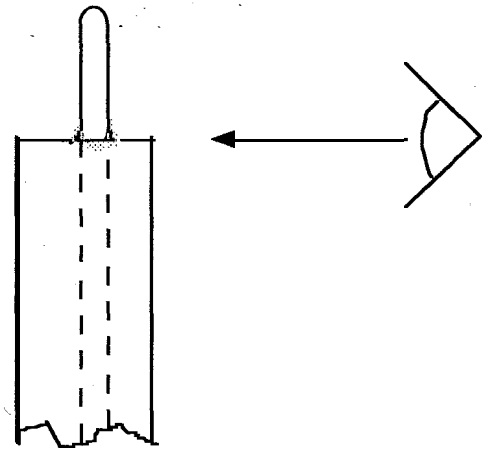
A. Select, as near as possible, a representative sample of the lot to be separated. Place enough fruit to loosely cover the bottom of a container of 5 gallons or greater capacity, Add separator fluid, of a density that no fruit will float, to about 1/3 the capacity of the container-

B. Gradually add water with stirring until some fruit floats. Measure and record the density (API) of the fluid.

C. Cut floating fruit and inspect for freeze damage. If all are damaged beyond an acceptable level continue adding water as in Step "B". When some fruit that is acceptable floats, cut the fruit remaining in the bottom of the container, if all are acceptable use this density for main tank.

NOTE: 1) Several samples should be tried in the small container until the optimum density is determined. 2) Each lot may vary as to the necessary density for best separation. 3) Fruit with air spaces inside are very difficult to separate efficiently.

DETERMINING DENSITY OF SEPARATOR FLUID:



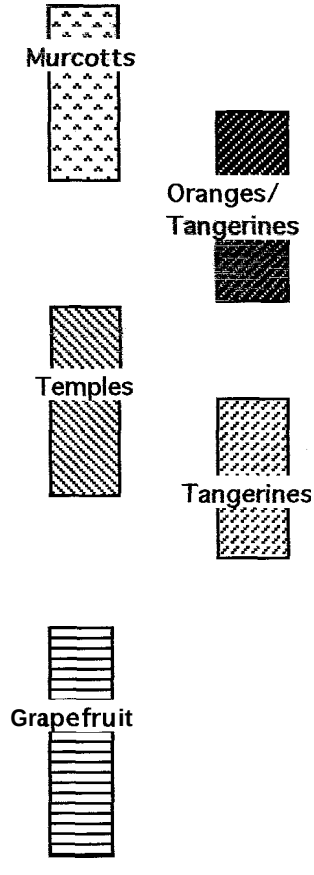
Fill a cylinder with enough fluid that it will overflow when the hydrometer is inserted. Set cylinder on a level surface and gently lower hydrometer so that it does not violently strike bottom (fragile). When hydrometer has settled down and is not touching the side, read by sighting across the surface of the fluid.

Reading should be made across the surface of the fluid, not at the point where the liquid rises up along the stem of the hydrometer (the meniscus).

FROZEN. FRUIT SEPARATION

HYDROMETER CONVERSION TABLES

The API scale for determining the density of fluids was developed specifically for measuring oil based products. Since Frozen Fruit Separator fluids are composed mainly of light oils, it is best to use this scale for controlling the density of the fluid in separators. If hydrometers with the proper API range are not available one with a scale for liquids lighter than water may be substituted. Their readings may be converted to API by the following table. NOTE: all conversions in this table are approximate and are rounded off to the point indicated on the table.



SOUND FRUIT RANGE	API	SPECIFIC GRAVITY	Baume' °Be	TRALLE	% ALCOHOL BY WT.
	10	1.000	10.0	0	0
	11	0.993	11.0	5	4
	12	0.986	12.0	10	9
	13	0.979	13.0	17	14
	14	0.972	14.0	24	20
	15	Q.966	15.0	30	25
	16	0.959	16.0	35	29
	17	0.953	16.9	39	32
	18	0.946	17.9	44	37
	19	0.940	18.9	47	40
	20	0.933	19.9	50	42
	21	0.928	20.9	53	45
	22	0.922	21.9	56	48
	23	0.916	22,9	59	51
	24	0.910	23.9	61	54
	25	0.904	24.9	64	56
	26	0.398	25,9	67	59
	27	0.393	26.8	69	60
	28	0.887	27.8	71	64
	29	0.882	28.8	73	66
	30	0.876	29.8	75	68
	31	0.871	30.8	78	70
	32	0.865	31.8	79	72
	33	0.860	32.8	81	75
	34	0.854	33.8	84	78
	35	0.850	34.7	85	79
	36	0.845	35.7	87	82
	37	0.840	36.7	88	83
	38	0.835	37.7	90	85
	39	0.830	38.7	92	87
	40	0.825	39.7	93	89
	41	0.820	40.7	94	91
	42	0.816	41.6	95	92
	43	0.811	42.6	96	94
	44	0.806	43.6	98	97
	45	0.802	44.6	99	99
	46	0.797	45.6		
	47	0.793	46.6		
	48	0.788	47.5		
	49	0.784	48.5		
	50	0.780	49.5		
	51	0.775	50.5		
	52	0.771	51.5		
	53	0.767	52.5		
	54	0.763	53.5		
	55	0.759	54.5		

TEMPERATURE ADJUST

The density of fluids change with the temperature. Determine the calibration temperature of your hydrometer (Usually 60'F). Then for each 10degrees F that the liquid is below this temperature add one degree API. For each 10 degrees F that the liquid is above this temp. subtract one degree API. For other scales, if no chart is available, convert to API then adjust.

Separator Fluid BLENDING CHART

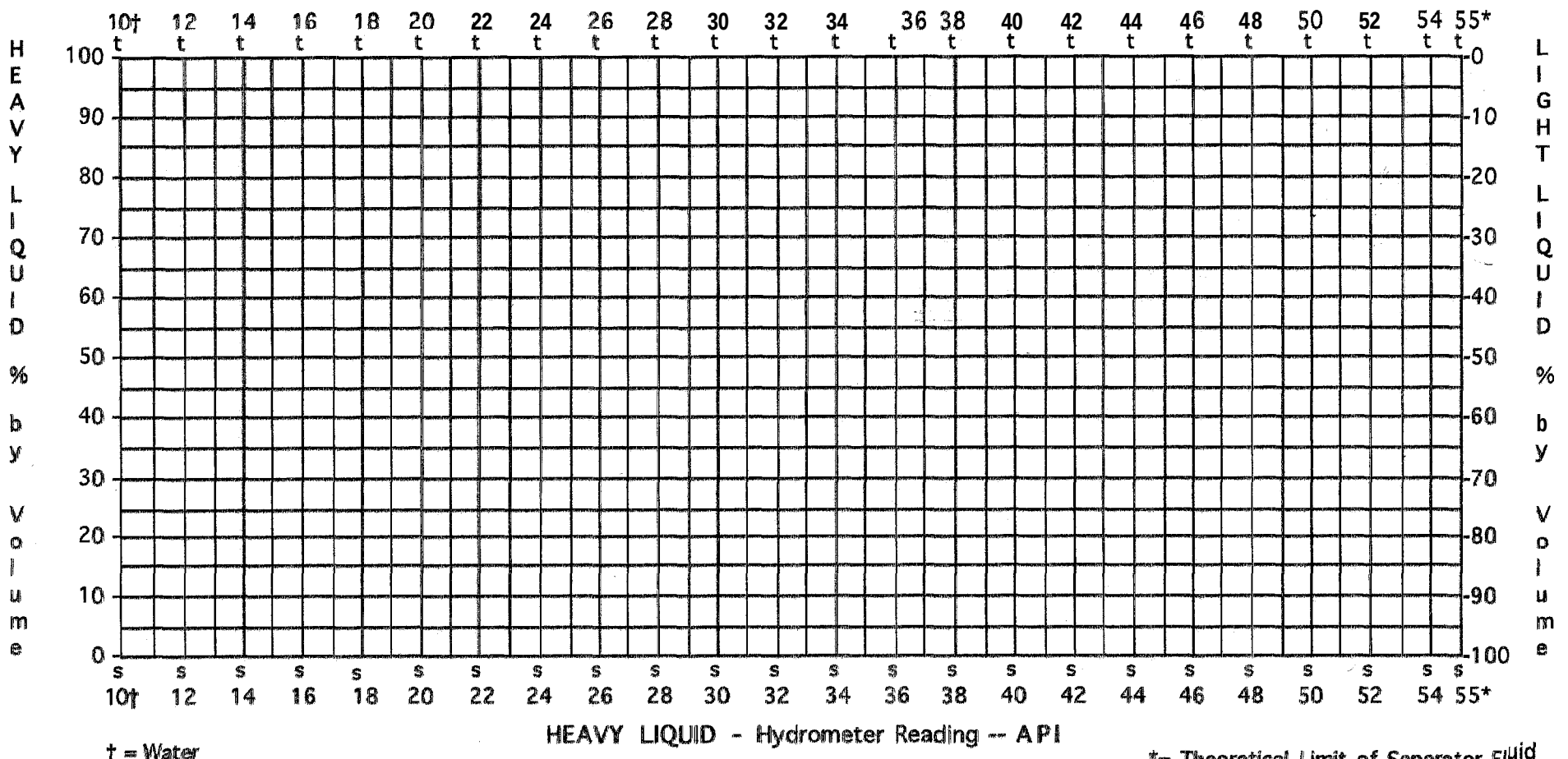
THE CHART BELOW MAY BE USED TO DETERMINE THE AMOUNT OF WATER, CONCENTRATED SPARATOR FLUID OR DILUTE SEPARATOR FLUID TO MIX WITH A BATCH OF DILUTED OF CONCENTRATED SEPARATOR FLUID TO OBTAIN A DESIRED A PI

1. **Determine the API hydrometer reading of each liquid to be mixed. Water = 10.**

2. **Lay a straight edge across the chart, Line up the API of the heavier liquid to be mixed along the top of the chart, line up the API of the lighter liquid at the bottom of the chart,**

3. **Find the vertical line representing the desired API,**

4. **The horizontal line at the intersection of the desired API and the straight edge will give the percent by volume of each liquid to use, Heavy liquid at the left, lighter liquid at the right.**



† = Water

*= Theoretical Limit of Separator Fluid