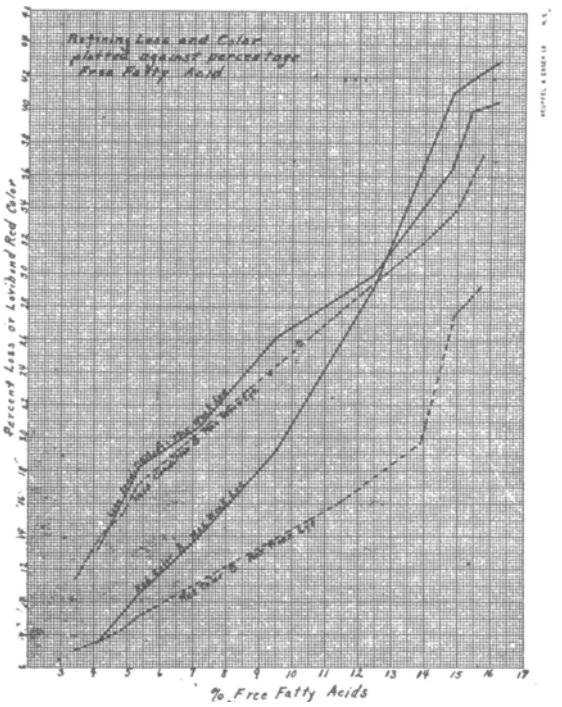
Report of Committee on Crude Mill Operations

By A. K. SCHWARTZ, *Chairman*

THE Committee on Crude Mill Operations during the season has attempted to duplicate with a French continuous cooker the experiments made last year with the open cooker. The open cooker experiments reported to the Society last May gave in detail the effect of the individual variables upon the cooking process, on the quality of oil and on the extent of extraction as indicated by analysis of the cake. This attempt was, it was found, unsuccessful for the reason that in making any one test the quality of seed had changed. The continuous cooker requires too long a time for the establishment of one set of experimental conditions to make this method practical.

The work of last year was reviewed and the generalization made that the most important cooking factor governing the quality of oil was the rate of heating of meats, that governing the extent of extraction being the time of cook with a corresponding increase or decrease in the moisture of meats. It appeared that if the two sets of conditions were chosen so that the rate of heating, the time of cooking and amount of moisture added were increased in one as compared with the other that the condition in which these factors were increased should produce an oil of better quality and cake of better standard than the other condition. To confirm this, two cooking conditions were established representing a variation in these factors to an extent liable to occur in ordinary mill operation. The quality of seed was varied and samples taken at regular time intervals. The results confirming the generalization are given below:



Experimental Conditions

Condition A

Stage of Cooker	Jacket Pressure Pounds Gage	Temp. °F
1	20	110-132
2	20	132-170
3	40	180-215
4	60	218-224
5	60	228-230

Condition B

Stage of Cooker	Jacket Pressure Pounds Gage	Temp. °F
1	60	120-153
2	60	170-224
3	40	220-227
4	20	225-228
5	20	230-230

	Sample		%FFA	Maximum Strong Lye Color		Loss	Maximum Weak Lye Color		Loss
1	Condition	A	15.4	35y	63.0r	41.5	35y	42.0r	40.0
2	"	"	16.2	35y	57.0r	42.0	35y	43.0r	40.6
3	"	"	14.8	35y	34.0r	39.2	35y	41.0r	36.5
4	"	"	12.5	35y	24.0	36.7	35y	29.3	30.0
5	"	"	9.5	35y	16.2	31.0	35y	19.2	26.1
6	"	"	7.2	35y	12.5	25.6	35y	14.0	20.7
7	"	"	5.4	35y	9.2	22.0	35y	10.6	18.3
8	"	"	4.1	35y	6.2	14.6	35y	7.5	13.0
1	"	B	3.45	35y	6.1	12.6	35y	7.1	11.4
2	"	"	4.2	35y	7.2	14.5	35y	7.7	14.0
3	"	"	4.95	35y	8.1	19.0	35y	8.5	15.5
4	"	"	5.3	35y	8.1	19.3	35y	9.1	17.1
5	"	"	11.45	35y	13.5	35.1	35y	16.1	27.8
6	"	"	13.80	35y	15.5	37.5	35y	19.7	31.7
7	"	"	14.90	35y	20.2	40.0	35y	27.5	33.9
8	"	"	15.70	35y	28.3	42.7	35y	29.2	37.3

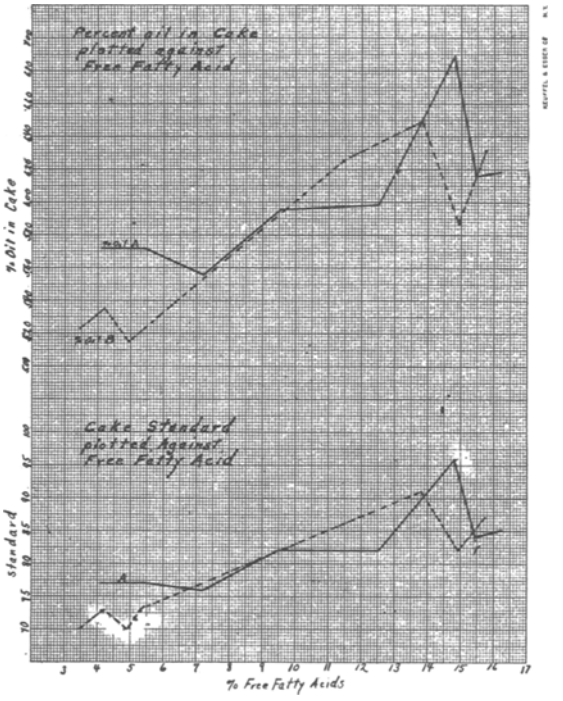
Cake Analysis

Sample No.		Moisture	NH_3	Protein	Oil	Standard
1	Condition A	8.55	7.30	37.50	6.16	84.0
2	" "	8.57	7.30	37.50	6.18	85.0
3	" "	8.43	7.18	36.91	6.89	96.0
4	" "	8.94	7.30	37.50	5.98	82.0
5	" "	8.83	7.30	37.50	5.95	82.0
6	" "	9.27	7.35	37.75	5.56	76.0
7	" "	9.16	7.40	38.03	5.72	77.0
8	" "	8.75	7.38	37.94	5.72	77.0
1	" B	8.87	7.43	38.19	5.23	70.0
2	" "	9.10	7.30	37.50	5.35	73.0
3	" "	8.51	7.40	38.03	5.15	70.0
4	" "	9.17	7.25	37.25	5.30	73.0
5	" "	8.56	7.23	37.16	6.25	86.0
6	" "	8.63	7.13	36.63	6.50	91.0
7	" "	8.36	7.18	36.91	5.87	82.0
8	" "	8.60	7.20	37.00	6.31	87.0

In condition A no direct steam was used, while in B direct steam was allowed to enter into the second stage. The total time of cooking was the same in both cases. Due to the quick rise in temperature the effective time of cooking was increased by about 20 minutes in condition B, and due to the condensation of the direct steam the moisture of meats in condition B was increased over that in A.

The refining tests in which the maximum of weak lye was used gave good refining, while those in which the maximum of strong lye was used gave spongy soaps from which considerable oil was recovered by remelting. The oil recovered by remelting was equivalent to as much as 3% loss. For this reason the results given for the strong lye are not so reliable as those given for the weak lye. For convenient inspection the results are plotted in the form of a curve.

In this work we wish to acknowledge the co-operation and aid of Mr. Eugene Bradshaw.



To improve the miscibility of castor oil with mineral lubricating oils, the castor oil is heated to a high temperature (550°-575° F.) in vacuo. It is claimed that this treatment produces polymerization of the castor oil. The action is usually carried on until the miscibility of the castor oil with alcohol disappears and that with mineral oils increases. A slow flow of carbon dioxide is usually, but not invariably, passed through the oil during the heating. Can. Pat. 285,743.

All the oil may be released from fish or fish offal by cutting the material into small pieces and treating it with a solution of ferric sulfate, (frequently in combination with aluminum sulfate) and leaving the mass to pickle for 2 to 24 hours. When the pickling is complete the material is put through a helical conveyor immersed in boiling water to extract the oil. Can. Pat. No. 285,632.

In the determination of the saponification number a clear solution of oil in alcoholic potash is not proof of complete saponification, since the oil forms an ester with alcohol which is soluble in potassium hydroxide. Experiments with ethyl esters required five to ten minutes boiling before saponification was complete. Fifty percent excess of potassium hydroxide is essential for rapid reaction. Methyl alcohol in place of ethyl is out of the question because saponification is incomplete even after one or two hours boiling. *Seifensieder Ztg.* 55,375-6 (1928).