TABLE II

Estimated Investment Cost of Flash Desolventizer and Cooler

Equipment	Estimated delivered cost[a]
Desolventizer Unit—Total cost $15,000	
Superheater: steel tubes and shell, fixed tube sheet, 300-lb. working pressure shell, 1,330 sq. ft.	$ 5,500
Gas booster: 2,920 cfm. of hexane and steam vapors at 230°F., 1.0 p.s.i. differential, with 30 h.p. exp.-proof motor and two 10-in. expansion joints	3,300
Desuperheater-condenser: tube and shell, fixed tube sheet, 150-lb. working pressure shell, steel shell, copper tubes, 150 sq. ft.	1,000
Solids rotary feeder valves (2): 8-in., bronze construction, with 1 h.p. exp.-proof gear motors	2,000
Cyclone collector: low resistance-type, mild steel, gas-tight, to handle 3,700 cfm. of hexane-steam vapor	1,200
Dust filters (2): simple, intermittent duty cloth filter, gas-tight, for handling 780 cfm. of hexane-steam vapor, at 230°F.	700
Solids inlet: Venturi-type section with 10-in. vapor inlet and outlet, steel	300
Pipe and fittings: 100 ft. of 10-in. iron pipe for desolventizing duct and recycle vapor stream, necessary welding flanges, ells, and tees	1,000
Cooling Unit—Total cost $4,800	
Cyclone collector: low resistance-type, mild steel, to handle 3,000 cfm. of air	300
Solids rotary feeder valve: for use with above cyclone, 8-in. size, with ¾ h.p. exp.-proof gear motor	800
Dust filter: cloth-type, continuous, automatic, to handle 3,000 cfm. of air; exhaust fan and 7.5 h.p. exp.-proof motor and drive included	2,800
Pipe and fittings: 60 ft. of 14-in. pipe, including necessary welding ells and flanges, 15 ft. of 14-in. diam. sheet metal duct, and solids inlet	900
Desolventizing and cooling equipment delivered	19,800
Allowance for installation, 43% of delivered cost	8,500
Allowance for piping and electrical wiring, 36% of delivered cost	7,100
Allowance for instrumentation, 5% of installed cost of equipment	1,400
TOTAL cost of equipment	$36,800

[a] 1957 basis.

140°F. with air entering at 95° and leaving at 125°F., and an air velocity of 40 ft./sec.

The cost of steam, cooling water, and labor for a flash desolventizer should be essentially the same as for other types of oilseeds desolventizing equipment that employ steam as a source of indirect heat. The electrical power requirements may be a little more but will be balanced by lower maintenance costs for this simpler equipment with fewer moving parts. Approximately 1 gal. of hexane per ton of product is required as make-up solvent, over and above the the amount required to cover the usual solvent loss. This added quantity increases the product cost only slightly.

Summary and Conclusions

The flash desolventizing process removes hexane to produce high-quality, essentially undenatured, soybean protein flakes for industrial uses. The most practical level of solvent removal is achieved when solids are heated to 170–190°F. and dried to a moisture and volatiles content of 7–8%. The desolventized solids should then contain less than 0.5% residual hexane. In desolventizing extracted, partially dehulled, high-quality soybeans, the NSI value of the solids will be decreased by only about two or three percentage points. When two-month-old soybeans or those from the preceding crop year are desolventized, no difference is noted in either the degree of protein denaturation incurred or the residual hexane content of the product. Friable soybean flakes naturally are subject to some attrition during desolventizing, but this breakage is not a handicap for the type of product normally obtained.

An increase in recycle vapor velocity from approximately 45 to 66 ft./sec. had about as much effect on solvent removal as did an increase in recycle vapor temperature from 230 to 305°F. The vapor velocity undoubtedly can be increased from approximately 66 ft./sec., the maximum used in this work, to 80–100 ft./sec. which will permit either greater throughput or a reduction in size of the desolventizing duct. These benefits must be balanced against the cost of the additional power required. A recycle vapor temperature of 350°, and possibly 400° F., is considered more practical and should give a satisfactory product as long as solids are not discharged above about 190°F.

The installed cost of a flash desolventizer should be less than the cost of systems presently used to produce soybean protein flakes and operating costs should be in the same range, but the solvent loss may be a little higher.

Acknowledgment

The authors express their appreciation to J. R. Dilley for the mechanical design and layout of the cooling unit, to F. C. Wohlrabe for mechanical advice, and to A. K. Smith and E. H. Melvin for advice and assistance with analytical methods.

REFERENCES

1. Becker, K. W., personal communication (1959).
2. Belter, P. A., Brekke, O. L., Walther, G. F., and Smith, A. K., J. Am. Oil Chemists' Soc., 31. 401–403 (1954).
3. Belter, P. A., and Smith, Allan K., J. Am. Oil Chemists' Soc., 29, 170–174 (1952).
4. Leslie, E. H., U. S. Patent 2,571,143 (1951).
5. Smith, A. K., and Circle, S. J., Ind. Eng. Chem., 30, 1414–1418 (1938).

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Report of the Smalley Committee, 1958-1959

HEREWITH is presented the 41st annual report of the Smalley Committee. Again this season nine different types of samples were distributed by seven subcommittees. These included cottonseed, soybeans, peanuts, meals, vegetable oils, tallow and grease, glycerine, drying oils, and edible fats. In all, 4,367 samples were distributed to 494 collaborators, and about 15,000 results were tabulated. Table I shows the distribution and participation. There was a slight drop in participation of about 2%.

As of April 2, 1959, the Smalley account showed $7,431.66 as total receipts for the season, $6,482.54 as total expense, and $949.12 as the net. This will be reduced at least $100 by some charges yet to be paid. The contemplated purchase of a new mixer for preparation of the cottonseed samples will probably leave about $200 in the account for the next season. A detailed accounting has been given to the Governing Board of the Society. A final report has been sent to the collaborators, summarizing the work and listing the relative standings, which are based on the various grading systems.

It is fitting to express thanks to various subcom-

TABLE I

	Number of collaborators	Number of samples	No. of determinations per sample
Cottonseed	43	10	6
Soybeans	35	10	2
Peanuts	9	7	5
Meal	139	15	3
Vegetable oils	85	6	3
Tallow and grease	83	5	7
Glycerine	26	5	5–3
Drying oils	14	6	5
Edible fats	60	5	14

mittee members for their contributions during the past season:

K. H. Fink, Armour and Company, for tabulating and mailing the tallow and grease results and calculating the final grades. He also assisted with the edible fat tabulations;

F. R. Earle, Northern Regional Research Laboratory, for tabulating and mailing the soybean oil results. Mr. Earle has resigned from the committee, and this work will be handled next year by J. F. Anodide, Lever Brothers Company;

C. L. Hoffpauir, Southern Regional Research Laboratory, for tabulating and mailing the cottonseed oil results;

R. A. Decker, Armour and Company, for calculating the final grades on the vegetable oils;

E. H. Tenent Jr., Woodson-Tenent Laboratories, for preparing and shipping the vegetable oils and the tallow and grease samples;

S. J. Rini, HumKo Company, for selecting the bulk vegetable oil;

R. B. Jones, Darling and Company, for selecting and shipping the bulk tallow and grease samples;

G. Conner Henry, Law and Company, for handling the preparation of the cottonseed, meal, and peanut samples;

W. F. Schroeder, HumKo Company, for the preparation and distribution of the edible fat samples;

Bart Teasdale, Canada Packers Ltd., for re-mailing the vegetable oil and the tallow and grease samples in Canada.

Reasonably sound grading systems have been established in all the series, and certificates of proficiency were presented in all categories this year. The Smalley awards have been bestowed as follows.

Cottonseed. With 43 chemists participating, first place was attained by D. A. Bradham, Barrow-Agee Laboratories, Greenville, Miss., with 97.90%; second place by G. G. Dickinson, Texas Testing Laboratory, El Paso, Tex., with 97.24%; and honorable mention by A. H. Grimes, Barrow-Agee Laboratory, Decatur, Ala., with 96.08%.

Soybean. With 35 chemists participating, first place was a three-way tie, all with grades of 100%: T. C. Law, Law and Company, Atlanta, Ga.; P. L. Phillips, Barrow-Agee Laboratories, Jackson, Miss.; and Ben C. White, Barrow-Agee Laboratories, Shreveport, La. Honorable mention was given to Carl Moss, Swift and Company, Champaign, Ill., and to W. G. Wadlington, Woodson-Tenent Laboratory, Chicago, Ill.

Peanut. Nine chemists participated in this series. First place went to E. S. Prevost, Law and Company, Wilmington, N. C., with 99.76%; second to P. D. Cretien, Texas Testing Laboratory, Dallas, Tex., with 99.36%; and honorable mention to T. C. Law, Law and Company, Atlanta, Ga., with 99.20%.

Tallow and Grease. Of the 83 collaborators first place was given to L. I. Clack, Procter and Gamble Company, Hamilton, Ontario, with 100%; second to D. W. Turnham, Swift and Company, Portland, Ore., with 99.94%; and honorable mention to W. R. Thomas, Los Angeles Soap Company, with 99.87%.

Vegetable Oils. First place was again this year won by F. M. Tindall, HumKo Company, Memphis, Tenn., with 99.4% in a field of 85 collaborators; second by Duane Tilson, Texas Testing Laboratory, Lubbock, Tex., with 98.8%; and honorable mention by J. G. Bowling, Woodson-Tenent Laboratory, Des Moines, Ia., with 98.3%.

Edible Fats. First place among 60 collaborators was given to F. S. Kosco, Armour and Company, Chicago, Ill., with 99.70%; second to J. L. Hale, Swift and Company, Newark, N. J., with 99.06%; and honorable mention to Eugene Nesom, Swift and Company, Chicago, Ill., with 97.82%.

Glycerine. With 26 collaborators participating, first place went to J. H. Dietz, Harshaw Chemical Company, Gloucester City, N. J., with a point score of 373.5; second to A. Foster, Thomas Hedley Company, London, England, with 317.5 points; and honorable mention to L. I. Clack, Procter and Gamble, Hamilton, Ontario.

Drying Oils. Out of the 14 chemists participating, first place was a tie between R. D. Johnson, Pittsburgh Plate Glass Company, Red Wing, Minn., and G. Alexander and P. Schlupp of the National Lead Company, Philadelphia, Pa., with grades of 95.50%. Honorable mention was given to V. F. Bloomquist, Minnesota Linseed Oil Company, Minneapolis, Minn., with 93.75%.

Meal. The original Smalley series is also the largest, with 139 chemists participating, a record number. On the determination of moisture, first place was awarded to G. G. Dickinson, Texas Testing Laboratory, El Paso, Tex., with 100%. Tied for second place, with grades of 99.8%, were M. E. Fogle, Buckeye Cellulose Corporation, Augusta, Ga., and H. L. Hutton, Woodson-Tenent Laboratory, Clarksdale, Miss.

On the determination of oil, first place went to E. R. Hahn, Hahn Laboratories, Columbia, S. C., with 99.8%; second to D. B. McIsaac, Kershaw Oil Mill, Kershaw, S. C., with 99.6%; honorable mention to R. L. Pope, Pope Testing Laboratories, Dallas, Tex., who tied with Mr. McIsaac.

On the determination of nitrogen, first place was given to T. L. Rettger (retired) and W. J. Johnson, Buckeye Cellulose Corporation, Memphis, Tenn., with grades of 99.6%. D. B. McIsaac was second with 99.4%.

Presented this year by Armour and Company to the Society, the Smalley Cup is given for the combined proficiency on the determination of moisture, oil, and nitrogen on meal. Two collaborators tied for this honor with grades of 99.44%: E. H. Hahn and D. B. McIsaac. Both have won the honor previously, the former in 1955, and the latter in 1933, 1944, 1947, and 1950. Honorable mention was given to R. L. Pope, with 99.32%.

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