JACKETED-PRINCIPLE COLD-STORAGE ROOM

The keeping qualities of stored frozen fishery products are dependent to a large degree on the atmospheric conditions within the refrigerated storage room. Fluctuating temperatures and low relative humidities in the refrigerated storage room tend to cause excessive dehydration of the products during storage. As a result the the fish not only lose weight, but also the quality depreciates due to loss of flavor, development of off-odors, and poor appearance. Such loss in weight and quality can "spell the difference between profit and loss" in any marketing transaction.

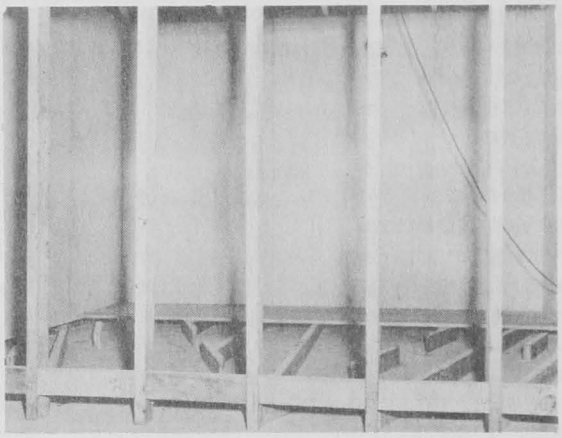

Fig. 1 - Arrangement of air ducts in the floor of the jacketed cold-storage room.

A refrigerated room designed in a manner so as to maintain ideal product environment offers tremendous possibilities in reducing the product losses which occur as a result of present cold-storage conditions. The jacketed cold-storage room (its use advocated in 1927 by Dr. Huntsman while Director of the Atlantic Fisheries Experimental Station at Halifax, Canada) seems to offer a combination of ideal product environment and practical engineering design. Some cold storage rooms employing the jacketed principle have been built in Canada; however, the lack of important data on preservation of product quality and cost of operation has made industry somewhat reluctant to accept this design. In order to furnish data on such a method of storage, a cold-storage room employing the jacketed principle was constructed at the U. S. Fish and Wildlife Service laboratory in East Boston, Mass.

In this freezer, cold air circulates through an enclosed space or jacket which completely surrounds the room. The outside surface of the jacket is lined with suitable insulation 10 inches thick. The inside surface of the jacket consists of the materials which comprise the walls, floor, and ceiling of the storage room. Vertical and longitudinal wooden members in the jacket are arranged so as to provide ducts which distribute cold air in the proper amounts through various parts of the jacket. The jacket is a closed-duct system containing a set of finned-pipe cooling coils to maintain the air at the proper temperature and two squirrel-cage fans to provide the necessary air circulation. The cold air circulating through the jacket maintains the inner room at predetermined temperatures of 0° to -25° F.

Some other features of this new cold-storage room are a two-stage Freon 22 refrigeration system, doors in the inner walls of the room which may be opened to enable forced air circulation directly into the room for rapid cooling when initially cooling the room, and dampers to control the air flow in the individual ducts.

Proper air circulation throughout the jacket results in temperature differences as small as 2° F. between the temperature of the jacket walls and the inside room temperature. Owing to this small temperature difference, it is possible to maintain a very high relative humidity within the storage area. Also, the air in the jacket does not enter the refrigerated room; therefore, it cannot draw moisture away from the product. During operation, the moisture contained in the air within the jacket is withdrawn by artificial defrosting. Consequently, the air in the jacket becomes very dry resulting in very little frost accumulation on the cooling coils.

During preliminary tests a room temperature of -23° F. with a maximum variation of only 0.5° F. was obtained by cycling the compressor off a thermostat located in the jacket. Several samples of exposed fish blocks were placed in a conventional-type still-air room at -5° F. and in the jacketed room. Six weeks later the samples stored in the still-air room showed a weight loss of approximately 6 percent, while no appreciable loss in weight occurred in the samples stored in the jacketed room.

More extensive tests will be conducted to determine the effect of storage in this type of room on the storage life of fishery products. Engineering data also will be obtained in regard to the operation of this equipment.

USE OF FISH OILS FOR ORE FLOTATION

During the early 1920's, fish oil was, among other oils, used as a collector in ore flotation. In this process a separation is effected by concentrating low-grade ores with the use of a collector to form a foam which floats the lighter particles such as siliceous material to the top and allows the heavier ore particles to sink to the bottom. Subsequent research by producers of oils of animal or vegetable origin resulted in findings that separated fatty acids or derivatives of fatty acids were more efficient collectors than the oils themselves. With such research lacking for fish oils, such oils dropped out as a source of material for this usage. The quantity of oil derivatives used for this purpose is not large with respect to the weight of the ore, amounting to only about half a pound per ton. In the past, when ore flotation has been used largely as a means of concentration of certain sulfide ores, the potential market of oils for ore flotation has not been very great. Iron ore represents by far the largest tonnage of all ores produced. With the depletion of high-grade iron ores in the United States and the possibility of ore flotation becoming a major method of concentrating low-grade ores, the potential requirement of oil derivatives for this purpose is now far greater than in the past.

Research under the Saltonstall-Kennedy Act has been undertaken at the School of Mines and Metallurgy, University of Minnesota, to investigate the properties of fish-oil derivatives as ore collectors for concentrating low-grade iron ores, sulfide ores, and other ores. Initial work is being concentrated on use for iron-ore flotation.

Preliminary work has developed a procedure for comparing the efficiency of fish oil-derivative collectors with oleic acid as a standard using laboratory and pilot plant-scale techniques. On a theoretical basis, fish oils with longer chain fatty acids combined with a high degree of unsaturation should offer certain advantages over material now used. In initial tests fish-oil fatty acids have been used successfully in experimental tests and have been found to form a foam which is tougher and more tenacious than that produced with oleic acid.

Arrangements have been completed recently for Hormel Institute to assist in this program by preparing certain fractionated fish-oil fatty acids for future testing.

Certain chemically-altered derivatives are also being prepared for use in the program by the U. S. Fish and Wildlife Service's Seattle Fishery Technological Laboratory.

FROZEN BREADED SHRIMP FEDERAL SPECIFICATION

Current Armed Forces and Federal Agencies requirements for frozen breaded shrimp indicated the need for a Federal Specification to facilitate government purchases of the product. Accordingly, a Proposed Federal Specification, PP-S-315 (Shrimp, Breaded, Raw; Frozen), dated February 23, 1956, was prepared by the Quartermaster Corps Food and Container Institute for the Armed Forces and the U. S. Fish and Wildlife Service. This draft has been submitted to the various Federal agencies and to industry for review and comment. It has not yet been approved and is subject to modification pending coordination.

COD-LIVER OIL CONCENTRATE HAS UNIQUE USE

Cod-liver oil concentrate (which is high in natural vitamin A) is superior to synthetic vitamin A in the diet of tuberculous patients, according to a paper ("A Physiologic and Clinical Study of Failures in Vitamin A Metabolism in Tuberculous Patients") by Horace R. Getz which appeared in the American Review of Tuberculosis and Pulmonary Diseases, vol. 72, no. 2.

A summary of the paper indicates that:

"A study was organized to determine if nutritional deficiencies in tuberculous patients could be abolished, and if their removal would lead to improvement in clinical progress.

"Seventy-eight patients with moderately advanced tuberculosis, all of them showing nutritional deficiencies, were placed on bed rest, with a good hospital diet, and subjected to nutritional study and treatment. . . .

"At the start of the investigation, most of the 78 patients were found to have abnormally low blood concentrations of vitamin A and vitamin C. Signs and symptoms of vitamin A deficiency were discovered in patients with normal carotene and vitamin A ester concentrations. This suggested failure of the tissue of these patients to convert carotene to vitamin A and to release vitamin A from vitamin A ester.

"For purposes of the investigation, the 78 patients were divided into three groups: Group I, with no vitamin supplementation of the hospital diet; Group II, which received the same basic diet as group I, plus supplementation with vitamin A in the form of the synthetic substance; and Group III, similar to Group II, which received vitamin A in the form of crude cod-liver oil concentrate instead of synthetic vitamin A.

"The basic hospital diet, more than sufficient for caloric and protein requirements, with more than average amounts of vitamins A and C, did not raise the original low plasma concentrations of tuberculous patients in these two vitamins significantly.

"Therapy with vitamin A produced slow and irregular responses in vitamin A blood concentrations. The response was much better with the cod-liver oil concentrate than with synthetic vitamin A.

"All patients in the group which received the cod-liver oil concentrate (Group III) had a good clinical course and were discharged as inactive cases of pulmonary tuberculosis. There were no clinical failures. In contrast, clinical failures occurred in both the control group and the group which received synthetic vitamin A."

EXPANDING SCHOOL-LUNCH PROGRAM INCREASES POTENTIAL MARKETS FOR FISH

Over 10 million school children eat in school lunchrooms. Eating habits of children throughout the country will be largely influenced by the meals they receive daily in the nationwide school-lunch program. This affords an excellent opportunity for the fishing industry to benefit from this large potential market.

In 12 years, the number of children participating in the national school-lunch program has almost tripled and is increasing at the rate of 8 to 10 percent each year. In 1944, the first year that

A U. S. Fish and Wildlife Service home economist conducting a fish-cookery demonstration at Paris, Ill.

Federal assistance was provided, the program reached about $3\frac{1}{2}$ million children. Since that time, the program has increased year by year to the present total of slightly more than 10 million children. This represents one of the most rapid growing volume markets in the country.

More children will be attending school, more schools will be equipped with lunchroom facilities, and more communities are planning lunch programs as an essential auxiliary food service.

Another measure of program growth is the improved quality of the meals. In 1944 less than one-half of the meals served were Type-A lunches which require milk, 2 ounces of protein, fruit or vegetable, and bread and butter. In 1952, more than two-thirds of the meals served met the Type-A requirement.

As more and better meals are served under the program, schools have purchased correspondingly larger quantities of food from local wholesalers, retailers, and producers. Value of foods purchased locally by schools increased from $129 million in 1947 to $250 million in 1952. These local purchases represent over 80 percent of the value of all foods used by the schools.

The United States Fish and Wildlife Service's program of fish-cookery demonstrations reaches over one million of these school children. An extensive program of fish-cookery demonstrations in cooperation with state school-lunch programs has been in progress for several years. School-lunch managers and cooks attend these demonstrations and learn new and easy methods of preparing fish in the school lunchrooms. Children should be served fish more often as a result of the increased knowledge of the school-lunch cooks, and therefore acquire an appetite for fish dishes, thus increasing the use of fish both at school and in the home.