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BYPRODUCTS OF THE GOVERNMENT-OPERATED
ALASKA FUR-SEAL INDUSTRY

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It is estimated that the Alaska fur-seal herd contains about 80 percent of the fur seals of the world. These animals have been exploited for their valuable fur almost continuously since their summer breeding grounds on the Pribilof Islands were discovered by the Russians in 1786. Records indicate that during the 81 years of Russian management the Alaska fur-seal herd yielded about 2½ million pelts. Since Alaska was purchased by the United States in 1867, over 5 million Alaska fur-seal pelts have been taken. Of this number 1,569,802 pelts have been taken since the Government assumed direct control of the herd in 1910.

Prior to World War I very little effort was made to utilize the waste products of the fur-seal industry. A relatively small proportion of the available seal meat was used as food by the residents of the Pribilof Islands, certain portions of the fur-seal carcass were utilized by the Aleut natives in making clothing, and in the early days the seal blubber was used as fuel for cooking purposes. In addition, fur-seal carcasses have always furnished an important source of food for the blue fox populations on the Islands.

For the most part the fur-seal carcasses were abandoned to the elements. Tens of thousands of seals were killed on the outskirts of the Pribilof Islands villages and yet the decomposition of the carcasses was so gradual in the prevailing cold weather that the proximity of the killing fields to the villages apparently had no ill effect on the health of the resident.

After the Government assumed responsibility for the Pribilof Islands fur-seal industry in 1910, efforts were made, particularly during World War I, to utilize the waste products of the industry. Seal meat was preserved in salt for experimental use by the Department of Agriculture, tests were made of the suitability of seal intestines for sausage casings, oil and gelatine were extracted from carcasses, the gullets or throats of the seals were used experimentally in fine leather

work, and fur-seal bone deposits from the killing fields were collected for chemical analysis. Very little was actually achieved as a result of this experimental work, except for the utilization of the bone deposits. From 1917 to 1919 about 235 tons of fur-seal bones were shipped to Seattle and San Francisco and sold for the manufacture of fertilizer.

In 1918 a small byproducts plant was built by the Government on St. Paul Island of the Pribilof group. Automotive trucks also were introduced on the Island in that year to replace the mule carts which had served as transportation since 1874. Approximately 80 percent of the annual take of skins is obtained on St. Paul Island and 20 percent on the neighboring island of St. George, 40 miles away. The original plant was a war time undertaking constructed at a cost of \$25,000 for the purpose of producing additional oil from which glycerine, an essential material for munitions manufacture, could be prepared. This plant was operated on a limited basis annually from 1919 through 1924, and for a short time in 1928, but produced a total of only 34,000 gallons of oil and 47 tons of meal. About 26 tons of meal was sold for use as fertilizer and the remainder was used on the Islands as fox food. The oil was used primarily in the tanning of sealskins and in the preparation of fox food. Only about 10,000 gallons of oil was sold. Rendering operations were restricted in 1919 and 1920 by a shortage of coal for fuel. After 1920 the price of meal and oil declined to the point where operation of the plant was not economical.

In 1930 a special appropriation of \$65,000 was made available to modernize and enlarge the byproducts plant. The most efficient type of "dry rendering" equipment was installed, capable of processing about 40,000 seal carcasses during the seven-week sealing season. Enlargement of the plant was completed in 1931, but due to low prices for oil and meal it was not placed in operation until 1935. In that year the plant was completely overhauled and some new equipment was added. The plant has been operated each season since 1935, except in 1942 when the Pribilof Islands were evacuated for military reasons.

Between 1930 and 1940 the annual take of sealskins on St. Paul Island increased about 50 percent and the capacity of the byproducts plant no longer was adequate to utilize all of the available carcasses and blubber. With the coming of World War II, the demand for fur-seal meal and oil was again stimulated. A special deficiency appropriation of \$135,000 was approved in fiscal year 1944 to double the capacity of the St. Paul Island plant. However, owing to the wartime shortages of equipment and materials and infrequent transportation service to the isolated Island, this expansion of plant capacity was not completed until the summer of 1948.

The present plant, consisting of the original building constructed in 1918 and the additions that have been made in the past 30 years, is valued at more than \$200,000. In 1949, products including nearly 50,000 gallons of oil and 347 tons of meal were sold for the account of the Government for a total of \$76,220. Direct operating

Expenses amounted to about \$30,000. The annual production of the byproducts plant in the period from 1935 to 1949 is shown in Table I, together with the quantities of meal and oil sold each year and the gross proceeds of such sales.

Table I - Annual Production and Sales of Fur-Seal Meal and Oil and Gross Proceeds of Sales 1935 - 1949

Year	Quantity Produced		Quantity Sold		Gross Proceeds of Sale		
	Meal (Pounds)	Oil (Gallons)	Meal (Pounds)	Oil* (Gallons)	Meal	Oil	Total
1935	155,254	18,994	-	18,238	\$ -	\$4,924	\$4,924
1936	276,040	25,252	-	23,669	-	7,229	7,229
1937	330,265	29,830	-	29,341	-	5,397	5,397
1938	357,222	30,587	-	29,865	-	4,157	4,157
1939	502,914	32,809	338,421	27,966	6,863	8,704	15,567
1940	618,762	30,605	569,536	24,405	10,495	8,969	19,464
1941	747,546	54,610	746,457	39,610	23,865	24,129	47,994
1942	(Plant not operated)						
1943	782,000	75,259	244,679	94,482	10,191	63,067	73,258
1944	484,776	32,976	835,470	32,976	33,408	21,616	55,024
1945	547,969	41,189	547,969	41,189	21,762	27,237	48,999
1946	528,040	33,912	528,040	33,912	23,471	21,997	45,468
1947	606,514	39,746	606,514	39,746	40,895	51,248	92,143
1948	686,089	48,592	684,089	48,592	37,119	42,557	79,676
1949	694,350	49,253	693,350	49,253	55,627	20,592	76,219
	7,317,741	543,614	5,794,525	533,244	\$263,696	\$311,823	\$575,519

*Net weight of oil in tank cars.

The method of taking sealskins on the Pribilof Islands determines to a considerable extent the manner in which the byproducts plant is operated. The skull of the fur seal is very thin on top and each animal is quickly and humanely dispatched by a blow on the head with a hardwood pole. Immediately thereafter its heart is pierced with a knife. The skin is slit up the belly and cut around the head and flippers. It is then stripped off in a single motion with specially designed pliers. Most of the animal's blubber adheres to the skin and is not removed until the following day.

The carcasses, which weigh about 70 pounds each, are all delivered to the plant immediately after the skins have been removed and are never held more than one day before processing. As the meal is used almost entirely as meat scrap in livestock and poultry feeds, only fresh carcasses are processed. Upon arrival at the plant the carcasses are dumped from trucks into a large bin. A conveyor belt moves them to the "hog" which chops up the carcasses for a quicker, more uniform rendering. The "hog" has a capacity of 10 tons and is driven by a 50 H. P. electric motor.

A second conveyor carries the material to one of eight melters for rendering. The melters are 12 feet long and 5 feet in diameter, of the steam

jacketed center-feed type, suitable for dry rendering at atmospheric pressure, rendering by the steam pressure cooking method, dry rendering under vacuum or any combination of the three. Agitation of the material within the melter is accomplished by a series of paddles fastened to a shaft which is driven by a 20 H. P. electric motor. The dry rendering method at atmospheric pressure has produced the best results and is used at present with 40 to 60 pounds steam pressure in the jacket. A melter load of 200 carcasses requires about 6 hours to cook. Steam is furnished by two 100 H. P. boilers and one 200 H. P. boiler, using diesel oil as fuel.

The blubber is kept separate from the carcasses as it produces a superior grade of oil. After the blubber is removed from the sealskins it goes directly to the melters without passing through the "hog." The blubber is sufficiently broken down in the melter so that separation of the oil takes place without the use of expellers. Following the rendering process the blubber oil is drained from the cracklings and pumped to storage tanks. The cracklings are added to a subsequent lot of raw carcass material so that they become thoroughly mixed in the cooking process. The carcass melters are unloaded by gravity into large pans and the cooked material is fed through a worm conveyor and over a magnetized belt to a mechanical press or expeller which has a capacity of 2500 pounds per hour. The expeller is driven by a 25 H. P. motor and operation is continuous.

From the expeller the carcass oil is pumped to settling tanks prior to barreling. The dried meal is carried by belt conveyors to an overhead cooling room and then by gravity to a hammer mill which has a capacity of 4,000 pounds per hour. After being pulverized in the hammer mill the meal is sacked and stored in an adjoining warehouse to await shipment to Seattle at the end of the season.

From 1935 to 1939 most of the fur-seal meal produced each year was used as fish food in fish hatcheries operated by the Service (at that time the Bureau of Fisheries). However, since 1939 it has been to the advantage of the Government to purchase protein base fish food locally for each hatchery and to dispose of the annual production of fur-seal meal by public sale, f.o.b. Seattle, Washington. Each summer bids are invited on the meal on the basis of a unit price per "protein unit," considered in this case to be each protein percent per ton. The protein content of each year's production of meal is determined through a composite sampling and analysis by a competent commercial laboratory. For this purpose 4 composite samples of the 1949 production of fur-seal meal were analyzed by Lauck Laboratories, Inc. of Seattle, Washington. The average of these 4 samples was as follows:

ANALYSIS OF 1949 FUR-SEAL MEAL

Moisture	5.48%
Fibre	.12%
Protein (N x 6.25)	63.93%
Ash	14.12%
Fat	15.31%

In recent years most of the annual output of fur-seal meal has been sold for use as a protein ingredient in poultry feed. A small quantity is used experimentally by the Department of Agriculture in the feeding of fur-bearing animals, and limited quantities have been sold to state fish and game agencies for use in fish hatcheries.

Since 1935 most of the fur-seal oil has been sold for the account of the Government for use in leather tanning. The oil is shipped to Seattle in 50-gallon drums and bulked into storage tanks prior to its sale. Analyses of the oil are made by a commercial laboratory in Seattle and the results of these analyses are used as the basis for soliciting bids. After the oil is bulked into the contractor's tank car for delivery, a further analysis is made as the basis for computing price adjustments for any excess of free fatty acid and any excess above 1 percent of water, volatile matter, and insoluble matter. The following analyses of the blubber and carcass oil produced in 1949 were made by Laucks Laboratories, Inc., of Seattle, from samples taken after the oil had been agitated for $1\frac{1}{2}$ hours in the storage tanks:

Table II - Analyses of Fur-Seal Blubber and Carcass Oil Produced in 1949

	<u>Blubber</u> <u>Oil</u>	<u>Carcass</u> <u>Oil</u>
Free Fatty Acids (As Oleic)	1.01%	5.29%
Moisture	0.35%	0.60%
Insoluble Matter	0.06%	4.44%
Iodine Number (Wijs)	132.8	133.4
Stearine at 70° F.	1.05%	1.89%
Unsaponifiable Matter	0.44%	2.19%
Titre	21.3° C	18.8° C
Lovibond color using a 1/4" column		
Yellow	20 *	55
Red	4.1 *	17.6

*(Using a 1" column)

Since 1945 consideration has been given to the possibilities of utilizing fur-seal carcasses for other than reduction purposes. An analysis of fur-seal flippers as a commercial source of glue or gelatine produced negative results. Preliminary tests also have been made of the Vitamin A potency of fur-seal blubber, carcass, and liver oils. These tests indicate a low Vitamin A content for blubber and carcass oil and a very wide range of potency in the oil extracted from livers. An experimental pack of fur-seal liver pate¹ of good quality was produced in 1945, but it was concluded that the costs of commercial production on the isolated Pribilof Islands would be prohibitive.

It is anticipated that the annual output of the St. Paul Island byproducts plant will continue to be about 350 tons of meal, 35,000 gallons of blubber oil, and 15,000 gallons of carcass oil. Normally the year's production of fur-seal oil and meal reaches Seattle, Washington, about September 1 and is offered for sale shortly thereafter. Current information concerning offerings of this nature may be obtained by writing to the Director, Fish and Wildlife Service, United States Department of the Interior, Washington 25, D. C., or to the General Manager, Pribilof Islands, Fish and Wildlife Service, 706 Federal Office Building, Seattle 4, Washington.