

Pilot Surimi and Analog Line

Information Manual

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INTRODUCTION

The Alaska Fisheries Development Foundation (AFDF) is a private, non-profit research and development firm chartered to help the Alaskan seafood industry develop new technologies and applications for its seafood. The experimental, pilot-scale surimi and seafood analog line is part of AFDF's ten-year effort to strengthen and diversify Alaska's fishing industry. AFDF and the National Marine Fisheries Service (NMFS) in Kodiak have worked together to install experimental equipment to produce surimi and surimi-based products.

One of the greatest difficulties in developing applications for surimi is the limited knowledge of how it will behave in a specific formulation. AFDF's goal in establishing a pilot facility is to gain a better understanding of surimi's performance as a functional ingredient in extruded food products. We propose to accomplish this by producing analogs from fresh surimi, testing different cryoprotectants, and changing process variables which can affect surimi quality. We also want to try making surimi without any additives for use in health food, and explore how we can replace foreign-made equipment with U.S. equipment in the processing line.

Based on our experience with commercial surimi production, we have identified some areas that need immediate attention in order to protect the viability of the U.S. surimi industry:

1. Consistency (uniformity) of functional specifications of surimi within lots and from one lot to the next;
2. Aspects of functionality, especially water-binding capacity, since it has a significant effect on the economics of analog and other surimi-based product processing;
3. Improvements in recovery necessary to compete with foreign producers whose operating costs are lower;
4. Ability to compensate for variations in the quality of landed fish;
5. Ability to adjust cryoprotectants and other additives to accommodate various custom nutritional and functional specifications.

To solve problems such as these, it is necessary to manipulate the process variables which influence the final product and to experiment in a controlled environment. We can accomplish this with a pilot-scale line and inform the industry of our results.

The pilot line is also available for use directly by members of the industry to perform their own experiments on surimi and analog formulations. For this purpose, we have developed this information manual. It contains all the information you need for arranging and using the pilot line. Remember, your participation and interest in the pilot line project means you are supporting the improvement of American surimi operations.

LOCATION

The AFDF pilot surimi analog line is located in the National Marine Fisheries Service (NMFS) Gibson Cove laboratory in Kodiak, Alaska. Gibson Cove is approximately two miles from the city of Kodiak, off Rezanof Road on the way to the airport. As a result, it is important that you obtain the transportation you need. Rental vehicles are available at the airport. A list of car rental agencies and hotels is located in this manual. Kodiak visitors guides are also available from AFDF.

INVOLVEMENT OF NMFS

The pilot line is located in a NMFS facility, and, except for the line itself, the remainder of the equipment needed to use the line belongs to the NMFS. Therefore, you will need to notify the lab director, Dr. Jerry Babbitt, of your interest in using the line. Arrangements for necessary equipment and for a NMFS representative to work with you on the pilot line can be made with Dr. Babbitt.

SETUP OF LAB

The pilot plant has 2700 square feet of floor space and includes the standard equipment you would expect to find in a pilot seafood processing plant, i.e. walk-in freezer (-5°F), refrigerators, ice box, ice making machine, sinks, work benches, steam boiler, 208 volt 3 phase power, overhead chain hoist, hand forklifts and other sundry equipment.

EQUIPMENT AVAILABLE

Analog Equipment

- 1- Stephan Vacuum Chopper
- 2- Hobart Silent Cutter
- 3- Hydraulic batch pump with extruder
- 4- Steam cook conveyor
- 5- Radiant cook conveyor
- 6- Roper (scoring and bundling machine)
- 7- Steam cabinet cooker (for setting color)

Surimi Equipment

- 1- Butcher Boy Grinder
- 2- Hobart Grinder
- 3- Baader 694 Deboner
- 4- Washing equipment
- 5- Gyra Vib Dewaterer Screen
- 6- Bibun Sum 420 Strainer
- 7- Brown Model 4000 Finisher
- 8- Fukoku Screw Press
- 9- Stephan Vacuum Chopper
- 10- Hobart Silent Cutter
- 11- Dole plate freezer
- 12- Alfa-Laval Decanter Centrifuge and In-line Wash System

SOURCE OF FISH AND SURIMI

Surimi: Alaska Pacific Seafoods (APS)
627 Shelikof Avenue
Kodiak, Alaska 99615
(907) 486-3234

APS has a production scale surimi line. Surimi and/or washed, minced fish can be purchased from them either fresh or frozen. APS only operates their surimi line from September to late April; therefore, if you intend to use the line in the summer months and want to use their surimi, you will need to purchase it before they shut the line down and have it stored.

Raw Fish: Dr. Jerry Babbitt
NMFS/NWAFRC
P.O. Box 1638
Kodiak, Alaska 99615
(907) 487-4961 or 486-5885

Dr. Babbitt will be able to inform you of what is available locally and seasonally, in what form, and who to contact.

STARCHES. PRESERVATIVES, FLAVORINGS

Roquette Corporation
1550 Northwest Avenue
Gurnee, Illinois 60031
(800) 223-5305 or (312) 249-5950

Roquette Corporation has donated samples of starches and sorbitols. Mr. Lon Wilson is available to answer any questions about these products.

T. Hasegawa USA, Inc.
5351 West 144th Street
Lawndale, California 90260
(213) 643-9711

T. Hasegawa U.S.A., Inc. has donated samples of its seafood flavor series. Mr. Jeff Carlson is a good source of information about flavorings and recipes.

Avron Resources
5251 Broadway, Suite 531
Oakland, California 94618
(415) 652-4556

Avron Resources represents Ogawa & Co., Ltd. and has offered to supply flavorings to interested pilot line users. Mr. Carl Arvold requests that you contact him directly for samples when arranging to use the pilot line so that he can supply exactly what you need and insure the freshness of his samples.

Lists of the above product samples can be found in the attachments to this manual. You may also contact AFDF for a complete list of ingredient suppliers.

SETUP OF LINE

The equipment that comprises the pilot analog line has been mounted on casters and is fairly easy to move from its storage area. Setting up the line and connecting the electrical and steam lines takes approximately 15 minutes. Starting the boiler and getting steam takes about 30 minutes. Both of these jobs can be done at the same time, so you can be set up and using the equipment within a half hour.

BOILER

The boiler is located in the furnace room which has an outside access door on the rear of the building. The light switch is on the right just inside the door. To start the boiler, the following steps must be followed in order.

- 1- Turn on both the fuel supply and return line valves. These are located on the floor in front of the furnace.
- 2- Turn on the water to the feed water tank. The valve is above the furnace in the water line going to the tank.
- 3- Let the water flow out of the feed water tank until it runs clear and then close the feed water tank drain valve.
- 4- Watch the sight gauge on the outside of the feed water tank. When the water is about half way up the gauge, turn on the power switch located above the feed water tank. The boiler will then start to fill with water.
- 5- The drain valve on the boiler will have been left open. Let the water run out of the boiler until it runs clear. Close the boiler drain valve.
- 6- There is a drain valve located below the sight gauge on the boiler. When water starts to flow out of the valve, close the valve.
- 7- When the water rises to about half way in the boiler sight gauge, the boiler should fire. If the boiler does not fire or does not seem to operate correctly, turn off the power switch and the fuel valves and have someone check it for you.
- 8- If all went well, you will have steam in 20 minutes or so.

To shut down the boiler, follow the sequence listed below.

- 1- Turn off the electrical power switch.
- 2- Shut both the fuel supply and return valves.
- 3- Shut off the water to the feed water tank.
- 4- Open drain valve on feed water tank.
- 5- Open the drain valve on the boiler one full turn after water starts to run out. This is so the boiler will not drain down too fast. It will take 15 or 20 minutes for the boiler to drain down.
- 6- Open the boiler drain valve all the way and open the drain valve under the boiler sight gauge.
- 7- Shut off the lights in the furnace room and shut the doors.

HYDRAULIC BATCH PUMP WITH EXTRUDER

We are using a hydraulic sausage stuffer to pump the surimi through the extruder. This unit is powered with a 220 volt motor and is plugged into the socket located below the small transformer which is to the right of the smoker. The extruder can be adjusted to lay down a ribbon of material of up to about 3 mm thick. Most recipes call for a thickness of 1.2 to 1.5 mm. There are screws on the extruder which can be adjusted to control the flow of material inside so that material coming out is flowing at the same speed across the outlet.

STEAM COOK CONVEYOR

Attach the steam hose to the unit and turn on main steam valve. The unit must be plugged in for the steam valves to work. There is a variable speed unit on the conveyor motor so that you can vary the length of time the material is being cooked in the steam tunnel. The boiler puts out 25 pounds of pressure. There is a pressure reduction valve on the steamer that can be adjusted and there is a thermometer mounted in the steam tunnel to monitor the temperature.

RADIANT COOK CONVEYOR

The drive unit must be plugged into the volt system and the electric heating unit into the 208 volt system to the right of the smoker. Using the variable speed drive unit, you can match belt speeds with the steam cooker. The radiant heater control unit is a duty cycle type. When set to "100," it is on all the time, and when set to "0," it is off.

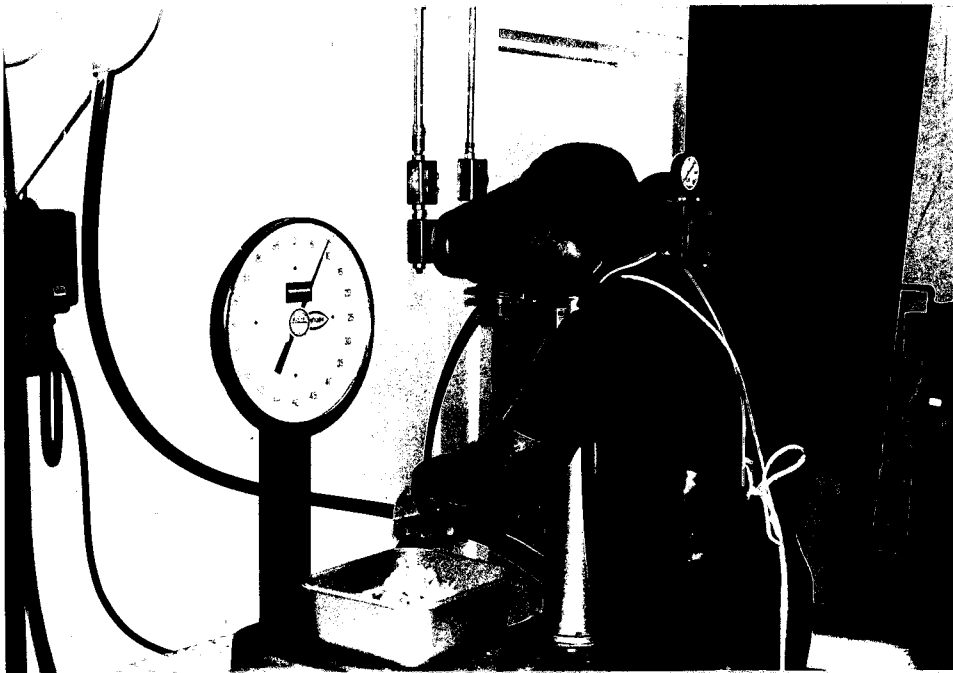
ROPER AND STEAM CABINET COOKER

The roper scores the cooked ribbon and rolls it into a round cylinder to simulate crab legs, or you can just score the material to simulate shredded crab. For small batches, it is not worthwhile to use the steam cooker as it is used to cook or pasteurize the material.

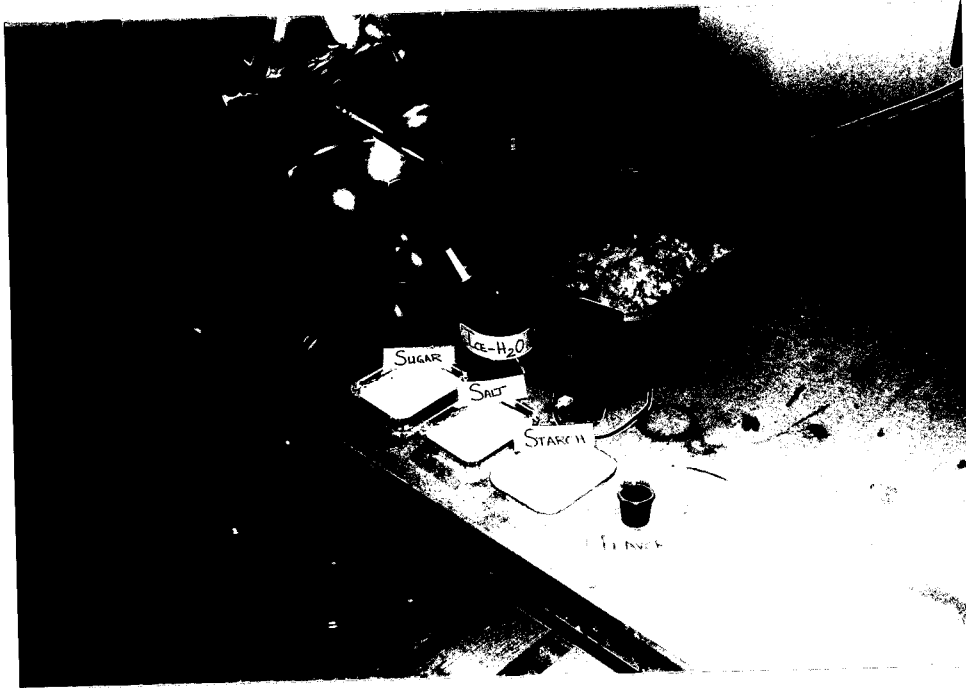
PREPARATION OF MATERIAL TO PROCESS



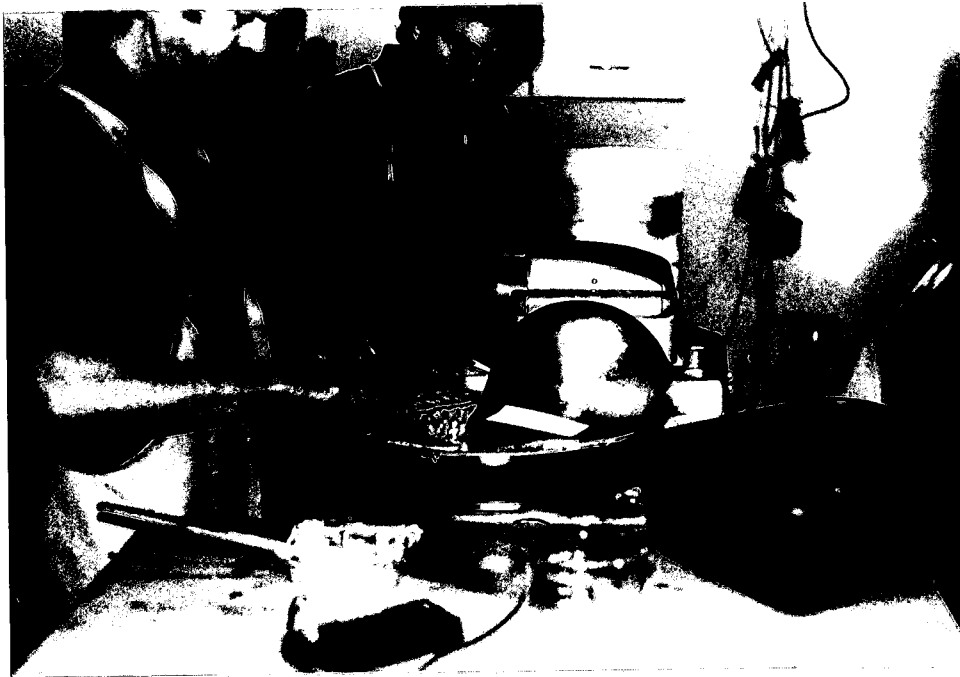
1) Weighing out the ingredients.



2) Weighing out the surimi or minced fish.



3) The ingredients, Hobart Silent Cutter, and temperature probe.

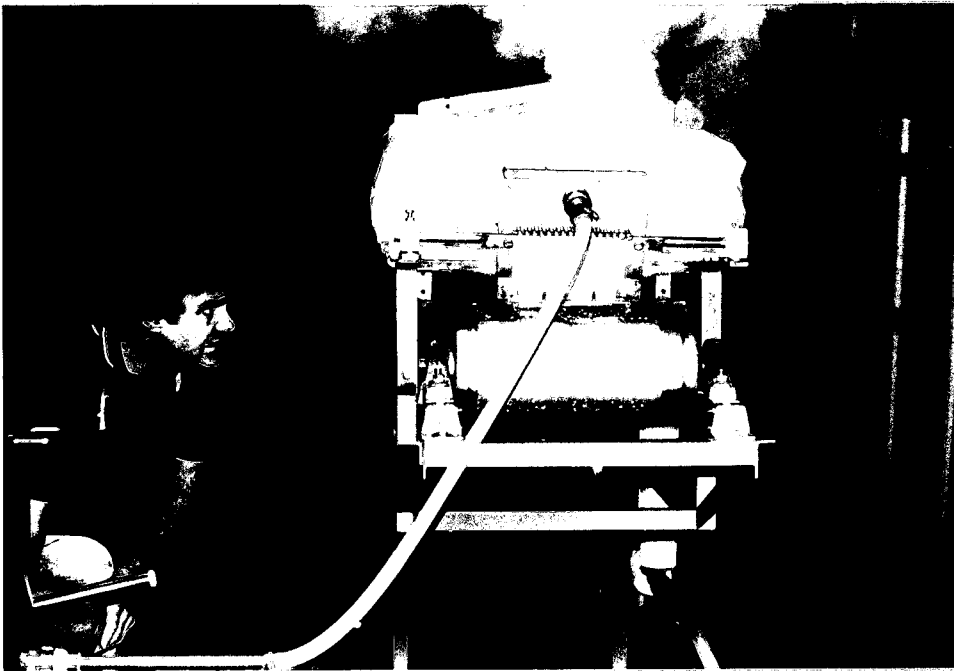


4) Using the Hobart Silent Cutter to blend ingredients together while monitoring the temperature.

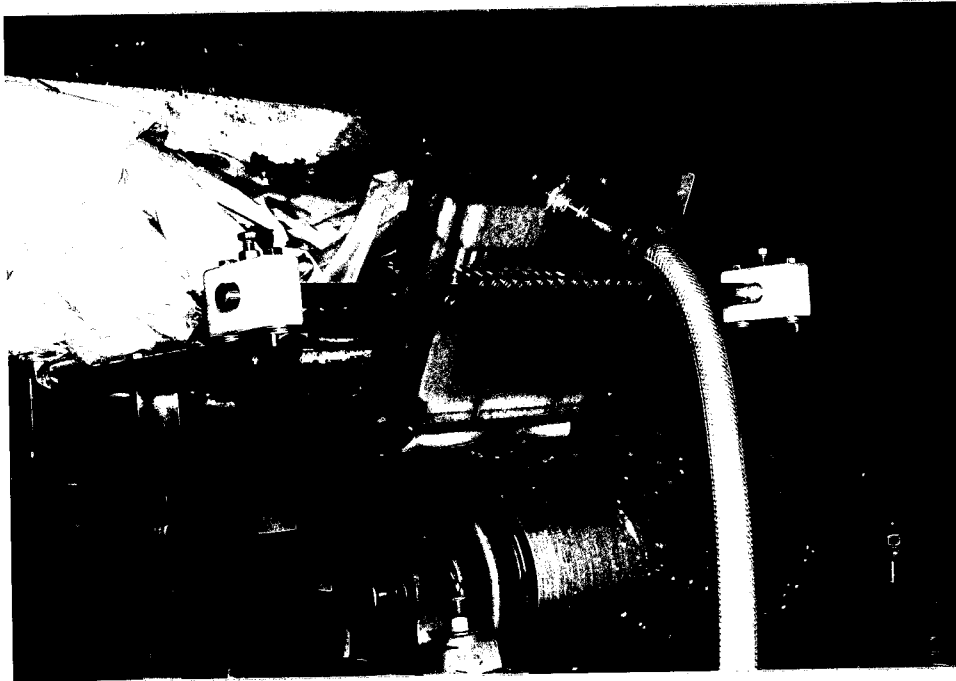


- 5) Putting the mixed batch into a plastic bag which is to be inserted into the hydraulic extruder. The bag is used to save time during cleanup.

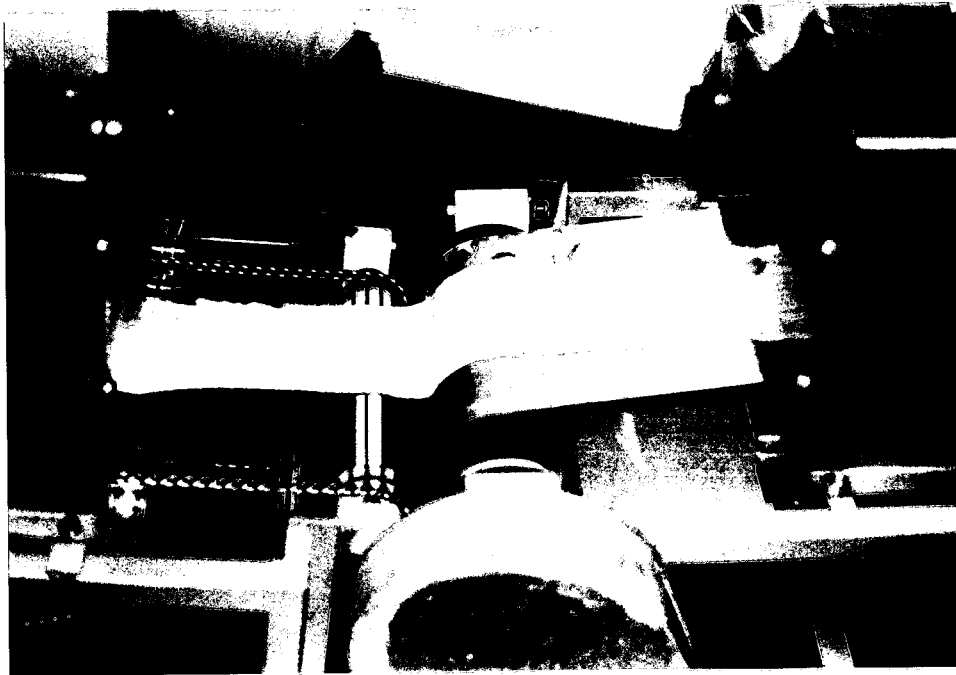
TYPICAL RUN



- 1) Using the hydraulic extruder to form a continuous sheet on the steam cook conveyor.



2) Sheet being formed on the steam cook conveyor belt.



3) Sheet of material being transferred from the steam cook conveyor to the radiant cook conveyor. You may or may not want to use the radiant cook conveyor depending on the type of product you intend to produce.

CLEANUP

Material to clean the equipment will be supplied. Please see to it that the equipment is clean and ready for the next person to use. Thank you.

PUTTING EQUIPMENT AWAY

The Gibson Cove facility is shared with the enforcement arm of NMFS, and they have some equipment stored in the pilot plant that may need to be removed in a hurry at night. Therefore, it is requested that when shutting down for the night you see to it that there is access to the overhead door and to the NMFS equipment.

SECURING BUILDING

The Gibson Cove facility is made available to AFDF through the NMFS, and a lot of hard-to-replace equipment is stored there. It would be appreciated if you would respect the facility and equipment. Be sure the building is locked when you leave and that the lights and equipment are turned off. Thank you.

AFDF USER POLICY

The pilot line project is a cooperative effort between AFDF and NMFS. AFDF is responsible for the line's installation and upkeep, monitoring its use, and disseminating information about pilot line research; NMFS has kindly provided the use of its facility to house the line. Therefore, we ask that users comply with the following provisions:

- 1- Prospective users must be recognized industry participants.
- 2- Prospective users must contact AFDF at least three weeks in advance of proposed experiment date to arrange for use of line.
- 3- Users must send AFDF brief outline and justification of proposed experiments, detailing supply needs (fish, cold storage space, volumes, etc.) and expected duration of tests.
- 4- Users must pay own transportation, lodging, and meals.
- 5- Users must cover costs of use of line and raw materials.

USER FEE: AFDF members: \$300.00/day, non-members: \$500.00/day

- 6- Use of line must be supervised by local AFDF or NMFS representative.
- 7- Users must comply with instructions outlined in this manual.
- 8- In keeping with AFDF's goal of technology exchange, AFDF will publish information about use of the facility and a general description of the research conducted. Specific details of experimentation and results will remain confidential upon request of the user. If such considerations are of concern to a user company, it would be wise to work out an arrangement with AFDF prior to beginning the work.

AFDF USER POLICY (continued)

- 9- Users must sign a NMFS liability release form.
- 10- Users must provide AFDF and NMFS with a certificate of insurance for workers' compensation and employer's liability with a policy period no less than the expected term of use of the pilot line.
- 11- Times and acquisition of raw materials must be arranged through AFDF and/or NMFS prior to commencement of pilot line experimentation.
- 12- Users are requested to indicate the amount of any flavorings, starches or other ingredient samples used so that we can restock for subsequent pilot line use.

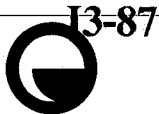
INFORMATION ON KODIAK

Automobile Rentals

Avis Rent-A-Car	(907) 487-2264
Budget Rent-A-Car	(907) 486-5815
Hertz Rent-A-Car	(907) 487-2261
National Car Rental	(907) 486-4751
Rent-A-Heap	(907) 486-5200

Hotels

Kodiak Buskin River Inn	(907) 487-2700
Westmark Kodiak	(907) 486-5712
The Shelikof Lodge	(907) 486-4141
Kodiak Star Motel	(907) 486-5657



ROQUETTE
Corporation

NEOSORB® 20/60
Sorbitol Powder NF-FCC

Specifications

Water Content (Karl Fischer)	0.5% max.
Reducing Sugars	0.2% max.
Total Sugars	1.0% max.
D-Sorbitol (gas chromatography)	96.0% min.
Residue on Ignition	0.1% max.
Chloride	10 ppm max.
Sulfate	50 ppm max.
Heavy Metals	5 ppm max.
Arsenic	1 ppm max.
Resistivity in 50% aqueous solution	500,000 ohm-cm min.
Melting Point	96 to 99° C

Standard Particle Size

Neosorb® Powder 20/60	Max. 5% residue on a 1000 micron sieve
	Max. 2% through 212 micron sieve

Neosorb® is a registered trademark of Roquette Freres.

GURNEE, ILLINOIS 1550 NORTHWESTERN AVENUE, 60031 1-800-223-5305 (312) 249-5950

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ROQUETTE
Corporation

CLEARAM[®] PG HV

Clearam[®] PG HV is a food grade specialty potato starch developed for the surimi industry.

It meets the requirements of the Food Chemicals Codex 3rd Edition 1981.

It has a low gelatinization temperature (approximately 57°C), a high viscosity and good dispersion in cold, tepid and hot liquids. Moreover, the stabilization imparts to **Clearam[®] PG HV** a low tendency towards retrogradation.

PHYSICO-CHEMICAL CHARACTERISTICS

Appearance	white powder
Loss on drying	18 % approx.
pH in solution	5.5 approx.
Particle size	
- Particles over 200 microns	0.1 % max.

Clearam[®] is a registered trademark of Roquette Freres.

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ROQUETTE
Corporation

CLEARAM® WG

Definition

Modified wheat starch.

Acetylated starch conforms with the requirements of:

- Food Chemicals Codex Third Edition 1981.
- EEC draft directive : modification G.

Specifications

Iodine Coloration	blue
Loss on Drying	14% max.
pH in Solution	5.5 to 6.5
Ash	0.5% max.
Acetyl Groups	0.4% max.
Protein Content	0.4% max.
SO ₂ Content	10 mg/kg max.

Clearam® is a registered trademark of Roquette Freres.

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ROQUETTE
Corporation

FOOD GRADE POTATO STARCH

SPECIFICATIONS

Loss on Drying	:	20.0 % ± 0.5
Ash	:	0.3 % max.
Cellulose	:	traces
Protein Content (N x 6.25)	:	0.08 % max.
pH in Solution	:	6.0 - 7.5
SO ₂	:	20 ppm max.
 <u>Brabender Viscosity (peak)</u>		
- 15 g anhydrous in 450 ml distilled water (Sensitivity cartridge 250 cm g)	:	1100 B.U. min.
Appearance	:	powder
Color	:	white
Taste and Odor	:	no peculiar taste or odor
 <u>Particle size</u>		
- Residue on 200 microns	:	0.1 % max.

GURNEE, ILLINOIS 1550 NORTHWESTERN AVENUE, 60031 1-800-223-5305 (312) 249-5950



T. HASEGAWA U.S.A., INC.



flavors/fragrances

5351 WEST 144TH STREET
LAWNDALE, CALIFORNIA 90260
213-643-9711 FAX: 213-643-4910 Telex: 181873

SEAFOOD FLAVOR SERIES

NATURAL CRAB FLAVOR	NSS-101	Fresh crab extract type Use levels : 1.5-2.0% Water soluble	
NATURAL SHRIMP FLAVOR	NSS-102	Fresh shrimp extract type Use levels : 1.5-2.0% Water soluble	
NATURAL LOBSTER FLAVOR WONF	NSS-103	Fresh lobster extract type Use levels : 1.5-2.0% Water soluble	
NATURAL SCALLOP FLAVOR	NSS-104	Fresh scallop extract type Use levels : 1.5-2.0% Water soluble	
NATURAL CLAM FLAVOR WONF	NSS-105	Fresh clam extract type Use levels : 1.5-2.0% Water soluble	
NATURAL OYSTER WONF	NSS-106	Use levels: 0.5-1.0%	
NATURAL SHRIMP FLAVOR	NSS-112	Fresh shrimp extract type Use levels : 1.5-2.0% Water soluble	*
NATURAL LOBSTER FLAVOR	NSS-113	Fresh lobster extract type Use levels : 1.5-2.0% Water soluble	*
NATURAL SCALLOP FLAVOR	NSS-114	Fresh scallop extract type Use levels : 1.5-2.0% Water soluble	*

* No MSG or Nucleotides



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213-643-9711 FAX: 213-643-4910 Telex: 181873

NATURAL & ARTIFICIAL CRAB EXTRACT TYPE FLAVOR	NSS-201	Boiled crabmeat type Use levels : 1.5-2.0% Water soluble
NATURAL & ARTIFICIAL SHRIMP EXTRACT TYPE FLAVOR	NSS-202	Boiled and slightly roasted shrimp type Use levels : 1.0-1.5% Water soluble
NATURAL & ARTIFICIAL SCALLOP EXTRACT TYPE FLAVOR	NSS-204	Boiled scallop type Use levels : 1.0-1.5% Water soluble
NATURAL & ARTIFICIAL CLAM EXTRACT TYPE FLAVOR	NSS-205	Boiled baby clam type Use levels : 1.0-1.5% Water soluble
NATURAL & ARTIFICIAL CRAB FLAVOR	NSS-301	Boiled crabmeat type with meaty, juicy notes Use levels : 0.4-0.8% Water soluble
NATURAL & ARTIFICIAL SHRIMP FLAVOR	NSS-302	Boiled shrimp type Use levels : 0.4-0.8% Oil soluble
NATURAL & ARTIFICIAL LOBSTER FLAVOR	NSS-303	Boiled lobster type with meaty, juicy notes Use levels : 0.4-0.8% Oil soluble
NATURAL & ARTIFICIAL SCALLOP FLAVOR	NSS-304	Boiled scallop type Use levels : 0.4-0.8% Oil soluble
NATURAL & ARTIFICIAL CLAM FLAVOR	NSS-305	Boiled baby clam type Use levels : 0.4-0.8% Water soluble



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213-643-9711 FAX: 213-643-4910 Telex: 181873

NATURAL & ARTIFICIAL CRAB FLAVOR POWDER	NSS-401	Boiled crabmeat type with rich full taste Use levels : 0.4-0.8% Water soluble	
NATURAL & ARTIFICIAL SHRIMP FLAVOR POWDER	NSS-402	Boiled shrimp type with rich full taste Use levels : 0.4-0.8% Water soluble	
NATURAL & ARTIFICIAL LOBSTER FLAVOR POWDER	NSS-403	Boiled lobster type with rich full taste Use levels : 0.4-0.8% Water soluble	
NATURAL & ARTIFICIAL SCALLOP FLAVOR POWDER	NSS-404	Boiled scallop type with rich full taste Use levels : 0.4-0.8%	
NATURAL & ARTIFICIAL CLAM FLAVOR POWDER	NSS-405	Boiled baby clam type with rich full taste Use levels : 0.4-0.8% Water soluble	
NATURAL CRAB FLAVOR POWDER	NSS-411	Fresh crab extract type Use levels : 0.5-1.0% Water soluble	*
NATURAL SHRIMP FLAVOR POWDER	NSS-412	Fresh shrimp extract type Use levels : 0.5-1.0% Water soluble	*
NATURAL LOBSTER FLAVOR POWDER	NSS-413	Fresh lobster extract type Use levels : 0.5-1.0% Water soluble	*
NATURAL SCALLOP FLAVOR POWDER	NSS-414	Fresh scallop extract type Use levels : 0.5-1.0% Water soluble	*
NATURAL CLAM FLAVOR POWDER	NSS-415	Fresh clam extract type Use levels : 0.5-1.0% Water soluble	*

* No MSG or Nucleotides



OGAWA & CO., LTD.

OGAWA™ SEAFOOD FLAVOR SPECIALTIES

SEAFOOD FLAVORS:

CRAB
CLAM
TUNA
SQUID

SHRIMP
SCALLOP
SALMON

LOBSTER
ABALONE
BONITO
OYSTER

All of the above flavors are available as Natural, Natural and Artificial or Artificial in liquid or spray dried powder forms.

NATURAL SEAFOOD EXTRACTS:

CRAB
CLAM
FISH

SHRIMP
SCALLOP

LOBSTER
BONITO
OYSTER

FLAVOR ENHANCERS:

HVP, HAP, Sodium Nucleotide and their complexes

COLORS:

Custom Natural and/or Artificial Blends