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ENGLISH

IDENTIFICATION OF ALTERNATIVE MEAT PRODUCTS FOR EXPORT

SI/URU/85/801/11-01

URUGUAY

Technical report: Appropriate technologies/techniques for suggested treatment of FMD meat in Uruguay and description of new beef product samples suitable for local consumption and for export*

Volume I

Prepared for the Government of Uruguay
by the United Nations Industrial Development Organization,
acting as Executing Agency for the
United Nations Development Programme

Based on the work of Robert B. Sparnon,
Meat Processing Expert

Backstopping Officer: B. Galat, Agro-based Industries Branch

United Nations Industrial Development Organization
Vienna

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V.87-85300

FOREWORD

The report of this project 'Identification of Alternative Meat Products for Export' is consisting of three volumes, two dealing with the technical aspects of the project and one with the marketing aspects; it has been prepared by three experts, one meat processing expert, one meat industry expert and one meat industry economist.

Volume I is one of the technical parts and has been prepared by Mr. Robert B. Sparnon at the home base in England. It is dealing with the appropriate technologies/techniques for suggested treatment of FMD meat in Uruguay and describes the new beef product samples suitable for local consumption and for export. Subjects like e.g. product identification, development of product recipes, product costings, manufacturing instructions, the factory equipment required and the potential factory layout are being dealt with in that volume.

Volume II is the other technical part prepared by Mr. Jimmy T. Keeton partly in Montevideo and in the USA. This part is dealing with the outline of the proposed processing and marketing policy for Uruguayan FMD beef for domestic consumption and for export. In connection with the development of value-added (for export) processed meats the processing facilities and processing requirements for certain meat products, the changes required to advance the meat industry in Uruguay are subjects which are being dealt with in that volume.

Volume III is the marketing report and has been prepared by Ms. Shirley M. Holt, whose duty station was Montevideo but who also coordinated the work of the other expert in England. The marketing report is dealing with the marketing aspects of the specially treated Uruguayan FMD virus free beef products for export to Europe, USA or Japan. Subjects like e.g. identification of the market, constraints, the situation of the Uruguayan meat industry, the packaging of meat products, the marketing of frozen meat products, the marketing chain or the commercial feasibility of the project are being dealt with in that volume.

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1.0

INTRODUCTION

1.1 CLIENTS AND TERMS OF REFERENCE

The United Nations Industrial Development Organisation (UNIDO) commissioned Mr R B Soarnon on behalf of the Government of Uruguay to undertake a technical project with the following objectives.

1.2 OBJECTIVES

- 1.2.1 Identify potential varieties of processed meat products to be developed for export during the forthcoming years.
- 1.2.2 To develop product recipes for the products identified.
- 1.2.3 Produce individual product costings for the products identified.
- 1.2.4 To produce production flow charts indicating the method of manufacture of the products identified.
- 1.2.5 To nominate the machinery for the manufacture of the products identified and to indicate a budget capital cost.
- 1.2.6 Propose factory layout with export to EEC countries in mind.

2.0

IDENTIFICATION OF PRODUCTS

2.1 INTRODUCTION

Firstly it was necessary to identify certain essential characteristics which the selected products must possess in order to meet the objectives of the producing country (Uruguay) and marketplace into which the products were being exported. In that the products are to be "prepared dishes" the market would have to be well developed and sophisticated for products of this kind to secure a niche. For this purpose the UK market was chosen as a typical market in which prepared dishes are well established and are currently enjoying an annual growth in excess of 50%.

The criteria used to select products given the above circumstances were

Products selected should utilize a high proportion of meat, thus exploiting the Raw Material meat resource in Uruguay to the full.

The meat ingredient of the product should be fully cooked thus reducing the legislative burden imposed on uncooked meats and also enabling the products to be imported with less duty payable.

The products should be aimed at the convenience sector of the marketplace which means the product if at all possible should be microwavable (current ownership 20%+).

2.2 PRODUCT TYPES

Meat products currently in the marketplace were then categorised according to their meat content and the criteria listed above applied to each category.

2.2.1 Category A - Sliced Meats

35% Raw Meat Thin slices of meat wrapped around a savoury/rice filling in a rich beef and wine sauce eg Beef Clives.

40% Raw Meat Thick slices, braised with vegetables in a complementary sauce eg Braised Beef with red wine with onions, carrots, garlic and herbs - Braised Beef Provencale.

Comments The popularity of sliced meat products in sauces has declined over the years and whilst examples can still be found in the marketplace they do not represent high volume sales.

2.2.2 Category B - Diced Meats

Suitable for the majority of casseroles and pies.

45% Raw Meat	Boeuf Bourguignonne casseroled with shallots, mushrooms, garlic, red wine, herbs etc. Beef Goulash with tomatoes, onions and paprika.
34% Raw Meat	Beef Carbonnade casseroled in Guinness with onion, garlic and herbs.
43% Raw Meat	Beef Curry.
25% Raw Meat	Rolled Crepes - Beef Burgundy filling.
Comments	Products in this category are enjoying substantial growth in the marketplace at the present time. Boeuf Bourguignonne was selected as a product which meets all the necessary criteria.

2.2.3 Category C - Julienne Strips

25% Raw Meat	Stir fried applications together with complimentary vegetables combined with an oriental seasoning.
28% Raw Meat	Specific culinary dishes where Julienne Strips are characteristic of the product eg Beef Stroganoff.
25-30% Raw	Boil in bag or ovenable ready meals eg Beef Julienne and rice, Beef Teriyaki - sliced strips of meat in a glaze style sauce.
Comments	This category of meat product is also popular in the convenience sector of the market at the present time. However with the proportion of meat used being as low as 25% these products were not thought suitable for selection at this stage.

2.2.4 Category D - Steaks

67% Raw Meat	Steak: topped with mushrooms/onions or sauce garnish.
Comments	This category of product is thought to have tremendous potential in the convenience marketplace. Products of this type are usually of poor quality because raw material meat prices preclude the use of the quality meat cuts. This category of product is thought to be ideally suited to the project because of the availability of competitively priced prime quality raw materials also that the percentage meat utilised in the recipe is very high. Steak with sauce topping was

selected as a product which complies with all the criteria previously listed.

2.2.5 Category E - Minced

85-100% Raw Meat	Steaks/Hamburgers.
40% Raw Meat	Spaghetti Bolognaise/Macaroni Beef.
35% Raw Meat	Chilli Con Carne.
18% Raw Meat	Cannelloni.
13% Raw Meat	Lasagne.

Comments Products in this category are also enjoying substantial growth in the marketplace but competition is high and the choice for the consumer is wide. Since minced meat is the principal ingredient in all cases these products do not utilise high quality prime cuts, this coupled with the low percentage meat utilized in the recipe does not make products in this category particularly well suited to the brief.

2.2.6 Category F - Kebabs

55% Raw Meat	Beef Kebabs with peppers, onions, mushrooms. Above with sauce garnish.
--------------	---

Comments Kebab style products are beginning to emerge in the marketplace now and have stimulated considerable interest. The unit price of the products are high and the quality indifferent. This product is thought to fit the criteria listed extremely well in that it utilizes a high proportion of meat in the recipe and exploits the use of prime quality meat cuts available at competitive prices from Uruguay. This product was selected to be progressed as part of the project.

2.3 SUMMARY OF PRODUCTS SELECTED FOR THE PROJECTS

BOEUF BOURGUIGNONNE
STEAK CHASSEUR
BEEF KEBAB

Two important points can be made with regard to this product selection.

The production equipment selected to manufacture these three products will also be capable of making similar products in that product group without major capital expenditure.

The three products chosen all differ substantially one from the other and therefore the production equipment selected to cover this range of product types will provide a very flexible production unit.

2.4 PRODUCT PACKAGING

The selection of the packaging is as important as the product itself if we are to ensure that the final article presented is to offer all the advantages of a convenience food to the consumer.

In simple terms there are two basic packaging types which could be considered for prepared meat products of the kind selected.

Boil in Bag Trays

The boil in bag concept is of course cheaper but suffers from major disadvantages

Removal of the product from the bag after reheating by the consumer can be a difficult and somewhat messy operation which certainly could not be described as convenient.

Products of the type selected require to be "presented" to the consumer in a style which would resemble that same product if made in the home. This is not possible with a boil in bag presentation.

The tray presentation therefore is the only option offering the convenience of handling and attractive presentation of the product.

One further consideration has now to be applied. All the products selected will be designed for reheating in the oven. Ownership of Microwave Ovens in the UK is now 20%+ and the overriding justification for the purchase is the added degree of convenience this appliance provides. All three products lend themselves particularly well to microwave preparation and it is therefore imperative that the products are offered in packaging suitable for both microwave and conventional oven.

Packaging of this type is offered in two basic materials

Board PET (poly ethylene tetraphthallate).

The material selected will require to withstand temperatures of up to 200C in the conventional oven. Allowing for variability between ovens and inaccuracy of temperature setting, it is probable that temperatures of up to 220 C will be encountered. In this situation the board trays tend to "char" which damages the quality of presentation very significantly. Couple with this the fact that board trays do not have the same "finish" as the PET alternative, the recommendation is that PET trays should be selected. The tray is sealed with a peelable lid which can be stripped off by hand very simply. The lidded tray is inserted into a printed carton which carries the product illustration cooking instructions etc.

The principal suppliers of both systems are listed below

Board Trays:

Mardon Son & Hall Limited
Tower Road North
Warmley
BRISTOL BS15 2XL

Traytite System

Keyes Fibre Company
Sperry House
78 Portsmouth Road
COBHAM Surrey
KT11 1JZ

Metal Box P.L.C
Cartons & Labels
PO Box 5
Speke
LIVERPOOL L24 9JA

Diotray System

PET Trays:

Plastona (John Waddington) Limited
Wakefield Road
LEEDS LS10 3TP

BXL Plastics Limited
Greenfield House
69/73 Manor Road
WALLINGTON Surrey
SM6 0BP

The trays selected in conjunction with the project are from BXL Plastics Ltd.:

Ref No 1051 - Steak Chasseur (Rectangular, 171 x 127 x 35; capacity: 480cc)
 Boeuf Bourguignonne
Ref No 1172 - Beef Kebabs (Rectangular, 215 x 127 x 50; capacity: 400cc)

3.0

DEVELOPMENT OF PRODUCT RECIPES

Using the resources of a Development Kitchen and a Chef product recipes have been developed for:-

BOEUF BOURGUIGNONNE
STEAK CHASSEUR
BEEF KEBAB

The principal consideration in these developments was that the quality of the Raw Material Beef available was high and therefore it was important to ensure that the quality of the sauces developed did not in any way compromise the quality of the final product.

3.1 BOEUF BOURGUIGNONNE

The sauce was prepared in classical style by pressure cooking the Beef in wine and spices separating the liquor from the meat and using this liquor to make the sauce in a separate vessel using freeze/thaw stable starches. The garnish of mushrooms and pearl onions was made separately and all three component parts combined in the final product in the following proportions:

Diced, Cooked Beef	91gm
Blanched Pearl Onions	20gm
Button Mushrooms	22gm
Bourguignonne Sauce	167gm
Total	300gm

3.1.1 Bourguignonne Recipe

Cooked Beef (Topside)	56.300
Beef Stock	31.670
Corn Oil	2.260
Diced Onions (5mm x 5mm x 5mm)	12.000
Fresh Garlic Finely Chopped	0.730
Red Wine (Burgundy)	19.470
Ground Black Pepper	0.049
Caramel	0.084
Rubbed Thyme	0.060
Tomato Puree (28 RS)	3.580
Ground Bay	0.017
Rubbed Parsley	0.100
Beef Bouillion	0.830
Sugar	0.240
Colflo	2.320
Flour	1.430
Streaky Bacon (Diced 27mm x 20mm x 5mm)	8.570
Water	16.590
Less Cooked Beef	-53.300
Total	100.000%

3.1.2 Kitchen Method of Preparation

The method of preparation outlined here is the method used by the Chef to prepare kitchen samples and can be used to duplicate these recipes where product samples are required. The full scale manufacturing method is detailed elsewhere.

Fry garlic and onions in oil for 5 minutes.

Add wine, water, tomato puree, salt and spices. Bring to the boil and add the beef.

Pressure cook at 15psi for 17 minutes.

Reduce pressure and separate out meat from stock.

Add the bacon to the stock and cook for 5 minutes.

Stirry in the starches and cook out for 5 minutes.

Adjust contents of cook back to original weight by the addition of water.

3.1.2.1 Pack Dish-Up

Weigh cooked beef into tray.

Add mushrooms and pearl onions.

Deposit sauce evenly over meat and garnish.

3.1.2.2 Raw Materials

Beef Scotch Topside diced (50 x 50 x 20mm)

Pearl onions water blanched for 12 minutes

3.1.3 Consumer Cooking Instructions

3.1.3.1 Conventional Oven

Preheat oven to 200C (400F) Gas Mark 6. Remove tray from carton. Do not remove film lid. Place on baking tray and cook for 35-40 minutes. Remove lid and serve.

3.1.3.2 Microwave

Timings based on 650 watt oven. Two or more items may require additional cooking time. Remove tray from carton, pierce film lid and cook on full power for 7 minutes. Remove film lid and serve.

3.2 STEAK CHASSEUR

The cooking of the beef and preparation of the sauce are two separate operations in this case. The meat is cooked as steaks by frying. The sauce is prepared in the cooking vessel using freeze thaw stable starches, spices, seasonings etc.

The garnish is prepared, again as a separate operation and all three

components combined in the final pack in the following proportions:-

Cooked Steak	160gm
Garnish	75gm
Chasseur Sauce	65gm
Total	300gm

3.2.1 Garnish Recipe

Diced Onions	17.000
Sliced Button Mushrooms	33.000
Canned Tomatoes	50.000
Total	100.000

3.2.2 Sauce Recipe

Butter, salted	9.000
Beef Bouillon	1.700
Sugar	0.300
Tomato Puree (28 RS)	3.800
Salt	1.100
Garlic	0.200
Black Pepper	0.120
Dried Parsley	0.200
Rubbed Basil	0.040
Rubbed Tarragon	0.100
Dry White Wine	20.000
Ground Bay	0.040
Sherry (Pale Cream)	3.200
Colflo	3.500
Flour	1.900
Water	54.800
Total	100.000

3.2.3 Preparation Technique (Kitchen Only)

3.2.3.1 Rump Steak

Cut into dimensions (approx. 100 x 100 x 20mm) thick. Dry fry for 16-20 minutes. A yield of the order of 75% will be obtained. This is obviously variable depending upon the quantity of visible fat present.

3.2.3.2 Garnish

Cut onions in half and slice yielding half rings of approximately 4mm thick,

blanch for 2 minutes. Drain canned mushrooms and slice into 2mm slices. Drain canned tomatoes and coarse chop. Blend all ingredients together.

3.2.3.3 Sauce

Blend together all ingredients in the cooking vessel with the exception of the starches. Slurry in flour and colflo and cook for 5 minutes. Adjust back to original weight/volume with water.

3.2.4 Final Packing

Place steak in tray and distribute garnish evenly over surface. Deposit sauce.

3.2.5 Consumer Cooking Instructions

3.2.5.1 Conventional Oven

Preheat oven to 200C (400F) Gas Mark 6. Remove tray from carton. Do not remove film lid. Place on baking tray and cook for 30-35 minutes. Remove lid and serve.

3.2.5.2 Microwave

Timings based on 650 watt oven. Two or more items may require additional cooking time. Remove tray from carton, pierce film lid and cook on full power for 8 minutes. Allow to stand for 1 min. Remove lid and serve.

3.3 BEEF KEBABS

The steak is cut into dice and cooked by frying. The vegetables and sauce ingredients are prepared separately and combined in the final pack in the following proportions:-

3.3.1 Dish-Up per Skewer

Fresh Green Pepper (40mm x 40mm)	9.0gm
Cooked Steak	20.5gm
Fresh Yellow Pepper (40mm x 40mm)	11.0gm
Cooked Steak	20.5gm
Blanched Pearl Onions	6.5gm
Fresh Green Pepper (40mm x 40mm)	9.0gm
Cooked Steak	20.5gm
Fresh Yellow Pepper (40mm x 40mm)	11.0gm
Cooked Steak	20.5gm
Blanched Pearl Onions	8.5gm
Total	139.0gm
2 Skewers/pack	278.0gm
Red Sauce	112.0gm
Total Pack Weight	390.0gm

3.3.2 Red Wine Sauce Recipe

	%
Red Wine Vinegar	4.00
Red Wine (Burgundy)	17.26
Garlic Export 500	0.20
Corn Oil	3.45
Beef Bouillon	0.48
Worcester Sauce	0.82
Redcurrent Jelly	25.90
Orange Juice (unsweetened)	14.50
White Pepper	0.02
Dried Parsley	0.08
Salt	0.04
Lemon Juice	0.25
Soy Sauce	3.60
Colflo	3.20
Water	26.20
Total	100.00%

3.3.3 Method of Preparation - Kitchen Only

3.3.3.1 The Skewer

The rump steak is diced into (40 x 40 x 20mm) dice and dry fried for 15 minutes. The cooking yield obtained in the kitchen was 68.8%. The pearl onions are blanched for 10 minutes and the fresh peppers prepared by hand.

All ingredients are assembled on the skewer by hand in the order set down under "Dish-up per Skewer".

3.3.3.2 Sauce

Blend together all ingredients in the cooking vessel with the exception of the starches. Slurry in flour and colflo and cook for 5 minutes. Adjust back to original weight/volume with water.

3.3.3.3 Final Packing

Lay the assembled kebabs on the base of the tray and dispense sauce on top.

3.3.4 Consumer Cooking Instructions

3.3.4.1 Conventional Oven

Preheat oven to 200C (400F) Gas Mark 6. Remove tray from carton. Do not remove film lid. Place on baking tray and cook for 30-35 minutes. Remove lid and serve.

3.3.4.2 Microwave

Timings based on 650 watt oven. Two or more items may require additional cooking time. Remove tray from carton, pierce film lid and cook on full power for 8 minutes. Leave to stand for one minute. Remove film lid and serve.

4.0

PRODUCT COSTINGS

It is necessary at this stage to proceed with product costings in order to assess the viability of the products chosen in the UK marketplace. The product costings are produced in two distinct parts.

A prime cost for each product which covers raw materials, packaging and labour.

A full costing showing full allocation of overheads etc.

The costings have been presented in such a way so as to make it absolutely clear how each component has been calculated. It is likely that some of the prices, usages, rates etc which have been assumed will be different in practice because UK prices have been used at this stage and will vary in Uruguay. The costing has been assembled in such a way so as to make the substitution of alternative figures a perfectly straightforward exercise.

4.1 COSTING - EXPLANATORY INFORMATION

Each costing has two parts;-

Initial Ingredient Preparation
Factory Standard Cost

4.1.1 Initial Ingredient Preparation

This shows the proportion of ingredients, loss factors and prices that are incurred in the initial preparation of ingredients.

Recipe Proportion - %	Proportion of ingredients in the recipe and always totals 100%.
Loss Factor - %	Loss of ingredients during preparation.
Usage Quantity/1000gm(Kg)	This column is inflated by the loss as per the "Loss Factor - %" and represents what must be input to allow for the loss.
Price pence/1000gm(Kg)	The price per kilogram(1000gm) of ingredients in pence.
Pence/1000gm(Kg)	Usage Quantity/1000gm(Kg) x Price expressed in pence/1000gm(Kg). The total of this column is the cost per 1000gm(Kg) of the recipe.

4.1.1.1 Example - Boeuf Bourguignonne

	Recipe Proportion %		Loss 2%		Usage 1000gm(Kg)		Price pence/Kg		Cost pence/Kg
Red Wine	19.47	x	100/98	=	0.199	x	200.0	=	39.80

4.1.2 Standard Factory Cost

This shows the total cost of the product with all its constituent elements.

4.1.2.1 Raw Material

Includes any initial preparation costs brought forward from the Ingredient Preparation Sheet plus any items that go directly into the pack make up.

Loss Overweight given away due to inability to be accurate or additional losses not accounted for on Initial Ingredient Preparation Sheet.

Usage 1000gm(Kg)/Unit Proportion of final ingredients after the "Loss Factor" has been applied. This gives the input quantity required after taking account of losses.

Price - pence/1000gm(Kg) Price per kilogram of the ingredient.

Cost/Unit - pence Usage - 1000gm(Kg)/unit x price in pence per 1000gm(Kg).

Pence/Unit Total of each item in the Cost/Unit pence column.

4.1.2.1.1 Example - Boeuf Bourguignonne - Sauce

Prime Cost Data 167gm
Loss Factor % 11% = 100/89

Usage 1000gm(Kg)/Unit 167 x 100/89 = 0.188

Price - pence/Kg 82.19pence (brought forward from Sheet 2 Cost pence/Kg)

Therefore Cost/Unit pence = 0.188 x 82.19 = 15.45p

4.1.2.2 Packing Material

Loss % = Loss due to damage etc.
Per Unit = Quantity required after loss %.
Price = Purchase price per item.
Cost/Unit = Per unit x price.
Total Packing Material Cost = Total of each item in the cost/unit column.

4.1.2.2.1 Example - Boeuf Bourguignonne - PET Tray

Loss	3% = 100/97
Per Unit	1.0309
Price	6.014

Therefore Cost/Unit pence = $100/97 \times 1.0309 \times 6.014 = 6.20$

4.1.2.3 Direct Labour

This shows the number of process operatives required to manufacture the product.

Hours/Unit The time it takes for all the operatives to make and pack the number of individual packs produced in one hour.

Pence Rate The cost per hour including statutory extra charges that it costs the manufacturer to employ the operatives.

Cost/Unit Standard Labour Hours(S.L.H)/Unit x pence rate.

4.1.2.3.1 Example - Boeuf Bourguignonne

Hours/Unit	= Operatives/Throughput/hour = 21/1800 = 0.0117 hours/pack
Pence Rate	300p/hour

Therefore 0.0117 hours/pack x 300p/hour = 3.5p/unit.

4.1.2.4 Total Prime Cost

This is the total of the Raw Material, Packaging and Direct Labour totals and represents the cost per tray before expenses.

4.1.2.5 Expenses

These are the costs incurred other than those items included in raw material, packing material and direct labour and are detailed in Paragraph 4.5 Factory Overheads which assumes a total production of 960 tonnes per annum made up as follows:-

30 packs/minute
300gm/pack or 390gm/pack
8 hours/day
5 days/week
48 weeks/year

This is equivalent to 594Kg per hour and therefore assumes 84% efficiency.

Most of the expenses are of a fixed nature with the exception of energy. Energy has a fixed element ie lights and air conditioning but mostly the cost varies with production.

Total Variable Costs(4.5.5) = £32000/960tonne = £33.33/tonne
1.0p/pack/300gm
1.2p/pack/390gm

Total Fixed Costs(4.5) = £301000/960tonne £313/tonne
9.41p/pack/300gm.
12.21p/pack/390gm.

Total Expenses = 10.41p/pack/300gm
= 13.41p/pack/390gm

4.2 PRODUCT COSTING - BOEUF BOURGUIGNONNE

The raw material used to develop this product in the kitchen was topside beef. This has been costed in at \$US1800/tonne (Marketing Report Table 5.9.6). A conversion rate of \$US1.524/£1.00 sterling has been used as in the Financial Times 6th January 1987.

4.2.1 Ingredient Preparation - Boeuf Bourguignonne

Principal considerations in this costing are listed below. The detailed cost calculations and are shown at Table 4.2.1 - Boeuf Bourguignonne.

TABLE 4.2.1 BEEF BOURGUIGNONNE

	Recipe Proportion %	Loss Factor %	Usage Quantity	Price P/Kg.	Cost P/Kg.
1 Beef Sawn/Diced/Weighed	100.00	4.00	1.042	*118.00	123.00
2 Beef Pressure Cooked	100.00	40.00	1.667	123.00	204.90
3 Sauce Preparation					
Garlic)	0.73	2.00	0.007	1053.00	7.44
Onions) Pre-fried in	12.00	2.00	0.122	32.00	3.90
Oil) vessel	2.26	2.00	0.023	113.00	2.60
Red Wine	19.47	2.00	0.199	200.00	39.80
Black Pepper	0.05	2.00	0.001	348.00	0.35
Caramel BBA	0.08	2.00	0.001	115.00	0.12
Rubbed Thyme	0.06	2.00	0.001	510.00	0.51
Tomato Puree 28RS	3.58	2.00	0.037	73.00	2.70
Ground Bay	0.07	2.00	0.001	922.00	0.92
Rubbed Parsley	0.10	2.00	0.001	307.00	0.31
Maggi Beef Bouillon	0.83	2.00	0.008	271.00	2.17
Sugar	0.24	2.00	0.002	39.40	0.08
Colflo	2.32	2.00	0.024	78.00	1.87
Flour	1.43	2.00	0.015	29.00	0.44
Streaky Bacon Diced	8.57	2.00	0.087	216.20	18.96
Water	16.59	2.00	0.169	-	
Beef Stock	31.67	2.00	0.323	-	
Total Sauce	100.00		1.021		82.19
4 Bacon Sawn/Diced/Weighed	100.00	4.00	1.042	209.40	218.20
5 Drain Mushrooms	100.00	40.00	1.667	150.8	251.33

* \$US1300/tonne at rate of \$US1.524/£1.00

The beef is available as frozen joints butchered to the required specification.

A preparation loss factor of 4% has been assumed which covers sawing the beef into "bolts" compatible with the "throat size" of the dicer, dicing and weighing.

A cooking loss of 40% is assumed.

All sauce ingredients assume a 2% preparation loss.

The bacon has a preparation loss of 4% calculated on the same basis as the beef ingredient.

Note. The bacon has been included at UK prices ie 218.20p/kg and accounts for 23% of the cost of the sauce. This should be checked against Uruguay prices for this ingredient.

The mushrooms used are canned and a drainage loss of 40% has been assumed. This must be revised if fresh mushrooms are used.

Having cooked the meat, prepared the sauce, onions and mushrooms, the product is assembled in a PET tray in the following proportions:-

Beef (topside)	91gm
Pearl Onions	20gm
Button Mushrooms	22gm
Sauce	167gm
Pack Weight	300gm

4.2.2 Standard Factory Costs - Boeuf Bourguignonne

The principal considerations which have been assumed during final product assembly in the costing are listed below. The detailed cost calculations appear in Table 4.2.2 - Boeuf Bourguignonne.

TABLE 4.2.2 BOEUF BOURGUIGNONNE STANDARD FACTORY COST

Prime Cost Data

Size 300gms

Topside	91gm
Pearl Onions	20gm
Button Mushrooms	22gm
Sauce	167gm
Total	300gm

RAW MATERIAL YIELD	Loss %	Usage Kg/Unit	Price p/Kg	Cost/Unit p
Beef (Weigh & Deposit)	6	0.097	204.99	19.88
Pearl Onions (Place)	6	0.021	46.00	0.97
Button Mushrooms (Place)	6	0.023	251.33	5.78
Sauce (Semi Auto Deposit)	11	0.188	82.19	15.45
Total Raw Material Cost:				42.08

PACKING MATERIAL	Loss %	Per Unit	Price p	Cost/Unit p
PET Tray	2	1.0309	6.014	6.20
Bonded Film Lid	3	1.0309	1.100	1.13
Carton	3	1.0309	5.330	5.49
Export Case x 12	1	0.0842	18.000	1.52
Total Packing Material Cost				14.34

DIRECT LABOUR Manning: Throughput = 30 Packs per minute

Weigh Meat	= 4	Hours/Unit = 0.0117
Garnish	= 2	
Sauce Deposit	= 2	Pence Rate = 300p
reed Sealer	= 2	
Sleeve	= 3	Cost/Unit = 3.50p
Tray Up	= 2	
Case Up/Outer Case	= 2	
Line Service	= 1	
Sauce Ingredients	= 2	
Extra	= 1	
Total	= 21	
Total Direct Labour		3.50

TOTAL PRIME COST 59.92

FACTORY OVERHEADS

Variable	1.00p/unit
Fixed	9.41p/unit

TOTAL EXPENSES 10.41

TOTAL FACTORY COST 70.33

4.2.2.1 Raw Material Costs

The beef is weighed as individual portions and deposited in the tray by hand. A 6% loss factor is assumed for this operation.

The pearl onions and button mushrooms are also weighed and placed in the tray by hand. In practice it will probably be more practical and efficient to "count in" the appropriate number of pieces in each case. A 6% loss factor has been assumed for each of these vegetables.

The addition of the sauce is by semi-automatic dispenser and an 11% loss factor has been assumed which will cover spillage, pipe line losses etc.

4.2.2.2 Packaging

The packaging cost calculations have been based on a PET tray with bonded film lid. This is inserted into a printed sealed carton and packed 12 units to the outer case. The loss factors for each of the packaging ingredients are clearly set out in Table 4.2.2.

4.2.2.3 Direct Labour

These calculations have been based on a line speed of 30 packs/minute. A total of 21 people are required. The individual tasks and the people associated with them are also clearly set out in Table 4.2.2.

4.2.2.4 Total Prime Cost Summary

Raw Materials	42.08	70.2%
Packaging	14.34	23.9%
Labour	3.50	5.9%
Total Prime Cost	59.92p	100.0%

4.3 PRODUCT COSTING - STEAK CHASSEUR

The raw material used to develop this product recipe in the kitchen was rump steak. This has been costed in at \$US1600/tonne (Marketing Report Paragraph 5.9.6). A conversion rate of \$US1.524/£ Sterling has been used.

4.3.1 Ingredient Preparation - Steak Chasseur

Principal considerations in this costing are listed below. The detailed cost calculations appear in Table 4.3.1.

TABLE 4.3.1 STEAK CHASSEUR

	Recipe Proportion %	Loss Factor %	Usage Quantity	Price P/Kg.	Cost P/Kg.
1 Beef - Press/Slice/Weigh	100.00	2.00	1.020	*105.00	107.14
2 Beef Frying/Transferred	100.00	26.00	1.351	107.14	144.75
3 Garnish					
Frozen Onions Sliced	17.00	2.00	0.173	35.00	6.06
Button Mushrooms Sliced	33.00	2.00	0.337	251.00	84.70
Tomatoes, Frozen	50.00	2.00	0.510	55.11	28.11
	100.00		1.02		118.87
4 Mushroom Drain	100.006	40.00	1.666	150.8	251.39
5 Sauce Preparation					
Butter Salted	9.00	2.00	0.092	190.00	17.48
Knorr Beef Bouillon	1.70	2.00	0.017	271.00	4.61
Sugar	0.30	2.00	0.003	39.40	0.12
Tomato Puree 28RS	3.90	2.00	0.039	73.00	2.85
Salt	1.10	2.00	0.011	12.00	0.13
Garlic 5100	0.20	2.00	0.002	422.00	0.84
Black Pepper	0.12	2.00	0.001	348.00	0.35
Dried Parsley	0.20	2.00	0.002	307.00	0.61
Rubbed Basil	0.04	2.00	0.001	424.00	0.42
Rubbed Tarragon	0.10	2.00	0.001	1771.00	1.77
Dry White Wine	20.00	2.00	0.204	200.00	40.80
Ground Bay	0.04	2.00	0.001	922.00	0.92
Sherry, Pale Cream	3.20	2.00	0.033	326.00	10.76
Colflo	3.50	2.00	0.036	78.00	2.81
Flour	1.90	2.00	0.019	29.00	0.55
Water	54.80	2.00	0.559	-	-
	100.00		1.021		85.02

* Based on \$US1600 tonne at rate \$US1.524 = £1.00

The beef is available as frozen joints butchered to the required specification.

A preparation loss factor of 2% has been assumed which covers pressing of the joint to the required shape, slicing and weighing.

A cooking loss (frying in this case) of 26% has been assumed.

The mushrooms used are canned and a drainage loss of 40% has been assumed.

The garnish consists of sliced onions, sliced button mushrooms and tomatoes, a 2% handling loss has been assumed in all cases.

A 2% handling loss has also been assumed for all the sauce ingredients.

Having cooked the meat and prepared the sauce together with the vegetable ingredients, the product is assembled in a PET tray in the following proportions:

Cooked Steak	160gms
Garnish	75gms
Chasseur Sauce	65gms
Pack Weight	300gms

4.3.2 Standard Factory Costs - Steak Chasseur

The principal considerations during final product assembly which have been assumed in the costing are listed below - the detailed cost calculations appear in Table 4.3.2

TABLE 4.3.2 STEAK CHASSEUR STANDARD FACTORY COST

Prime Cost Data		Size 300gm			
Cooked Steak	160gm				
Garnish	75gm				
Chasseur Sauce	65gm				
	300gm				
RAW MATERIAL	YIELD	Loss %	Usage k/Unit	Price p/Kg	Cost/Unit p
Beef (Place)		1	0.162	144.75	23.45
Garnish (Volumetric)		6	0.080	118.87	9.48
Sauce (Semi Auto Deposit)		11	0.073	85.02	6.21
Total Raw Material Cost					39.14
PACKING MATERIAL		Loss %	Per Unit	Price p	Cost/Unit p
PET Tray		3	1.0309	6.014	6.20
Bonded Film Lid		3	1.0309	1.100	1.13
Sleeve		3	1.0309	5.300	5.49
Export Case x 12		1	0.0842	18.000	1.52
Total Packing Material Cost					14.34
DIRECT LABOUR Manning: Throughput = 30 Packs per minute					
Place Steak	= 2				
Garnish	= 2			Hours/Unit = 0.0106	
Sauce	= 2				
Feed Sealer	= 2			Pence rate = 300p	
Sleeve	= 3				
Tray Up	= 2			Cost/Unit = 3.17p	
Case Up/Outer Case	= 2				
Line Service	= 1				
Sauce Ingredients	= 2				
Extra	= 1				
TOTAL	= 19				
Total Direct Labour					3.17
Total Prime Cost					56.65
FACTORY OVERHEADS					
Variable	1.00p/unit				
Fixed	9.41p/unit				
TOTAL EXPENSES					10.41
TOTAL FACTORY COST					67.06

4.3.2.1 Raw Materials

The beef is weighed as individual portions and deposited in the tray by hand. A 1% loss factor is assumed for this operation.

The solid garnish of vegetables is measured out volumetrically and a 6% loss factor is included which covers giveaway (5%) and a finished product loss of 1%.

Sauce is deposited using a semi-automatic dispenser and a total loss of 11% has been assumed which covers spillage and pipe line losses.

4.3.2.2 Packaging

The packaging cost calculations have been based on a PET tray with bonded film lid. This is inserted into a printed sealed carton and packed 12 units to the outer case. The loss factors for each of the packaging ingredients are clearly set out in Table 4.3.2.

4.3.2.3 Direct Labour

Calculations are again based on a line speed of 30 packs/minute. A total of 19 people are required. The individual tasks and the people associated with them are clearly set out in Table 4.3.2.

4.3.2.4 Total Prime Cost Summary

Raw Materials	39.14p	69.1%
Packaging	14.34p	25.3%
Labour	3.17p	5.5%
	56.65p	100.0%

4.4 PRODUCT COSTING - BEEF KEBABS

The raw material used to develop this product recipe in the kitchen was rump steak. The cost assumptions are the same as those used in the Steak Chasseur product.

4.4.1 Ingredient Preparation - Beef Kebabs

Principal considerations in this costing are listed below. The detailed cost calculations appear in Table 4.4.1 - Beef Kebabs.

TABLE 4.4.1 BEEF KEBABS

	Recipe Proportion	Loss Factor	Usage Quantity	Price P/Kg.	Cost P/Kg.
1 Beef Pressed/Diced/Weighed	100.00	4.00	1.042	*105.00	109.37
2 Beef Fried/Transferred	100.00	26.00	1.351	109.37	147.39
3 Sauce Preparation					
Red Wine Vinegar	4.00	2.00	0.041	136.00	5.58
Red Wine - Burgundy Type	17.25	2.00	0.175	200.00	35.20
Garlic 5100	0.20	2.00	0.002	422.00	0.84
Corn Oil	3.45	2.00	0.035	113.00	3.95
Knorr Beef Bouillon	0.45	2.00	0.005	271.00	1.35
Worcester Sauce	0.82	2.00	0.008	259.00	2.0
Redcurrant Jelly	25.90	2.00	0.264	104.00	27.48
Unsweetened Orange Juice	14.50	2.87	0.142	50.00	7.40
White Pepper	0.02	2.00	0.001	257.00	0.25
Dried Parsley	0.00	2.00	0.001	307.00	0.31
Salt	0.04	2.00	0.001	12.80	0.71
Lemon Juice	0.25	2.00	0.003	144.00	0.43
Soy Sauce	3.50	2.00	0.037	112.50	4.16
Colflo	3.20	2.00	0.033	79.00	2.57
Water	26.20	2.00	0.267	-	-
Total Sauce	100.00		1.022		91.60

* SUS1500/tonne at rate of SUS1.52 = £1.00

The beef is available as frozen joints butchered to the specification.

A preparation loss factor of 4% has been assumed which covers pressing, dicing and weighing.

A cooking loss (frying in this case) of 26% has been assumed.

A 2% handling loss has been assumed for all sauce ingredients.

Having cooked the meat and prepared the sauce with the remaining vegetable ingredients, the assembly of the kebab on wooden skewers takes place.

The separate ingredients are present in the following proportions:

Rump Steak	82gm
Peppers	40gm
Pearl Onions	17gm
Sauce	56gm
	195gm x 2
Total Pack Weight	390gm

4.4.2 Standard Factory Costs - Beef Kebabs

The principal considerations during final product assembly which have been accounted in the costing are listed below - the detailed cost calculations appear in Table 4.4.2

TABLE 4.4.2 BEEF KEBABS STANDARD FACTORY COST

Prime Cost Data		Size 390gms		
Rump Steak	52gm x2 = 104gm			
Pearl Onions	17gm x2 = 34gm			
Peppers	40gm x2 = 80gm			
Sauce	56gm x2 = 112gm			
RAW MATERIAL YIELD	Loss	Usage	Price	Cost/Unit
	%	Kg/Unit	p/kg	p
Steak (Assemble)	3	0.174	145.00	25.23
Pearl Onions (Place)	2	0.037	45.00	1.70
Peppers (Transfer & Assemble)	6	0.007	70.00	6.70
Sauce (Semi Auto Deposit)	11	0.120	91.00	11.52
Total Raw Material Cost				45.15
PACKING MATERIAL	Loss	Per	Price	Cost/Unit
	%	Unit	p	p
PET Tray	3	1.0309	9.824	10.13
Bonded Film Lid	3	1.0309	1.400	1.44
Carton	3	1.0309	8.850	9.15
Export Case x 12	1	0.0842	19.000	1.60
Total Packing Material Cost				22.33
DIRECT LABOUR	Panning: Throughput = 30 Packs per Minute			
Assembly = 10	Hours/Unit = 0.015			
Traying = 2				
Sauce = 2	Pence Rate = 300p			
Feed Sealer = 2				
Sleeve = 3	Cost/Unit = 4.50p			
Tray Up = 2				
Case Up/D.C. = 2				
Line Service = 1				
Sauce Ingots. = 2				
Extra = 1				
Total = 27				
Total Direct Labour				4.50
TOTAL PRIME COST				71.94
FACTORY OVERHEADS				
Variable	1.30p/unit			
Fixed	12.21p/unit			
TOTAL EXPENSES				13.51
TOTAL FACTORY COST				85.45

4.4.2.1 Raw Material Costs

A 6% loss factor has been assumed for the meat ingredient which covers 1% finished pack losses and 5% associated specifically with the assembly operation.

Peppers and onions are handled in a similar way and the losses associated with both vegetables are 8% in total. This is made up of a 2% transfer loss, 5% assembly loss and 1% finished pack losses.

The sauce is again deposited as a semi-automatic operation and a total loss of 11% has been assumed which covers spillage and pipe line losses (10%) and 1% finished pack loss.

4.4.2.2 Packaging

These considerations are the same in principle as for Boeuf Bourguignonne except for the size of the container which is larger in the case of Kebabs.

4.4.2.3 Direct Labour

Calculations are again based on a line speed of 30 packs/minute. The assembly operation of the Kebabs makes this a labour intensive operation. A total of 27 people are required. The individual tasks and the people associated with them are set out on Sheet 1.

4.4.2.4 Total Prime Cost Summary

Raw Materials	45.11	62.71
Packaging	22.33	31.04
Labour	4.50	6.25
Total Prime Cost	71.94p	100.00%

4.5 FACTORY OVERHEADS

Basis 500Kg/hour x 8 hours/day x 5 days/week x 48 weeks/year = 960 tonnes.

	£000	£000
Management		
1 Unit Manager + Car	18	
1 Electrical Engineer + Assistant Manager	15	
Total		33
Office		
1 Cost Clerk/Planner/Buyer	12	
1 Book Keeper	10	
1 Typist/Receptionist/Clerk	6	
Total		28
Indirect Labour		
2 Forklift Drivers/Goods Received/Goods Outwards/Cold Store/Dry Goods	16	
2 Cleaners Office & Factory & Site Cleaning	10	
Total		26
Energy		
Assume 1p/pack Variable	32	
Fixed - Lighting, Heating	2	
Total		34
Motor Expenses;		
1 Small Open Back Dropside Vehicle	3	3
Cleaning Materials	3	3
Maintenance - Materials & Contractors	25	25
Rates - Local Authority	25	25
Water	1	1
Bacteriological Analysis		
Raw Materials/Finished Goods	10	10
Insurance		
Employees and Public Liability and Stock	4	4
Audit Fees;	5	5
Phone/Stationery	4	4
General & Contingency	8	8
Depreciation (rounded figures);		
Buildings @ 2% £1,250,000	25	
Plant @ 10% £750,000	75	
Total		100
Bank Interest @ 15% of Working Capital Requirement		24
TOTAL		333

5.0 OUTLINE MANUFACTURING INSTRUCTIONS

5.1 BOEUF BOURGUIGNONNE

To be read in conjunction with Flow Sheet and Factory Plan (Attachment 2)

5.1.1 Raw Material Specification and Supplier

Note: The sourcing of ancillary ingredients such as vegetables is based on the assumed availability of frozen and/or pre-processed supplied in most instances:-

Beef	100% Visual Lean Topside. Frozen boxed joints
Bacon	Green "streaky" 60-70% Visual Lean. Frozen boxed joints
Button Onions	Frozen Individually Quick Frozen 15-20mm diameter. Blanched
Diced Onions	Frozen 5mm dice. Blanched
Button Mushrooms	Canned (in brine). Approximately 20mm diameter
Garlic	Frozen/or canned. Garlic puree
Red Wine	Burgundy "type". Plastic containers - 5 gallons.
Oil	Vegetable, corn oil. Edible, refined, deodorised
Colflo 67	Modified Starch. National Starch
Wheatflour	Heat treated, plain flour
Black Pepper	Ground, sterilised
Caramel	Powder (from Bush Boake Allen)
Thyme	Dried, rubbed
Tomato Puree	Canned. 28 RS
Bay	Ground
Parsley	Dried, rubbed
Bouillon	"Maggi" quality
Sugar	Refined. Extra fine

5.1.1.1 Beef

The quality of the finished product will be very much determined by the quality of the raw material employed. It is anticipated that the producer will have the major contribution to make with regard to this. However as a point of reference the following criteria have been adopted to date.

All meat will be drawn from good quality steers bearing any required stamp of fitness for human consumption. All sides employed will be free from contamination by foreign material, metal or wooden tags and any other coloured ink identification stamps.

Overall fat should not exceed 10mm depth on any quarter (external).

All meat will have been handled under strict hygienic, storage and temperature conditions at all times and must have been slaughtered, boned and stored in EEC licensed premises.

The particular "cut" of meat employed in this product is hindquarter "topside", Nominal 100% Visual Lean. The exact nomenclature and method of removal of this joint may vary from locality to locality and hence a general diagrammatic identification is attached (Attachment 3).

The boneless trimmed meat will be packed into either a polythene lined carton or a waxed carton and blast frozen.

Packaging will be free from metal staples.

The level of trimming employed to achieve the required removal of any fat, gristle etc would have to be determined. Any ageing would be similarly determined.

Target bacteriological standards would be:-

Total Viable Count	1,000,000 per gram maximum
Staphylococcus	100 per gram maximum
E Coli 1	1,000 per gram maximum
SRC	10 per gram maximum
Salmonella	Absent in 50 grams.

5.1.1.2 Bacon

The material employed in the recipe is basically non smoked (green) streaky bacon. This would be 60-70% Visual Lean distributed evenly so as not to give rise to any complete dice of fat in subsequent processing. All rind will be removed from the joints in question which will be derived from the "belly" portion of the whole pig as indicated on the attached diagram (Attachment 4). The joints will be taken only from supplies handled under the strictest controls of hygiene and temperature and exhibiting no evidence of poor quality.

The cooked product shall be free from any foreign flavours and any flavours

associated with rancidity or excessive brining.

The bacon will conform to the UK and EEC Food Regulations relating to bacon with particular reference to preservatives ie:-

Sodium Nitrate	500 ppm maximum
Sodium Nitrite	200 ppm maximum

Salt levels would be anticipated between 2-4%.

Target bacteriological standards would be:-

Total Viable Count	500,000 per gram maximum
Staphylococcus	100 per gram maximum
E Coli 1	1,000 per gram maximum
SRC	10 per gram maximum
Salmonella	Absent in 50 grams.

Product should be packed in polythene or wax lined boxes free from metal staples.

5.1.1.3 Button Onions/Diced Onion

Individually Quick Frozen Button Onions 15-20mm diameter
Individually Quick Frozen Diced Onions 5mm x 5mm x 5mm

Source from typical white, creamy yellow onions. The taste and aroma should be typical of English and Spanish onions. Raw material should not exhibit any grey/pink colouration, more than 1/3 surface pale green, brown outer skin, onion fly, mould etc or any other blemishes.

They should be pre-blanching sufficiently to avoid any requirement for further processing prior to packing.

5.1.1.4 Button Mushrooms

Canned in brine.

Evenly sized at approximately 20mm button mushrooms. Colour to be beige light brown. There should be no discoloured product and no evidence of root ends or any other extraneous matter.

Percentage salt in brine should be 0.6 to 0.8% with no added citric or ascorbic acids.

Drained weight will be consistent to that agreed at time of purchase.

The finished product will be free from all pathogenic and food poisoning hazards.

5.1.1.5 Garlic

Garlic puree, a fine free flowing light wheat coloured puree of uniform composition throughout with the taste and odour of strong garlic.

Typical solids 34-38% with normally 1.5-2.0% added citric acid.

5.1.1.6 Red Wine

"Burgundy" type red wine. Should have a typical wine flavour and odour without any vinegar types. Alcohol content should be standard at 11-12.5%.

When filtered through a fine (100 mesh) sieve there shall be nothing retained.

As no glass is permitted, delivery should be in plastic containers exhibiting no evidence of leakage.

5.1.1.7 Oil

Vegetable, corn oil should be a clear transparent yellow oil with a typical refined, deodorised corn oil flavour bland and free from foreign flavours and odours.

Various factors such as Iodine Value, Free Fatty Acids and Peroxide Value are likely to determine rancidity of oil rather than bacteriological activity. Target values for these quality indicators would be:-

Iodine Value (IV)	110-128
Free Fatty Acid Level (FFA)	0.1% maximum
Peroxide Value (PV)	2.0 maximum (milliequivalent/Kg)
Saponification Value	186-196

Other factors such as colour, smoke point, relative density, refractive index can be specified but are not considered important in this context.

5.1.1.8 Colflo 67

Specific modified starch only supplied by National Starch & Chemical, Trafford Park, Manchester.

5.1.1.9 Wheatflour

A plain, heat treated, amylase inactivated flour. Free from foreign bodies and milled under hygienic controlled conditions. Protein content and gluten levels are not particularly important in this context.

5.1.1.10 Ground Black Pepper

A brown/black speckled free running coarse powder with a typical hot spicy taste. No foreign material will be evident and it will have been sterilised to achieve acceptable bacteriological levels - maximum viable count 1 million.

5.1.1.11 Caramel

A dark brown hygroscopic natural food colour complying with the general purity criteria of the EEC Colour Directive and the Colouring Matter in Food Regulations for E150 Caramel.

Supplier: Bush Boake Allen
 Blackhorse Lane
 London
 Code H8332

5.1.1.12 Rubbed Thyme

A mixture of dried leaf fragments and small stalks obtained from the dried leaves and flowering tops of *Thymus Vulgaris*, varying in colour from light brown to dark green and purple.

It should exhibit a fairly strong aromatic and sweet odour characteristic of the herb with a slightly scented flavour and no "off" flavours.

There should be no stalks greater than 20mm in length and only a limited number of smaller stalk present.

5.1.1.13 Tomato Puree

A bright, deep red coloured paste with a typical tomato puree flavour. The refractive solids will be 28% target. There will be no evidence of spoilage, mould or "off" flavours and any "blown" cans will be discarded.

5.1.1.14 Ground Bay

A dark olive green, very fine powder, free flowing like talcum powder. The odour will be slightly sweet, very aromatic, characteristic of bay. There will be a strong, clear flavour characteristic of bay, there may be a slight but not unpleasant bitter after taste. The material will be free from stalks, wood, dirt and any other material which is not bay (*Laurus Nobilis*).

5.1.1.15 Parsley

Dried, rubbed parsley will be used with an appearance of dark green, dried leaf pieces including a small amount of dust/stalk material. A cooled infusion will have a characteristic odour and taste like fresh parsley but

not as strong. Stalks, wood, splinters, grass and other EVM (Extraneous Vegetable Matter) will only be permitted at very low levels ie 0.05%.

5.1.1.16 Bouillon

Maggi Beef Bouillon. A dark brown, granulated/powder material. The flavour will be typical of meat powder, salty and spice flavour being noticed. A stronger, harsher note is present than in other bouillons employed. The product should be Monosodium Glutamate free if possible. A typical ingredient list would be:-

Hydrolysed vegetable protein, salt, beef meat extract, edible fat, caramel paste, garlic, celery.

Supplier Maggi Soups Limited
 The Nestle Company Limited
 Croydon
 Surrey

5.1.1.17 Sugar

Refined, extra fine, retail quality sugar from a reputable supplier.

5.1.1.18 General Note

Individual ingredients can if appropriate be separately specified on a common raw material specification document, an example of which is attached (Attachment 5).

5.1.2 Processing - Boeuf Bourguignonne

5.1.2.1 Pack Make up

Declared pack weight 285gm. (10.0oz).

Cooked, diced beef	91.0gm
Sauce	167.0gm
Button Onions	20.0gm
Button Mushrooms	22.0gm

300.0gm (5% giveaway)

5.1.2.2 Beef Preparation

Remove boxed beef from cold store (-25C to -30C). Note: Only sufficient to maintain tempering operation should be withdrawn at any one time in order to ensure consistent temperature control.

Load batch microwave tempering unit with prescribed quantity of beef, still

boxes, and temper to -40 to -50 detailed in operation instructions. Note: These could be affixed to unit at appropriate time.

Transfer tempered meat (-40 to -50) to deboning area.

Debox Beef. Note: This would be carried out in a separate, enclosed environment in order to keep packaging materials away from the remainder of the processing operation and so avoid potential contamination.

Transfer to bandsawing area usually via one way only exit portal from the boxing room.

Bandsaw meat blocks into bolts of suitable size to fit feed chamber of dicing machine. Note: Specific sizes to be determined, specified at appropriate time.

Dice beef to approximately 50 x 50 x 20mm cubes. Note: Specific sizes to be determined to optimise sizes and minimise any offcuts.

For both bandsawing and dicing operations temperature control is important to maintain consistency and efficiency and avoid any losses due to drip etc. Any product not intended for immediate use should therefore be returned to the designated chill store (raw meat).

Pre-weigh diced beef into lidded stainless steel bins to required batch size (500 kg) and transfer to cooker as required. (Hold in raw meat chiller until such time).

As low a temperature as possible conducive to efficient operation and well being of staff should be maintained at all times for both product and environment in the best interests of product quality.

5.1.2.3 Beef Cooking and Cooling

This operation will be carried out in a 1000 litre Giusti type vessel provided with pressure cooking and vacuum cooling facilities. Vessel will also be provided with facilities for automatic or semi-automatic operation including times, temperatures etc.

Add prescribed quantity of vegetable oil into vessel and heat.

Add weighed quantity of diced onion and saute until soft and transparent (approximately 5 minutes) with stirrer on.

Water or measure required quantity of water to vessel.

Add pre-weighed quantities of all other ingredients (except starches and bacon) to vessel.

Tie (using mechanical hoist provided) weighed quantity of raw, diced beef into vessel.

Close lid and clamp.

Bring to temperature and pressure (15 psi - 121C) and hold for specified time (approximately 15 minutes). Note: Non pressure cooking would entail significantly extended cooking times (2-2.5 hours) with additional cooking capacity to cope with throughput.

Completion of cooking cycle will be indicated by either visual and/or audible signal.

Operate vacuum cooling cycle, switch off stirrer and cool to 10C to 15C. Achievement of preset temperature will be again indicated automatically. (Vacuum cooling significantly reduces processing times).

Unclamp lid and lift.

Gradually tilt cooker and empty contents onto separating/sorting bed.

Stock will be collected through grid which will retain cooked meat and be pumped to holding tank or direct to sauce cooking vessel as required.

After draining meat will be weighed to appropriate batches and transferred direct to packing line or to chill holding buffer designated for cooked meat. Note: Separation of any raw and cooked products is essential for good handling principles and bacteriological control.

5.1.2.4 Sauce Preparation

5.1.2.4.1 Sauce Recipe

The bulk of the sauce comes from the flavoured stock separated from the meat cooking operation which is subsequently thickened. The make up would be as follows:-

Ingredient	%	Kg/454 Kg Batch
Bacon	8.59	39.00
Oil	2.26	10.26
Diced Onion	12.00	54.48
Garlic Puree	0.73	3.31
Red Wine	19.47	88.40
Black Pepper	0.05	0.23
Caramel	0.09	0.41
Thyme	0.06	0.27
Tomato Puree	3.58	15.25
Bay	0.02	0.09
Parsley	0.10	0.45
Bouillon	0.83	3.77
Sugar	0.24	1.09
Colflo	2.21	10.03
Flour	1.43	6.50
Meat Stock	31.64	143.60
Water 1	16.70	75.86
Water 2 (for starch slurry)	10.00	46.00
	110.00	500.00
Evaporation loss	10.00	46.00 Kg.
	100.00	454.00 Kg.

Note: Vacuum cooling results in a loss of moisture taken to be derived only from free water for ease of presentation.

5.1.2.5 Sauce Ingredients

Note: Removal of outer packaging and decanting of ingredients will take place in a designated area separated from the processing environment in order to minimise potential contamination of product.

5.1.2.5.1 Bacon

Bacon is handled/processed in the same way as the raw beef, and the handling instructions given for beef apply with the only variation being the dice size employed which for the bacon would be 20 x 20 x 5mm and would necessitate a change in dicing set.

Diced bacon is weighed to batch weight and held in chill until required for

use in suitable containers.

5.1.2.5.2 Diced Onion

Frozen, diced onion will be removed from cold store and weighed to batch size as required in suitable plastic containers.

5.1.2.5.3 Garlic Puree

This product may be either frozen or canned and will subsequently be handled as either diced onion or tomato puree.

5.1.2.5.4 Tomato Puree

Cans of puree will be removed from store. They will be inspected and wiped prior to use if necessary.

Cans will be opened using a crown punch type opener which minimises risk of swarf contamination.

Puree will be tipped and/or scraped from cans and weighed to batch size into suitable plastic containers.

5.1.2.5.5 Oil

Vegetable oil will be decanted from storage drums and weighed to batch size in an appropriate container.

5.1.2.5.6 Red Wine

Red wine will be decanted from suitable storage containers (not glass) and weighed to batch size.

It may be possible to allocate wine volumetrically employing containers as received.

5.1.2.5.7 Dry Ingredients

Remaining ingredients many of which are herbs and/or spices and as such only required in small amounts will be weighed out using appropriate bench scales in a separate spice room and stored in specifically coded polybags denoting a particular recipe.

All dry ingredients will have previously been decanted into storage containers for the spice room in a separate area so as to segregate outer packaging of incoming items from the processing environment so minimising any possible foreign bodies or contamination.

The accuracy of weighing at this point is paramount hence the specifically supplied scales. Many of the herbs and spices are only added in relatively small amounts and variations in weight can lead to inconsistency and flavour differences in finished sauces.

5.1.2.5.8 Starch Slurry

Starches will be weighed to required batch weight and dispersed in a measured quantity of water (water 2) employing a specifically supplied tank and high shear mixer for that purpose.

The slurry so made will be held and pumped to the cooking vessel as required.

5.1.2.5 Sauce Process

For sauce preparation a 500 litre Giusti type vessel is employed with the vacuum cooling system and necessary control instrumentation.

Pump flavoured stock derived from meat cooking operation into sauce cooking vessel to required quantity.

Add diced bacon and bring to boil.

Turn off heat and add pre-made starch slurry with stirrer at full speed for maximum dispersion.

Hold for 5 minutes to allow starches to "cook out". Reduce stirrer speed.

Apply vacuum cool system and cool sauce to 10C to 15C. Check yield and quality.

Empty cooking vessel via valve into stainless steel bins or other suitable containers.

Weigh off to line or hold in chill store until required for use on line.

5.1.2.7 Garnish Preparation

5.1.2.7.1 Button Onions

Remove from cold store frozen Individually Quick Frozen products.

Weigh to appropriate bowls for use on line.

Transfer to line as required holding in chill in interim.

5.1.2.7.2 Button Mushrooms

Remove cans from store and inspect and wipe prior to use if necessary.

Open cans employing crown punch type opener to minimise swarf.

Drain liquor using sieve and discard.

Weigh drained mushrooms to suitable unit weight and hold in chill in plastic pans until required for use on line.

5.1.2.8 Pack Assembly

Feed trays onto conveyor.

Weigh cooked, diced meat into each tray. Note: This will be done by hand at a purpose designed weigh station with a scale and a rack for a pan of diced meat supplied.

Add garnish to tray. This will be achieved by counting individual button onions and mushrooms into each tray.

Dispense sauce. Sauce will be deposited volumetrically over the meat and garnish from a food products filler and via a hand held "gun" nozzle. The filler reservoir being topped up with sauce as required.

Checkweigh. Trays will be automatically checkweighed and lightweight trays can be topped up with sauce before lidding.

Apply film lid to tray. This operation will be carried out automatically by machine. It is important to ensure that during filling and transfer to the machine that sauce is not allowed to contaminate the seal area and so give rise to faulty or inadequate seals.

Lidded trays are metal detected. It is important that products are only metal detected once they are "secure" against ingress of any further metal foreign body contamination.

Trays are put into cartons and sealed. The operation is carried out at this stage to avoid rejection at metal detector of tray plus expensive carton (also potential metal contamination of board can lead to unnecessary rejection) and then to give protection to film lid as soon as possible against puncture or damage and contamination.

Finished packs are placed onto specially selected metal trays which are in turn loaded into trolleys.

Once full of trays trolleys are pushed into tunnel freezer for allotted period to fully freeze product (-18C).

5.2 STEAK CHASSEUR

To be read in conjunction with Flow Sheet and Factory Plan (Attachment 6)

5.2.1 Raw Material Specification and Supplier

Note: The sourcing of ancillary ingredients such as vegetables is based on the assumed availability of frozen and/or pre processed supplies in most instances.

Beef	100% Visual Lean Rump Steak. Frozen boxed joints
Onions	Sliced 3mm. Individually Quick Frozen
Tomatoes	Diced 10 x 10 x 10mm. Individually Quick Frozen
Mushrooms	Sliced, canned
Butter	Salted, commercial amounts
White Wine	Dry white, Chablis type. Plastic containers
Sherry	Pale Cream. Plastic containers
Tomato Puree	Canned 2ERS
Bouillon	"Knorr" type
Sugar	Food grade refined
Salt	Food grade
Garlic Powder	Export Garlic Powder 500 from McCormicks
Black Pepper	Ground sterilised
Basil	Rubbed
Tarragon	Rubbed
Bay	Ground
Colflo	National starch
Wheatflour	Heat treated plain flour

5.2.1.1 Beef

The quality of the finished product will be very much determined by the quality of the raw material employed. It is anticipated that the producer will have the major contribution to make with regard to this. However as a

point of reference the following criteria have been adopted to date.

All meat will be drawn from good quality steers bearing any required stamp of fitness for human consumption. All sides employed will be free from contamination by foreign material, metal or wooden tags and any other coloured ink identification stamps.

Overall fat should not exceed 10mm depth on any quarter (external).

All meat will have been handled under strict hygienic, storage and temperature conditions at all times and must have been slaughtered, boned and stored in EEC licensed premises.

The particular "cut" of meat employed in this product is hindquarter "Rump", Nominal 100% Visual Lean. The exact nomenclature and method of removal of this joint may vary from locality to locality and hence a general diagrammatic identification is attached (Attachment 3).

The boneless trimmed meat will be packed into either a polythene lined carton or a waxed carton and blast frozen.

Packaging will be free from metal staples.

The level of trimming employed to achieve the required removal of any fat, gristle etc would have to be determined. Any ageing would be similarly determined.

Target bacteriological standards would be:-

Total Viable Count	1,000,000 per gram maximum
Staphylococcus	100 per gram maximum
E Coli 1	1,000 per gram maximum
SRC	10 per gram maximum
Salmonella	Absent in 50 grams.

5.2.1.2 Button Onions/Diced Onion

Individually Quick Frozen sliced onions 3mm thickness

Source from typical white, creamy yellow onions. The taste and aroma should be typical of English and Spanish onions. Raw material should not exhibit any grey/pink colouration, more than 1/3 surface pale green, brown outer skin, onion fly, mould etc or any other blemishes.

They should be pre-blanching sufficiently to avoid any requirement for further processing prior to packing.

5.2.1.3 Tomatoes

Individually Quick Frozen diced 10 x 10 x 10mm. The product will be discreet pieces of skinless tomato sourced from material which was whole, of good uniform deep orange/red colour and firm texture. The product will be

free from all foreign bodies and odours. The presence of some blemishes, peel, stalk/calyx and pale colour will be permitted but at very low levels.

5.2.1.4 Mushrooms

Sliced, canned in brine. Evenly sliced (4-5mm after sterilisation) button mushrooms. Colour of uncut surfaces to be beige-light brown. There shall be no discoloured pieces and no evidence of root ends or any other extraneous matter. Percentage salt in brine should be 0.6% - 0.8% with no added citric or ascorbic acids. Drained weight will be consistent to that agreed at time of purchase. The finished product will be free from all pathogenic and food poisoning hazards.

5.2.1.5 Butter

Salted butter complying with EEC and UK standards obtained in commercial quantities.

5.2.1.6 White Wine

"Chablis" type white wine. Should have a typical wine flavour and occur without any vinegar types. Alcohol content should be standard at 11-12.5%.

When filtered through a fine (100 mesh) sieve there shall be nothing retained.

As no glass is permitted, delivery should be in plastic containers exhibiting no evidence of leakage.

5.2.1.7 Sherry

"Pale Cream" type sherry. Should have a typical sherry flavour and odour without any "off" notes. Alcohol should be standard at approximately 20%. When filtered through a fine (100 mesh) sieve there shall be nothing retained.

As no glass is permitted delivery should be in plastic containers exhibiting no evidence of leakage.

5.2.1.8 Tomato Puree

A bright, deep red coloured paste with a typical tomato puree flavour. The refractive solids will be 28% target. There will be no evidence of spoilage, mould or "off" flavours and any "blown" cans will be discarded.

5.2.1.9 Bouillon

Knorr Beef Bouillon. A dark brown solid paste-like material. The flavour

will be rounded meat stock with no harsh, high salt notes when hydrated. Parsley pieces will be evident also. The product should be Monosodium Glutamate free if possible.

Typical ingredient list:-

Salt
Beef fat and dehydrated beef
Wheatflour
Starch
Vegetable oil
Hydrolysed vegetable protein
Beef stock
Hydrolysed beef protein
Yeast extract
Onion powder
Parsley
Spices

Supplier: Knorr
Nahrungsmittel AG
Thayngen
Switzerland
(CPC - UK)

5.2.1.10 Sugar

Refined, extra fine, retail quality sugar from a reputable supplier.

5.2.1.11 Salt

Food grade salt from a reputable source adequately packaged.

5.2.1.12 Garlic Powder

Specifically Export Garlic Powder 500:-

McCormicks Foods Limited
Ellesmere Port

A free running white to pale cream powder. When hydrated should have a typical garlic taste and aroma with no rancid flavours/aromas.

5.2.1.13 Ground Black Pepper

A brown/black specked free running coarse powder with a typical hot spicy taste. No foreign material will be evident and it will have been sterilised to achieve acceptable bacteriological levels - maximum viable count 1 million.

5.2.1.14 Rubbed Basil (Sweet)

A mixture of dried leaf fragments obtained from the dried leaves of *Ocimum Basilicum*. The material will exhibit a characteristic odour and flavour and will be free from stalks, wood, dirt and any other material which is not Basil.

5.2.1.15 Rubbed Tarragon

A mixture of dried leaf fragments obtained from the dried leaves of *Artemisia dracunculus*. The material will exhibit a characteristic odour and flavour and will be free from stalks, wood, dirt and any other material which is not Rubbed Tarragon

5.2.1.16 Ground Bay

A dark olive green, very fine powder, free flowing like talcum powder. The odour will be slightly sweet, very aromatic, characteristic of bay. There will be a strong, clear flavour characteristic of bay, there may be a slight but not unpleasant bitter after taste. The material will be free from stalks, wood, dirt and any other material which is not bay (*Laurus Nobilis*).

5.2.1.17 Colflo

Specific modified starch only supplied by National Starch & Chemical, Trafford Park, Manchester.

5.2.1.18 Wheatflour

A plain, heat treated, amylase inactivated flour. Free from foreign bodies and milled under hygienic controlled conditions. Protein content and gluten levels are not particularly important in this context.

5.2.1.19 General Note

Individual ingredients can if appropriate be separately specified on a common raw material specification document, an example of which is attached (Attachment 5).

5.2.2 Processing - Steak Chasseur

5.2.2.1 Pack Make Up

Declared pack weight 285g. (10.0 oz).

	Cooked Steak	160.00gm
	Sliced Onions	12.75gm
Garnish Blend	Sliced Mushrooms	24.75gm
	Diced Tomatoes	37.50gm
	Sauce	65.00gm
		300.00gm (5% giveaway)

5.2.2.2 Beef Preparation

Remove boxed joints from cold store (-25C to -30C). Note: Only sufficient to maintain tempering operation should be withdrawn at any one time in order to ensure consistent temperature control.

Load batch microwave tempering unit with prescribed quantity of beef, still boxed and temper as detailed in operating instructions. Note: These would be affixed to unit at appropriate time.

Transfer tempered meat (-2C to -3C) to deboxing area.

Debox beef. Note: This would be carried out in a separate enclosed environment in order to keep packaging materials away from the remainder of the processing operation and so avoid potential contamination.

Separate joints and transfer to pressing operation via one way only exit portal from deboxing room. Individual joints are required to produce intact "steaks".

Press into specifically selected shape. This stage is important for consistency of product from several points of view ie weight control, packaging size and consumer visual appeal.

Slice shaped "logs" on slicing unit to fixed thickness (20mm). Slicing has a higher yield factor than other possible methods such as bandsawing. This operation will also produce steaks of a consistent thickness which is necessary also for optimum performance from the cooker. (There may be some offcuts from the end of the pressed logs which would be directed to the Bourguignonne product).

For both pressing and slicing operations control is important to maintain consistency and efficiency and avoid losses due to drip etc. Any product not intended for immediate use should therefore be returned to the designated chill store (raw meat).

Weigh off steaks to unit batches and transfer to cooker as required (hold in raw meat chiller until such time).

As low a temperature as possible conducive to efficient operation and well being of staff should be maintained at all times for both product and environment in the best interests of product quality.

5.2.2.3 Beef Cooking

This operation will be carried out in a continuous belt grill unit. This is a "dry frying" principle with both sides of the meat being cooked simultaneously and has been selected to give the most appropriate finished, cooked appearance to the meat for the product in question. This would not necessarily be so or as easily achieved with alternative methods.

Feed steaks consistently to unit and cook for preset time/temperature (to be determined) to give required results of core temperature and appearance.

Collect cooked steaks from end of cooker, continuously, into suitable containers and transfer to the cooked product chiller to cool.

Weigh cooked steaks to unit weights and transfer to the pack assembly line as required.

5.2.2.4 Garnish Preparation

Supply of garnish items is taken to be pre processed and canned/frozen Individually Quick Frozen to required specifications.

Sliced Onions. Frozen onions will be removed from cold store and weighed to unit weights in suitable containers. Transfer to mixing operation.

Diced Tomatoes. Frozen product will be removed from cold store and weighed to unit weights in suitable containers. Transfer to mixing operation.

Sliced Mushrooms. Remove cans from store and inspect and wipe prior to use if necessary. Open cans employing a crown punch type opener to minimise swarf. Drain liquor using sieve and discard. Weigh drained mushrooms to unit weights into suitable containers. Transfer to mixing operation.

Mix Garnish. Add pre weighed quantities of all three garnish elements to bowl mixer and mix until a uniform blend is achieved. Do not overmix or break down as colour migration could occur. Weigh off garnish blend to unit weights and transfer to packing line. If not required for immediate use hold in chill store.

5.2.2.5 Sauce Recipe

Ingredient	¢	Kg/454Kg Batch
Butter	9.00	40.90
Bouillon	1.70	7.70
Sugar	0.30	1.40
Tomato Puree	3.80	17.30
Salt	1.10	17.00
Garlic Powder	0.20	0.90
Black Pepper	0.12	0.50
Parsley	0.20	0.90
Basil	0.04	0.20
Tarragon	0.10	0.50
White Wine	20.00	90.80
Bay	0.04	0.20
Sherry	3.20	14.50
Colflo	3.50	15.90
Wheat Flour	1.90	8.60
Water (including slurry)	64.80	294.70
	110.00	500.00
Evaporation loss	10.00	45.00
	100.00¢	454.00 Kg.

Note: Vacuum cooling results in a loss of moisture taken to be derived only from free water for ease of presentation.

5.2.2.6 Sauce Ingredients

Note: Removal of outer packaging and decanting of ingredients will take place in a designated area separate from the processing environment in order to minimise potential contamination of product.

5.2.2.6.1 Butter

Butter will be kept in cold storage until required for use. This will protect it from any rancidity problems. After removal from cold store it will be weighed to batch quantity for transfer to cooker.

5.2.2.6.2 Tomato Puree

Cans of puree will be removed from store. They will be inspected and wiped prior to use if necessary. Cans will be opened using a crown punch type opener which minimises risk of swarf contamination. Puree will be tipped and/or scraped from cans and weighed to batch size into suitable plastic containers.

5.2.2.6.3 White Wine

White wine will be decanted from suitable containers (not glass) and weighed to batch size. It may be possible to allocate wine volumetrically employing containers as received.

5.2.2.6.4 Sherry

Sherry will be decanted from suitable containers (not glass) and weighed to batch size.

5.2.2.6.5 Dry Ingredients

Remaining dry ingredients other than starches, many of which are herbs and/or spices and as such only required in relatively small amounts will be weighed out using appropriate bench scales in a separate spice room and stored in specifically coded polythene bags denoting a particular recipe.

All dry ingredients will have previously been decanted into storage containers for the spice room in a separate area so as to segregate outer packaging of incoming items from the processing environment so minimising any possible foreign bodies or contamination.

The accuracy of weighing at this point is paramount hence the specifically supplied scales. Many of the herbs and spices are only added in relatively small amounts and variations in weight can lead to inconsistency and flavour differences in finished sauces.

5.2.2.6.6 Starch Slurry

Starches (Colflo and wheatflour) will be weighed to required batch weight and dispersed in a measured quantity of water employing a specifically supplied tank and high shear mixer for that purpose. The slurry so made will be held and pumped to the cooking vessels as required.

5.2.2.7 Sauce Process

For sauce preparation a 500 litre Giusti type vessel is employed with a vacuum cooling system and necessary instrumentation.

Meter/measure required amount of water (less quantity for slurry make up) to vessel.

Turn on stirrer and heat.

Add all ingredients (except slurry) and ensure good dispersion.

Bring to boil. Turn off heat and turn stirrer to maximum speed.

Immediately pump slurry mix to vessel to thicken.

Hold for five minutes to fully cook starches then reduce stirrer speed.

Turn on vacuum cooling system and cool to 10-15C.

Check yield and quality.

Empty cooking vessel via valve into stainless steel bins or other suitable containers.

Weigh off to packing line or hold in chill store (for cooked product) until required for use on line.

5.2.2.8 Pack Assembly

Feed trays to conveyor.

Place one cooked steak into each tray.

Add required weight of garnish blend to top of steak. This could be either weighed or dispensed volumetrically by hand.

Dispense sauce over steak and garnish. Sauce will be deposited volumetrically from a food products filler via a hand held "gun" nozzle. The filler reservoir being topped up with fresh sauce as required.

Checkweigh. Trays will be automatically checkweighed and lightweight trays can be topped up with sauce before lidding.

Apply film lid to tray. This operation will be carried out automatically by machine. It is important to ensure that during filling and transfer to the machine that sauce is not allowed to contaminate the seal area and so give rise to faulty or inadequate seals.

Metal Detect. Trays are metal detected once lidded. It is important that products are only metal detected once they are secure against ingress of any further metal foreign body contamination.

Trays are introduced into cartons and sealed. The operation is carried out at this stage to avoid rejection at metal detector of tray plus expensive carton (also potential metal contamination of board can lead to unnecessary rejection) and then to give protection to film lid as soon as possible against puncture or damage and contamination.

Finished packs are placed onto specially selected metal trays which are in turn loaded into trolleys.

Once full of trays trolleys are pushed into tunnel freezer for allotted period until product is fully frozen.

5.3 BEEF KEBABS

To be read in conjunction with Flow Sheet and Factory Plan (Attachment 7)

5.3.1 Raw Material Specification and Suppliers

Note The sourcing of ancillary ingredients such as vegetables is based on the assumed availability of frozen and/or pre-processed supplies in most instances.

Beef	100% Visual Lean Topside. Frozen boxed joints.
Peppers	Green and yellow frozen Individually Quick Frozen. Diced to required size.
Button Onions	Frozen Individually Quick Frozen. 15-20mm diameter. Blanched.
Redcurrant Jelly	Canned.
Red Wine	"Burgundy" type. Plastic containers = 5 gall.
Vinegar	Red Wine vinegar. Plastic containers.
Orange Juice	Unsweetened, pure, sterilized for ambient storage.
Worcester Sauce	Commercial supply. Plastic containers.
Light Soy Sauce	Commercial supply. Plastic containers.
Lemon Juice	"Natural" strength, commercial supply. Plastic containers.
Bouillon	"Knorr" quality.
Oil	Vegetable, corn oil. Edible, refined and deodorised.
Garlic Powder	Export Garlic 500 ex McCormicks.
White Pepper	Ground, sterilised.
Parsley	Dried, rubbed.
Salt	Food grade.
Colflo 67	National Starch.

5.3.2 Processing - Beef Kebab

5.3.2.1 Pack Make-Up

Declared Pack Weight 397g (14.0oz.) 2 Kebabs per pack.

Cooked, diced beef	154.0g
Green pepper	40.0g
Yellow pepper	40.0g
Onions	34.0
Sauce	125.0g
	403.0g (1.5% giveaway)

5.3.2.2 Beef Preparation

Remove boxed beef from coldstore (-25C to -30C). Note: Only sufficient to maintain tempering operation should be withdrawn at any one time in order to ensure consistent temperature control.

Load batch microwave tempering unit with prescribed quantity of beef still boxed and temper to -2C to -3C as detailed in operating instructions. Note: These would be affixed to unit at appropriate time.

Transfer tempered meat (-2C to -3C) to deboxing area.

Debox beef. Note: This would be carried out in a separate, enclosed environment in order to keep packaging materials away from the remainder of the processing operation and so avoid potential contamination.

Separate joints, transfer via exit portal to pressing area and press into pre-determined shape to give optimum loading of dicing machine.

Note: This process stage is designed to minimise arising of incomplete dices which would result from bandsawing ie at interface of abutting joints but is not so critical for dishes such as the Boeuf Bourguignonne. There may be some incomplete dices from the end of an individual joint and these would be transferred to Boeuf Bourguignonne production.

Dice beef to approximately 40 x 40 x 20mm cubes. Note: Specific size to be determined in conjunction with pressing operation to optimise sizes and minimise any offcuts.

For both pressing and dicing operations temperature control is important to maintain consistency and efficiency and avoid any losses due to blood drip etc. Any product not intended for immediate use should therefore be returned to the designated chill store (Raw Meat).

Weigh off diced beef to unit batches and transfer to cooker as required. (Hold in raw meat chiller until such time).

As low a temperature as possible conducive to efficient operation and well being of staff should be maintained at all times for both product and environment in the best interests of product quality.

5.3.2.3 Beef Cooking

This operation will be carried out in a continuous belt grill unit. This is a "Dry frying" principle with both sides of the meat being cooked simultaneously and has been selected to give the most appropriate finished, cooked appearance to the meat for the product in question. This would not necessarily be so, or as easily achieved with alternative methods.

Feed dices consistently to unit and cook for preset time/temperature (to be determined) to give required results of core temperature and appearance.

Collect cooked meat from end of cooker, continuously into suitable containers and transfer to cooked product chiller to cool.

Weigh cooled dices to unit weights and transfer to Kebab assembly operation as required.

5.3.2.4 Garnish Preparation

Supply of garnish items taken as being pre-processed and frozen Individually Quick Frozen to required specifications.

5.3.2.4.1 Peppers

Green and yellow peppers (packed separately) will be taken from cold store and weighed to unit weights before being transferred to Kebab assembly operation.

5.3.2.4.2 Button Onions.

Onions will be removed from coldstore and weighed to unit quantities before being transferred to Kebab assembly operation.

5.3.2.5 Kebab Assembly

Automation of this operation is only possible to a limited extent. Stainless steel jigs will be loaded with individual components before being passed for skewer insertion which is carried out using a specifically designed machine.

It is proposed that the jigs follow a circuitous route with one element being added at each "station", with the full jig then reaching the skewering "station". Having been completed, the Kebab would be removed and the empty jig returned to the first station for refilling.

5.3.2.5.1 Make-Up

The individual components would be presented on the finished Kebab in the following order (with the first item listed on the point):

Onion, Beef, Yellow Pepper, Beef, Green Pepper, Onion, Beef, Yellow Pepper, Beef, Green Pepper.

ie Button Onions	x 2
Yellow Pepper Dice	x 2
Green Pepper Dice	x 2
Cooked Beef Dice	x 4

5.3.2.6 Sauce Preparation

Ingredient	%	Kg/454Kg Batch
Vinegar	4.00	18.2
Red Wine	17.26	78.4
Garlic Powder	0.20	0.9
Oil	3.45	15.7
Bouillon	0.48	2.2
Worcester Sauce	0.32	1.4
Redcurrant Jelly	25.90	117.6
Orange Juice	14.50	65.8
Pepper	0.02	0.1
Parsley	0.08	0.4
Salt	0.04	0.2
Lemon Juice	0.25	1.1
Soy Sauce	3.60	16.3
Colflo	3.50	15.9
Water (including slurry)	36.40	165.8
	110.00	500.0
Evaporation Loss	10.00	46.0
	100.0%	454.0Kg

Note: Vacuum cooling results in a loss of moisture taken to be derived only from free water for ease of presentation.

5.3.2.7 Sauce Ingredients

Note Removal of outer packaging and decanting of ingredients will take place in a designated area separate from the processing environment in order to minimise potential contamination of product.

5.3.2.7.1 Redcurrant Jelly

Cans of redcurrant jelly will be removed from store. They will be inspected

and wiped prior to use, if necessary.

Cans will be opened using a crown punch type opener which minimises risk of swarf contamination.

Redcurrant jelly will be tipped and/or scraped from cans and weighed to batch size in an appropriate container.

5.3.2.7.2 Red Wine

Red wine will be decanted from suitable storage containers (not glass) and weighed to batch size.

It may be possible to allocate wine volumetrically employing containers as received.

5.3.2.7.3 Orange Juice

Orange juice will be decanted from appropriate container and weighed to batch size in a suitable vessel for transferring to cooker.

5.3.2.7.4 Vinegar

Vinegar will be decanted from suitable storage container (not glass) and weighed to batch size in an appropriate container.

5.3.2.7.5 Oil

Vegetable oil will be decanted from storage drums and weighed to batch size in a suitable container.

5.3.2.7.6 Lemon Juice

Lemon juice will be decanted from appropriate containers and weighed to batch size in a suitable container.

5.3.2.7.7 Worcester Sauce

Worcester sauce will be decanted from appropriate containers and weighed to batch size in a suitable container.

5.3.2.7.8 Dry Ingredients

Remaining dry ingredients, herbs and spices etc will be weighed out using appropriate bench scales in a separate spice room and stored in specifically coded polythene bags denoting particular recipe.

All dry ingredients will have previously been decanted into storage containers for the spice room in a separate area so as to segregate outer packaging of incoming items from the processing environment so minimising any possible foreign bodies or contamination.

The accuracy of weighing at this point is paramount, hence the specifically supplied scales. Many of the herbs and spices are only added in relatively small amounts and variations in weight can lead to inconsistency and flavour differences in finished sauces.

5.3.2.7.9 Starch Slurry

Colflo will be weighed to required batch weight and dispersed in a measured quantity of water employing a specifically supplied tank and high shear mixer for that purpose.

The slurry so made will be held and pumped to the cooking vessel as required.

5.3.2.8 Sauce Process

For sauce preparation a 500 litre Giusti type vessel is employed with a vacuum cooling system and necessary instrumentation.

Meter/measure required amount of water (less quantity for slurry makeup) to vessel.

Turn on stirrer and heat.

Add all ingredients (except slurry) to ensure good dispersion.

Bring to boil. Turn off heat and turn mixer to maximum speed.

Immediately pump slurry mix to vessel to thicken.

Hold for 5 minutes to fully cook starches then reduce stirrer speed.

Turn on vacuum cooling system and cool to 10-15 degrees C.

Check yield and quality.

Empty cooking vessel via valve into stainless steel bins or other suitable containers.

Weigh off to line or hold in chill store (for cooked product) until required for use on line.

5.3.2.9 Pack Assembly

Feed trays to conveyor.

Place two Kebabs into each tray.

Dispense sauce over kebabs. Sauce will be deposited volumetrically from a food products filler via a hand held "gun" nozzle. The filler reservoir being topped up with fresh sauce as required from chill store.

Checkweigh. Trays will be automatically check weighed and lightweight trays can be topped up with sauce before lidding.

Apply film lid to tray. This operation will be carried out automatically by machine. It is important to ensure that during filling and transfer to the machine, that sauce is not allowed to contaminate the seal area and so give rise to faulty or inadequate seals.

Metal Detect. Trays are metal detected once lidded. It is important that products are only metal detected once they are "secure" against ingress of any further metal foreign body contamination.

Trays are loaded into cartons and sealed. The operation is carried out at this stage to avoid rejection at metal detector of tray plus expensive carton (also potential metal contamination of board can lead to unnecessary rejection) and then to give protection to film lid as soon as possible against puncture or damage and contamination.

Finished packs are placed onto specially selected metal trays which are in turn loaded into trolleys.

Once full of trays, trolleys are pushed into tunnel freezer for allotted period until product is fully frozen.

6.0

FACTORY EQUIPMENT

The following three paragraphs detail the specialist production equipment required to produce the three lines. The manufacturers offering the equipment are listed in Attachment 1 of this report and are identified by the item number.

The prices shown are budget prices in the UK and an adjustment for export to Uruguay is contained in Chapter 11 of the Marketing Report.

6.1 BOEUF BOURGUIGNONNE - EQUIPMENT LIST

The Boeuf Bourguignonne line illustrates the basic equipment required for all three products but additional equipment will be required for both the Steak Chasseur and Beef Kebabs as shown below.

TABLE 6.1 EQUIPMENT FOR BOEUF BOURGUIGNONNE

Item	Supplier	No	Price £
(Scales			
(Spice Room - Bench	Avery	1	1100
1 - 6 (Bench/Platform	Avery	2	2500
(Floor	Avery	1	4000
(Line Weighing (Including Quality Control & Spares)	Avery	8	4000
(Containers. Bins, Tubs, Pans etc.			
7 (General Plastic	Paxton		3000
(Stainless Steel Bins		12	3000
8-10 (Can Opener	Edlund	1	1100
11 (Tempering Unit	Raytheon	1	80000
12 (Bandsaw	AEW	1	2500
13 (Dicer	Trief	1	6000
14 (Slurry System - Vessel	Skerman	1	1500
- Mixer	Silverson	1	2000
15-16 (Pumps (+ Pipework)	SSP	3	5000
(Cooking Vessels			
17 (1000 Litres	Giusti	1	54450
(500 Litres	Giusti	1	46000
+ Hoists			8000
18 (Sauce Filler	Turbo	2	15000
20 (Checkweigher and Metal Detector	Loma	1	10200
22 (Tray Litter	Packaging Automation	1	32000
20 (Metal Detector	Loma	1	
Holding Tank			2000
18 (Conveyor	Turbo	1	6000
Cartoning Machine			15000
Total Boeuf Bourguignonne Equipment			304350

6.2 STEAK CHASSEUR - EQUIPMENT LIST

Item		Supplier	No.	Price £
1-6	Scales	As Boeuf Bourguignonne		
7	Containers	As Boeuf Bourguignonne		
8-10	Can Opener	As Boeuf Bourguignonne		
11	Tempering Unit	As Boeuf Bourguignonne		
23	Press Change Parts	As Kebabs		8000
25	Slicer	Ross	1	20000
14	Slurry System	As Boeuf Bourguignonne		
15-16	Pumps	As Boeuf Bourguignonne		
17	Cooking Vessel	As Boeuf Bourguignonne		
30	Belt Grill	As Kebabs		
18	Sauce Filler	As Boeuf Bourguignonne		
20	Check Weigher	As Boeuf Bourguignonne		
22	Tray Lidder	As Boeuf Bourguignonne		
20	Metal Detector	As Boeuf Bourguignonne		
33-34	Garnish Mixer	Aicoh/Turbo	1	6500
18	Conveyor	As Boeuf Bourguignonne		
Total Additional Equipment				34500

6.3 KEBABS - EQUIPMENT LIST

Item		Supplier	No.	Price £
1-6	Scales	As Boeuf Bourguignonne		
7	Containers	As Boeuf Bourguignonne		
8-10	Can Opener	As Boeuf Bourguignonne		
11	Tempering Unit	As Boeuf Bourguignonne		
23	Press	Ross		35000
13	Dicer	As Boeuf Bourguignonne + Change Parts		1500
14	Slurry System	As Boeuf Bourguignonne		
15-16	Pumps	As Boeuf Bourguignonne		
17	Cooking Vessel	As Boeuf Bourguignonne		
30	Belt Grill	Square		140000
18	Sauce Filler	As Boeuf Bourguignonne		
20	Check Weigher	As Boeuf Bourguignonne		
22	Tray Lidder Change Parts	As Boeuf Bourguignonne		6000
20	Metal Detector	As Boeuf Bourguignonne		
32	Kebab Machine (incl Jigs)	Flupp/EPM	5	6000
18	Conveyor	As Boeuf Bourguignonne		
Total Additional Equipment				186500

6.4 CAPITAL - ANCILLARY ITEMS

Item	Supplier	No	Price £
Freezer	Frigoscandia Trolley Freeze		123000
Trolleys/Trays	UK 12 @ £700		8400
Chill Room + Electrics etc.	UK		35000
Floor Scrubbing Machine & Charger	UK		10000
Pallet Trucks	Lansing Bagnall		
Reach Truck		1	25000
Forklift Truck		1	15000
Hand Jacks	Lansing Bagnall		
Handjacks		3	12000
Batteries & Chargers			6200
Building	UK 1700 sq metres @ £500 per sq metre		850000
Cold Store	UK 200000 cubic ft @ £2 per cubic ft		400000
Total Plant and Equipment			1484600

7.0 POTENTIAL FACTORY LAYOUT - EXPLANATORY NOTES

7.1 GENERAL

The factory layout demonstrated (Attachment 8) is intended only as a guide to illustrate some of the basic requirements either for good food handling practices and subsequent licences, and/or approval for export to ECC for example, or alternatively for operating logistics and efficiencies in construction.

7.2 BASIC CONSIDERATIONS

The layout arrived at results from the accommodation of several specific requirements. These are as follows:

7.2.1 Separation of Raw and Cooked Meats

Because both raw and cooked product is being handled with the facility, it is essential to ensure separation for potential bacteriological cross contamination reasons, not only of the products in question but also the personnel handling those products.

7.2.2 Process Flow

The product/processing flow should be as "linear" as possible with a logical progression from one processing step to another, hence minimising chances of product mixing. This tends to give the longer, rectangular layout as opposed to a square configuration for the processing hall.

7.2.3 Packaging

As much outer packaging as possible should be kept away from the processing areas so avoiding risk of contamination. Other essential packaging items should be limited where feasible and confined to specific areas if possible.

7.2.4 Cold Storage

The cold storage facilities were to be a single unit only and as such accommodate both raw materials (with up to six months holding capacity for beef) and finished product. It is this requirement which necessitates its overall size.

7.2.5 Refrigeration Plant

The refrigeration and energy plant rooms (the freezer excepted which has its own integral package) should be able to be located in one location each and supply the necessary requirements from there.

7.3 EXPLANATION IN DETAIL

7.3.1 Personnel

7.3.1.1 Personnel Reception

Personnel enter facility through a common entrance which could house all necessary checking in/out equipment coupled with reception for visitors, security if required, and general office accommodation, storage etc.

7.3.1.2 Circulation

Personnel then proceed to their respective changing rooms depending upon which part of the process they are engaged in.

7.3.1.3 Segregation

From this point there should be no mixing of personnel from these cooked and raw product areas. To ensure ease of identification it is often a requirement that different colour protective clothing is worn by the groups in question and any person then seen outside areas where these should be worn eg raw product personnel in the cooked area or either in entrance hall, can be appropriately disciplined.

7.3.1.4 Welfare

Should facilities such as canteens need to be provided, these could theoretically be located above and accessed from the changing rooms and hence still kept separate but with common kitchen facilities.

7.3.1.5 Hygiene - Raw Product

Raw product personnel would enter the raw product area directly from their changing rooms having been channelled past hand washing units, foot baths and whatever other hygiene requirements are considered necessary.

Note: It is an assumed but nevertheless important point that adequate protective clothing, hats and hairnets will be worn by all personnel entering production areas and that the wearing of watches, jewellery etc will be strictly forbidden.

Once in the raw product area the layout is such that access to other areas is discouraged unless returning back via changing facility.

7.3.1.6 Hygiene - Cooked Product

Cooked product processing personnel having changed into their relevant protective clothing proceed via the central thoroughfare to the cooked area entrance where once again they are channelled past the necessary hygiene, hand washing facilities and into an isolated production unit.

7.3.2 Raw Materials

7.3.2.1 Reception

All incoming raw materials can be received by a central storage facility into either cold storage, dry storage or packaging storage. This aids management and simplifies control.

7.3.2.2 Storage

The stores should be temperature and humidity controlled and operate independently of each other.

7.3.2.3 Packaging Removal

Product subsequently removed from store for processing passes into a common decanting area. Here outer packaging can be removed as required, plastic pallets replaced for wooden ones as necessary, products decanted into suitable containers etc. The discarded packaging can be transported out of the plant via the thoroughfare and discarded.

These operations as a whole ensure that the minimum of potential contaminants, foreign body hazards etc pass into the processing areas.

7.3.3 Packaging

Packaging is treated in a similar manner. It can be decanted as necessary in the allotted area. However, some inner packaging items have to pass through to the packing line. The layout however ensures that they enter against the flow of product and as a result does not need to enter the actual processing area but is limited to those points only where it is essential. Outer packaging can be limited to an area beyond the freezer where it is "naturally" contained on all sides with the freezer itself forming one of these "natural" barriers.

7.3.4 Processing

7.3.4.1 Meat Raw Materials

Beef/bacon are removed from cold store and taken to the tempering room annexe via an entrance designated purely for this purpose and out of bounds for any other personnel. The personnel carrying out this task would not be permitted to proceed any further beyond this point.

Tempering room personnel, and those only, who gain access from the raw product area would collect the boxed beef/bacon from this annexe. Likewise they would be prohibited from proceeding beyond the annexe.

7.3.4.2 Tempering and Chilling Raw Meat

Meat would be tempered and transferred to the de boxing room from where packaging would return via annexe procedure to be discarded. Tempered meat would pass via the exit portal into the raw meat preparation area for bandsawing/pressing/dicing etc.

The raw product chiller would only be accessible from the raw meat preparation area, again ensuring optimum separation.

7.3.4.3 Cooking

Meat cooking takes two forms:

7.3.4.3.1 Grilling

The belt grill would run through the separating partition permitting raw product to be fed at one end and cooked product removed from the other within the respective areas.

7.3.4.3.2 Pressure Cooking

Pressure cooked meat would have to be tipped and separated within the actual limits of the raw product area. However, it would be carried out adjacent to the cooked area and the transfer across would be easily and closely controlled via a limited access entrance which could be a one way only portal or similar.

Cooked product would only be handled by the designated personnel.

7.3.4.4 Cooked Meat Chiller

The cooked product chiller would only be accessible from the cooked product area. The loading on this chiller would be greater, hence its larger size.

7.3.4.5 Seasoning Room

Spice weighing and garnish preparation would be carried out in designated areas in order to confine and control arising of dust, packaging materials, metal cans etc. Any waste arising being easily discarded via the thoroughfare without entering the processing area proper.

7.3.4.6 Packaging

The packing line is located such as to direct packed product and hence packaging away from the processing area and with the general flow of product.

The resulting packed product would emerge adjacent to the freezer entrance

for ease of handling/loading etc.

Frozen product would be packed, palletised and taken directly to the cold store via the thoroughfare.

7.3.5 Cold Store

The cold store would be racked 5 pallets high in order to accommodate the volume of raw materials and finished product designated within the floor area indicated.

7.3.6 Plant Location

7.3.6.1 Cold Storage

The cold store and chill rooms are sited in close proximity to each other to permit central location of refrigeration plant say on the roof of the building.

7.3.6.2 Cooler

Similarly energy users such as cookers are within a confined area also and easily serviced by an energy centre, the location of which is optional.

8.0

SUMMARY/CONCLUSIONS OF TOTAL PROJECT

Three prepared meat products have been selected which are judged to have significant potential in the UK market as follows:

Ex Factory Price

Boeuf Bourguignonne	70.33
Steak Chasseur	67.06
Beef Kebabs	85.45

The total cost of a manufacturing facility to produce 1000 tons a year in total of a combination of these three products would be:

	£
Buildings	1,250,000
Equipment	750,000
Total	2,000,000

The principal market for the products listed is the EEC and the production facilities have been selected and costed with this in mind.

Product samples are available and are obviously fundamental to the success of this project. The samples should therefore be presented to the appropriate individuals in UNIDO/Uruguay.

Could you please inform me:

- 1 The individual to whom the samples should be presented.
- 2 The number of samples required and the method to be adopted for shipment.

The next phase of this project quite clearly should be the presentation of product samples to the grocery trade in the UK.

Facilities are available to produce the samples and present them to the trade if so required.

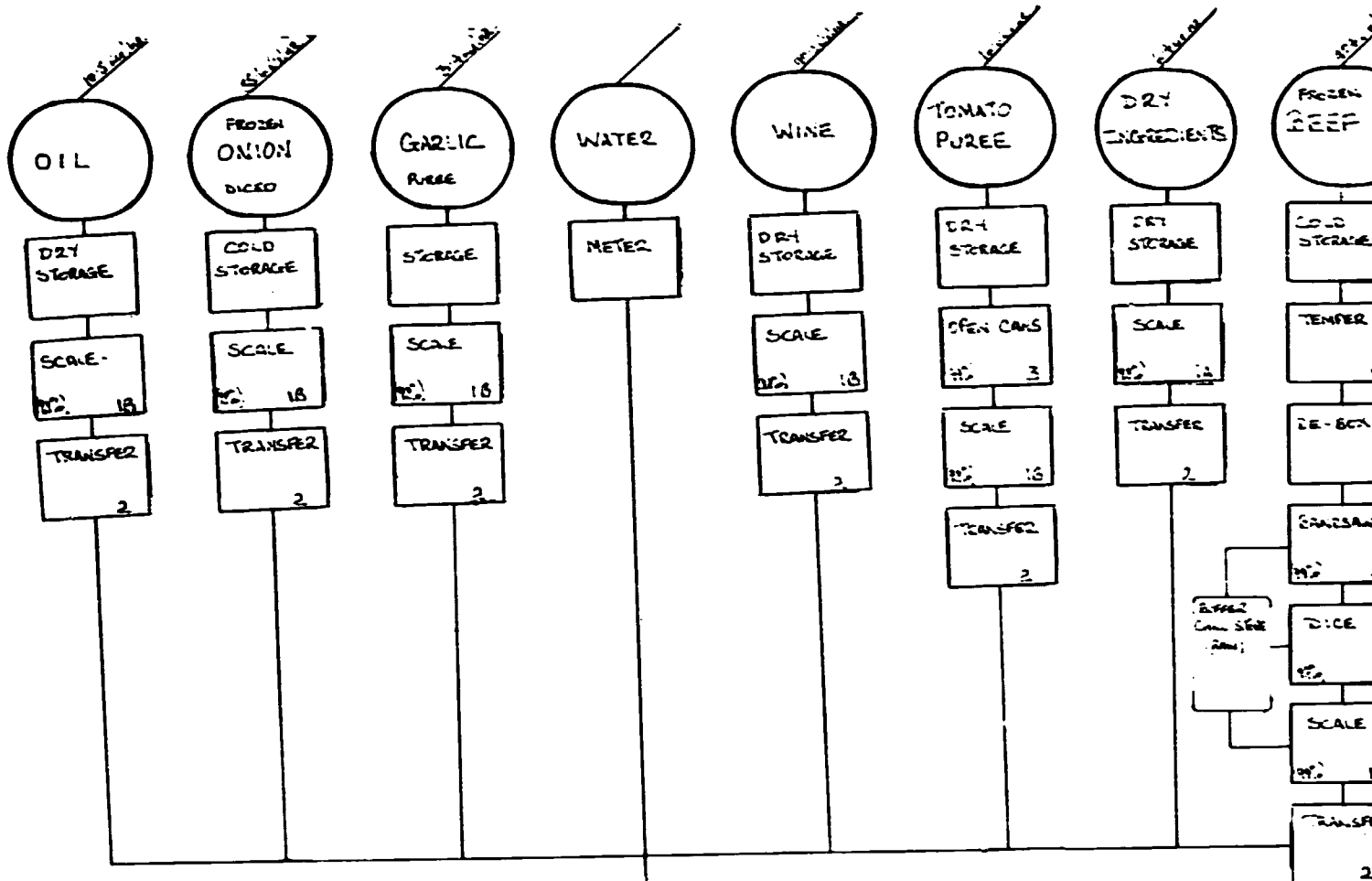
EQUIPMENT LIST

(Range of equipment as offered by various suppliers)

Item	Supplier
1 H 201 Bench Scale with L101 Indicator (Digital Indicator System)	Avery, W & T Avery Limited, Smethwick, Warley, West Midlands, England B66 2LP
2 H 202 Bench Scale with L101 Indicator	" " "
3 H 300 Bench Scale with L101 Indicator	" " "
4 H500TH Heavy Duty Platform Scale with Digital Indicator	" " "
5 3303 COB Mechanical Bench Scale with Dial Indicator	" " "
6 1215BFH 2kg semi-self indicating counter scale	" " "
7 Containers: Bins, Tubs, Pans; Gen-plastic, stainless steel bins	C.G. Paxton Limited, Pillory Street, Nantwich, Cheshire CW5 5BP
8 Heavy duty can opening machine Model 825 System	Peter Holland Group of Companies, St. Peter's Hill Stamford, Lincolnshire PE9 2PE
9 Can opener model 700 Crown Punch and model 610 crown punch	" " "
10 Can opener model 625&650 crown punches	" " "
11 Microwave processing equipment QMF 1879B Batch Processor	RAYTHEON Company, Food Processing Equipment, Foundry Avenue, Waltham, Mass. 02154, U.S.A.
12 AEW 400 Series L High Speed Cutting Edge; bandsaw	AEW Engineering Co Ltd, Horizon Works, Dereham Road, Costessey, Norwich, Norfolk, NR3 0SA
13 TREIF-Piccolo 11 universal cutters	Albrin Products Limited, 551 Green Lane, Ilford, Essex, IG3 9R1
14 Multi-purpose High Shear Mixer/Homogenizer/Disintegrator Batch (in-tank) Type Medium Range Models BX-GX and larger range models 700X, HX, JX, KX, MX	SILVERSON, Silverson Machines Ltd., Waterside, Chesham, Bucks, England HP5 1PQ

Item		Supplier
15	AP Pumps (+ pipework)	SSP Pumps Ltd, Eastbourne, East Sussex BN23, 6PQ
16	Fittings (for stainless steel pipework)	Lancashire Fittings Limited, County Works, Claro Road, Harrogate, North Yorkshire, HG1 4AF, UK
17	Processing Equipment Cooking vessels (1000 litres, 500 litres - hoists)	T. Giusti & Son Ltd., Rixon Road, Finedon Road Industrial Estate, Wellingborough, Northamptonshire NN8 4BA
18	Turbo Tools Precision Engineers to the Food Processing Industry; Stainless steel topped conveyor	Turbo Tools (Hull) Limited, Gillett Street, Hessle Road, Hull, England HU3 4JA
19	Ready Meals/Microwave Tray	LOMA ENGINEERING LIMITED, Invincible Road, Farnborough, Hants, GU14 7SX
20	Loma Superscan 'S' Metal Detector and Checkweigher	" " "
21	Loma Conveyor	" " "
22	Packaging	Packaging Automation Limited, Green Hedges Works, Moor Lane, Wilmslow, Cheshire SK9 6DW
23	Ross Uniform 914 Press	ROSS Midland Virginia, Ross Industries, Inc., Midland, Virginia 22728, U.S.A.
24	TC-700 Bone-in Mechanical Meat Tenderizer	" " "
25	950 High-speed Slicer	" " "
26	711 Dicer	" " "
27	950 Wide Belt High-speed Slicer	" " "
28	UNICOM 1000 Comminuter	" " "
29	712 Preportioner	" " "
30	Square Belt Grill	SQUARE Alfa-Laval Group, Square AB, Box 9100, S-200 39 Malmö, Sweden
31	Square Formers and boilers	" " "
32	Flupp 800, Automatic Skewering of Hand Made Kebabs	EPM Food Machines Ltd., Far Holme Lane, Sutton-on-Trent, Newark, Notts, NG23 6PQ

Item	Supplier
33 Mighty60, 60 litres heavy duty mixer or 90 litres	AICOHSHA MFG.CO.LTD., 7-10-8 Chuo, Warabi, Saitama 335, Japan
34 Mighty25 and Mighty 30 multi purpose heavy duty mixers	" " "
35 Diotite C25F Carton closer	Metal Box Cartons and Labels, West Road Tottenham, London N17 ORH
36 Trolley Freeze	AGA FRIGOSCANDIA, Frigoscandia Contracting AB, Box 913, S-25109 Helsingborg, Sweden with regional offices in France, FRG, Italy, UK, U.S.A.
37 Multipet Ovenable Foodtrays Single Chamber Trays and Compartmented Trays	BXL Plastics Limited, Greenfield House, 69/73 Manor Road, Wallington, Surrey SM6 0BP
38 Packaging systems	Wilhelm WAGNER GmbH & Co. Alleenstr. 30, D-7300 Esslingen, Postfach 788, FRG
39 Smoothwall containers, deep-drawn, sealable and sterilizable; filling and sealing machines	Alcan Ohler GmbH, Division Ohler Verpackungen, D-5970 Plettenberg-Ohle, FRG
40 Combitherm HXX (gasproof composite film with heat-stable exterior and interior polypropylene layer)	Wolff Walsrode AG, Postfach, D-3030 Walsrode 1, FRG
41 Packaging machines: Multivac M855D, R 7000	Multivac Packaging Machines, Multivac Export AG, Falkenweg 9, CH-6340 Baar Switzerland
42 Range of complete meals	Quality Cuisine Oliver McMonagle, Unit 9B, Campsie Real Estate, McLean Road Eglinton, BT47 3PF.
43 Range of frozen foods	FRESHBAKE FOODS GROUP P.L.C., Crayfield House, Main Road, St. Paul's Cray, Orpington, Kent BR6 0DY, UK.



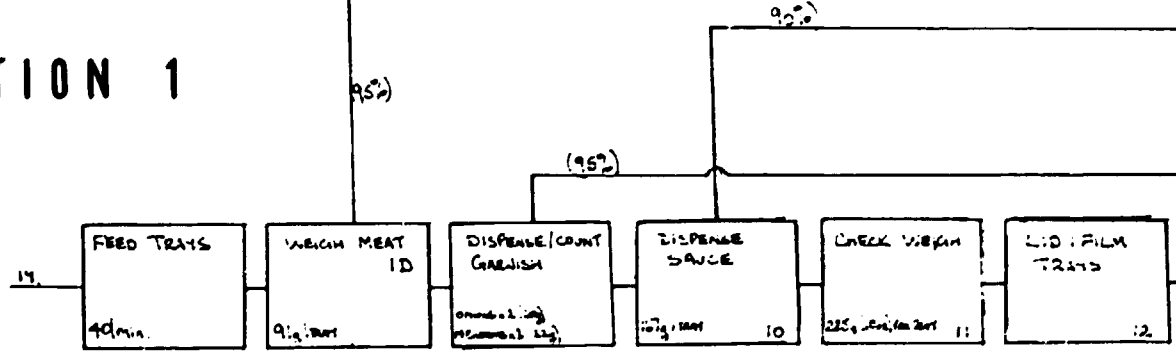
VESSEL 1
 COOK / COOL BEEF
 CYCLE TIME 1 1/2 hrs.
 TOTAL BEEF 10 5/8 (1000 lbs)
 FROZEN BEEF 2500 (2500 lbs)
 REST COOKING TIME 1 1/2 9A

SEPARATE MEAT STOCK

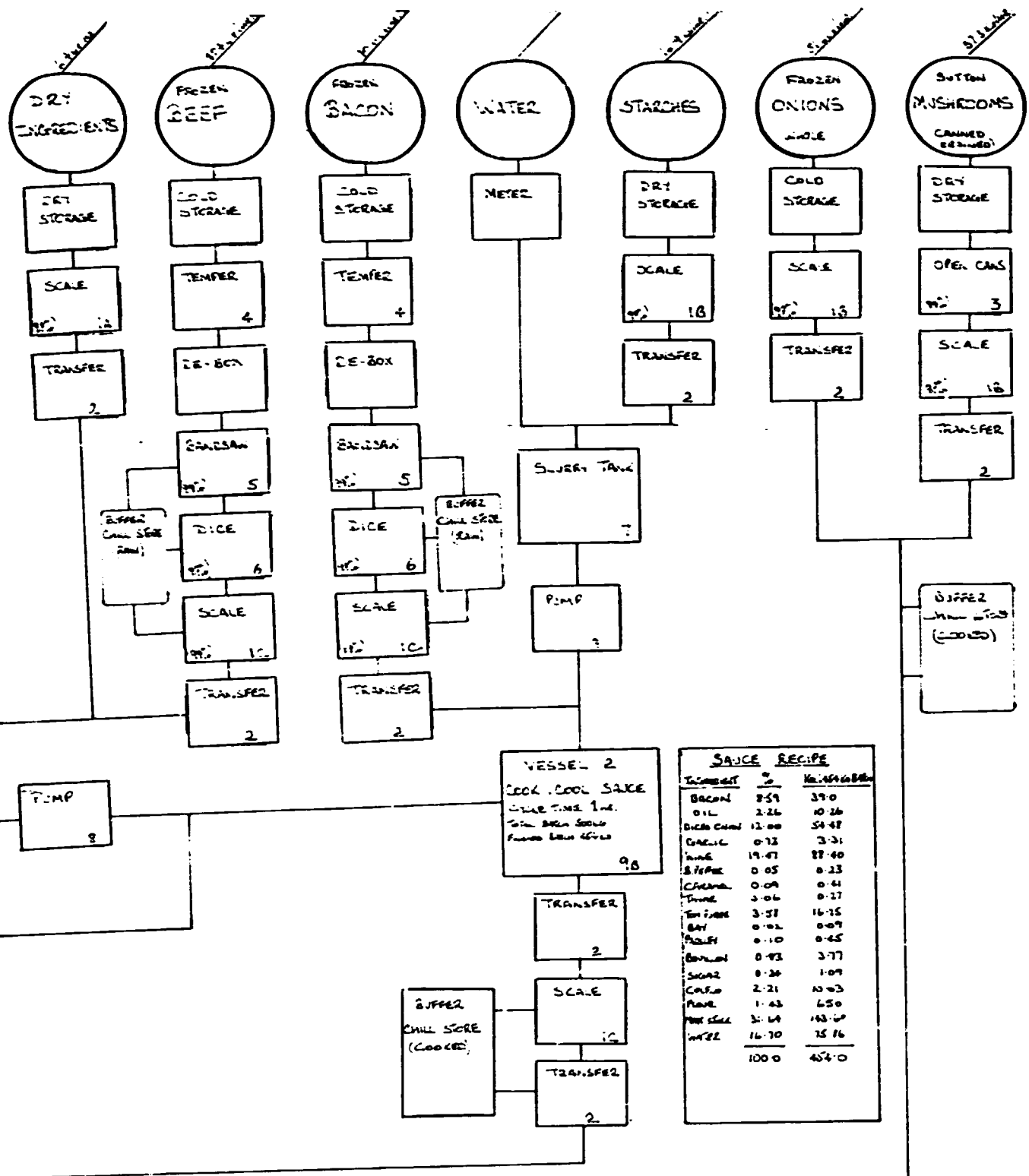
UPPER CHILL STORE (COOLED)
 SCALE 10 2
 TRANSFER
 SCALE 18 2
 TRANSFER

HOLDING TANK 14
 PUMP 8
 PUMP 8

SECTION 1



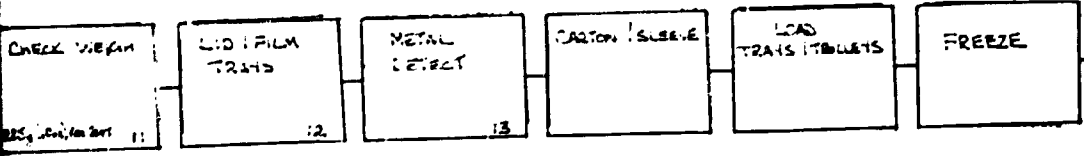
BEEF BOURGUIGNOIS



SAUCE RECIPE

Ingredient	%	Weight (kg)
BACON	8.59	39.0
OIL	2.26	10.26
DICE BEEF	12.00	54.48
Garlic	0.73	3.31
WINE	19.47	87.40
STARCHES	0.05	0.23
CHEESE	0.09	0.41
THYME	3.06	0.17
Tom Paste	3.57	16.25
BAV	0.02	0.09
Powder	0.10	0.45
Bouillon	0.83	3.77
SUGAR	0.24	1.09
CAROL	2.21	10.03
FLAV	1.43	6.50
WATER	3.14	143.47
WATER	16.70	75.76
TOTAL	100.0	454.0

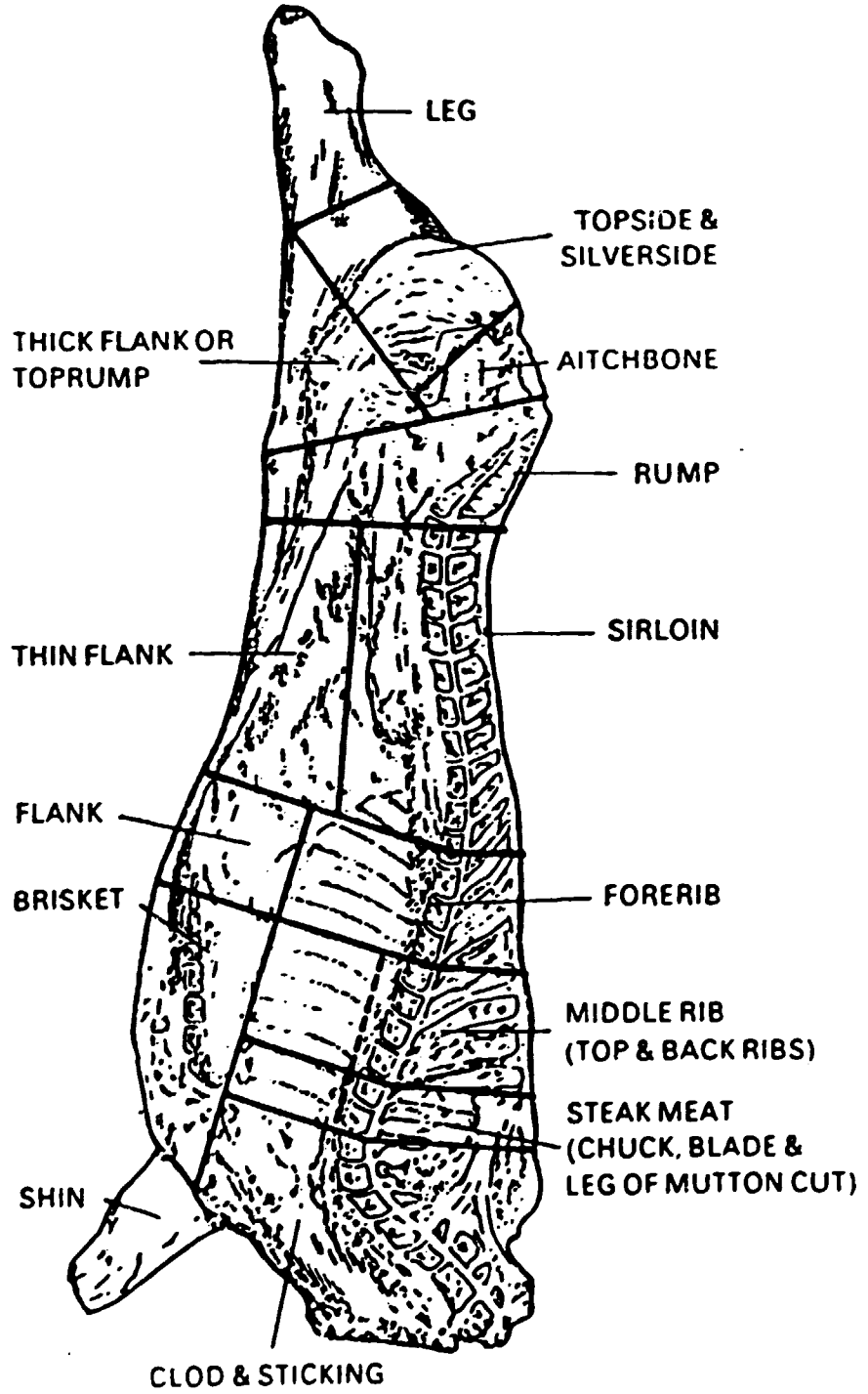
SECTION .2



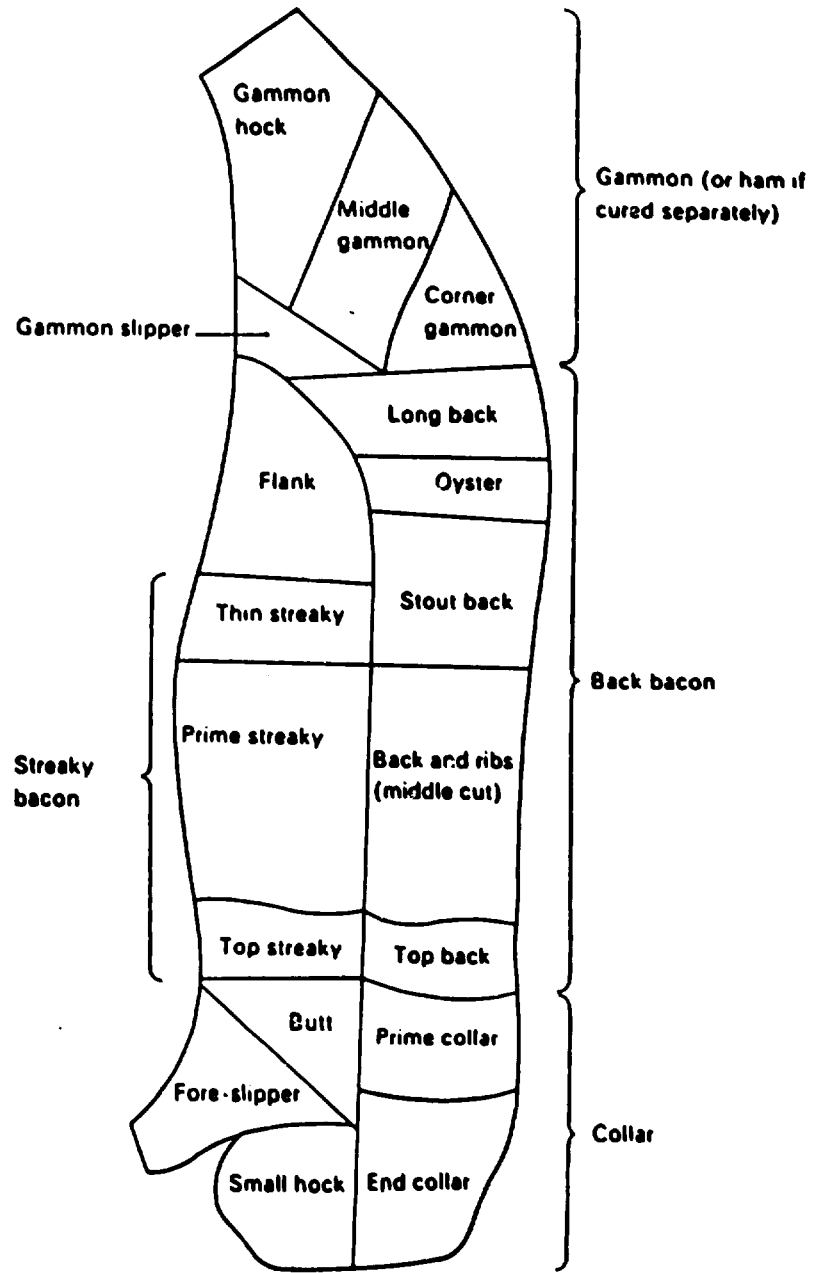
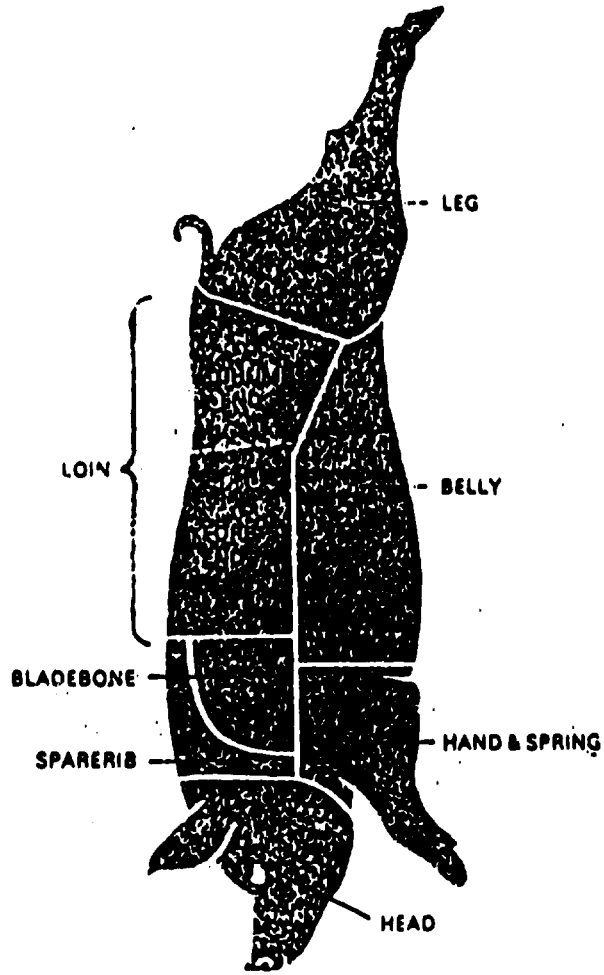
LINE CAPACITY
 1/2 Tonne PER HOUR
 1704 Pcs/hr. TARGET (75% PERFORMANCE)
 2400 Pcs/hr. ACTUAL
 40 Pcs/min

BEEF BOURGUIGNONNE

BEEF 'JOINT' DEFINITIONS



BACON 'JOINT' DEFINITIONS



RAW MATERIAL SPECIFICATION

MATERIAL

SUPPLIER

(Typical, if relevant)

A. APPEARANCE

B. TASTE

C. ODOUR

D. FOREIGN MATERIAL

E. TYPICAL DEFECTS

F. OTHER CHARACTERISTICS

G. ANALYTICAL STANDARDS

H. BACTERIOLOGICAL STANDARDS

	<u>Target</u>	<u>Maximum</u>
T.V.C.		
Staph. Aureus		
E. Coli 1		
Cl. Welchii		
Salmonella		

I. PACKAGING

N.B. The outside of the container must clearly indicate the exact nature of the contents and supplier.

J. RAW MATERIAL QUALITY

Initial investigation should reveal no visible evidence of moisture, foreign material, infestation, mould or fungal growth.

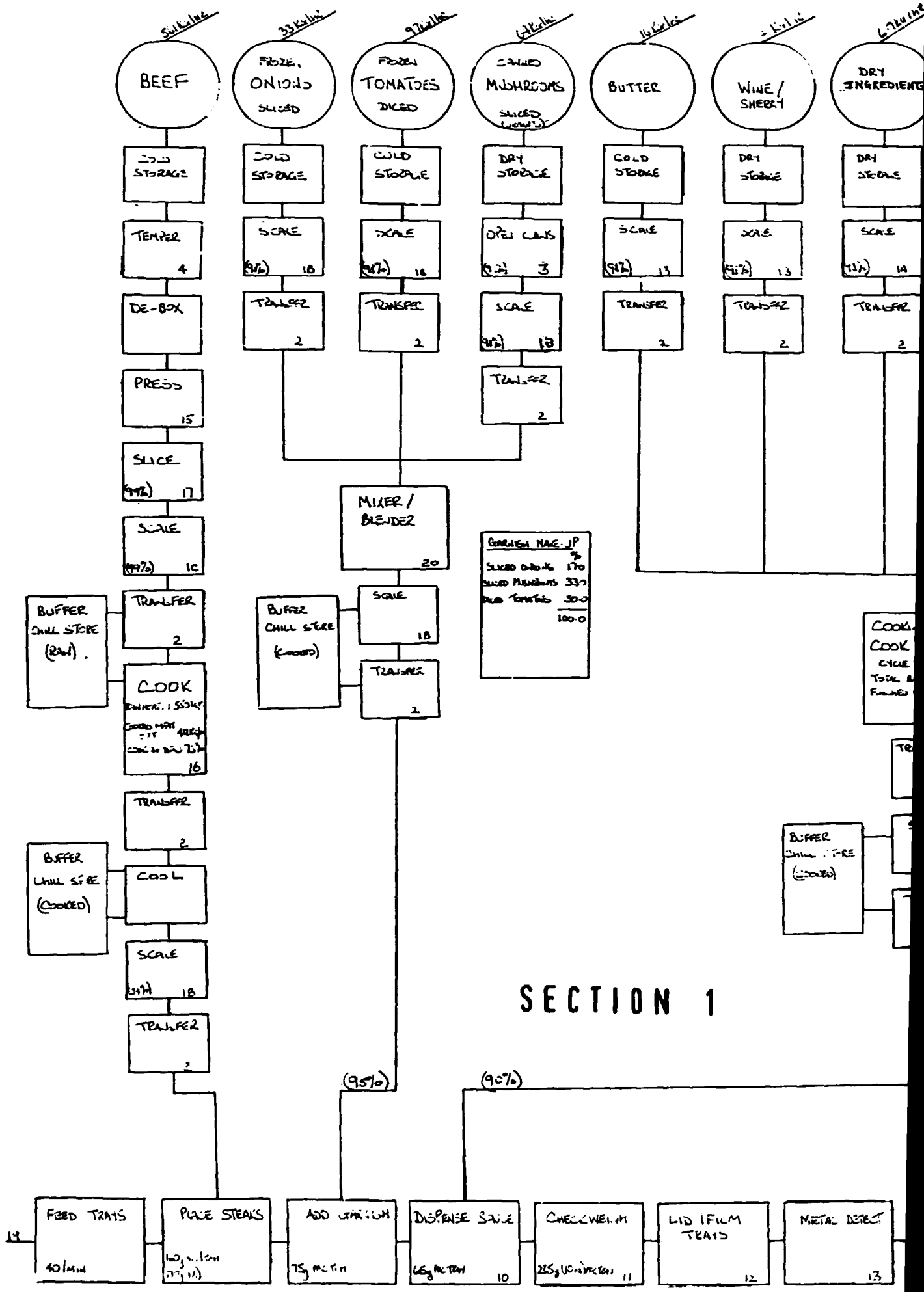
K. STORAGE LIFE/PARAMETERS

months if stock in a cool, dry place in unopened containers. Protect from extremes of temperature and store on pallets away from walls to allow access for pest control operations.

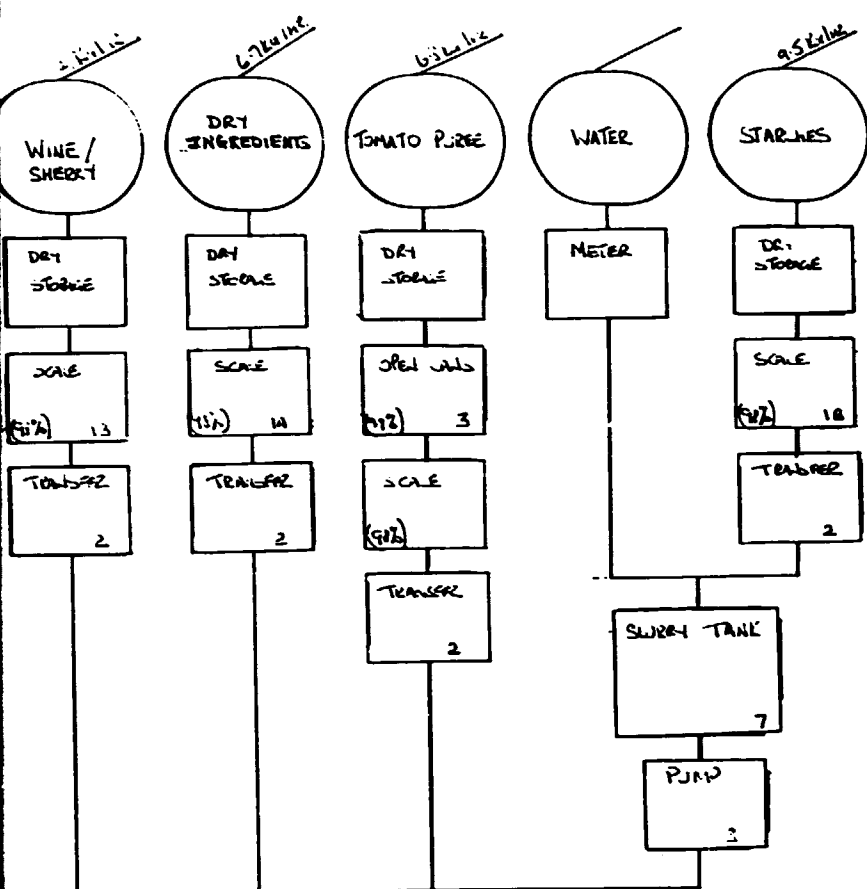
If stored for longer than recommended period, the material should be re-evaluated before use.

L. TRANSPORT

Delivery vehicles should be clean and free from undesirable odours. The materials will be adequately loaded and protected against the environment.



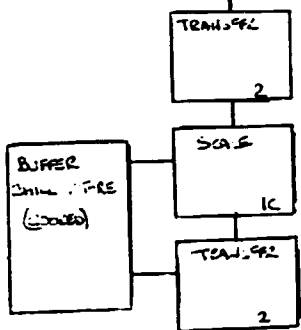
STEAK CHASSEUR



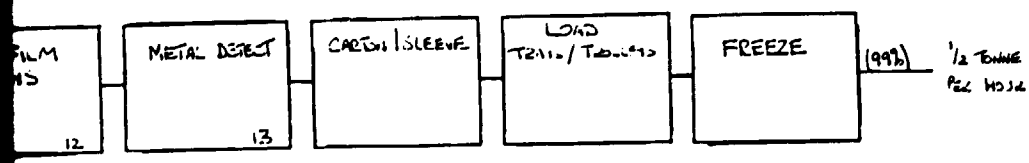
COOKING VESSEL
COOK / COOL SAUCE
CYCLE TIME 1 1/2 HRS
TOTAL BATCH 500 LBS
FURNED BATCH 100 LBS
98

SAUCE RECIPE

INGREDIENT	%	Wt. in LBS
BUTTER	9.0	40.9 LBS
BONEMARROW	1.7	7.7
SUGAR	0.3	1.3
TOMATO PUREE	3.8	17.3
SALT	1.1	5.0
WATER PUREE	0.2	0.9
D. PEPPER	0.2	0.9
PARSLEY	0.2	0.9
BASIL	0.04	0.2
THYRAEON	0.17	0.8
W. WINE	20.0	90.9
BAH	0.04	0.2
SHERBT	3.2	14.5
ONION	3.5	15.7
FLOR	1.4	6.4
WATER	54.8	248.7
	100.0	454 LBS

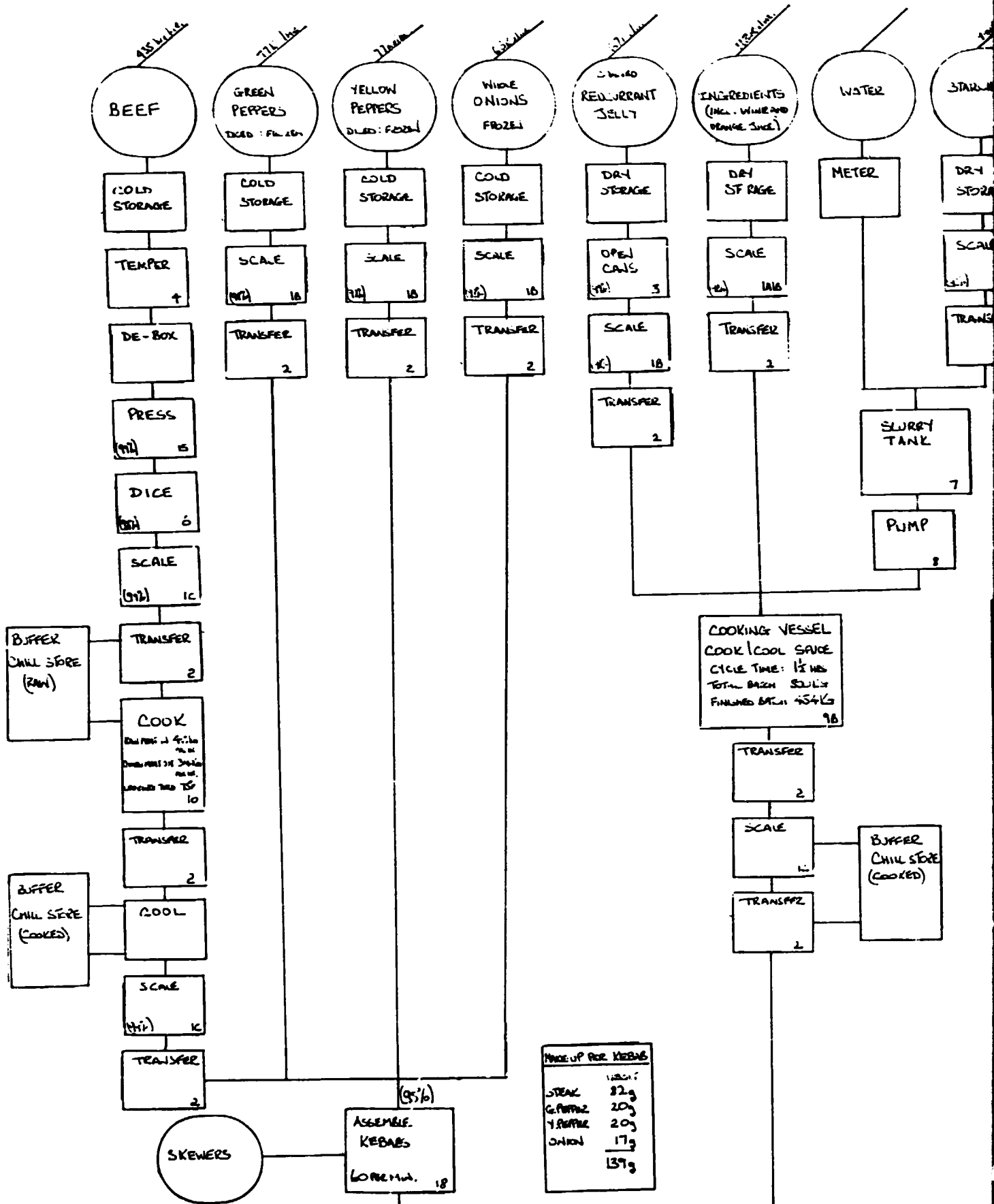


SECTION .2

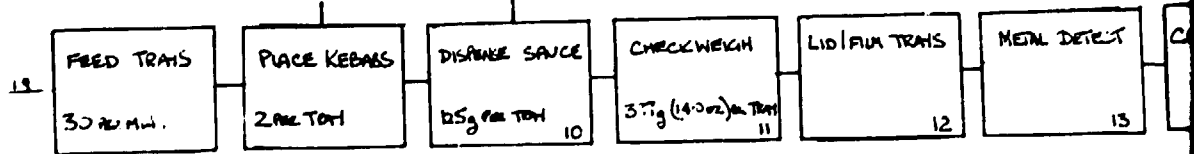


LINE CAPACITY
1800 PAKS PER HOUR
20 PAKS PER MINUTE
2400 PAKS PER HOUR
40 PAKS PER MINUTE

TAGLET
(7) J. T. T. M. S.
ASSUM

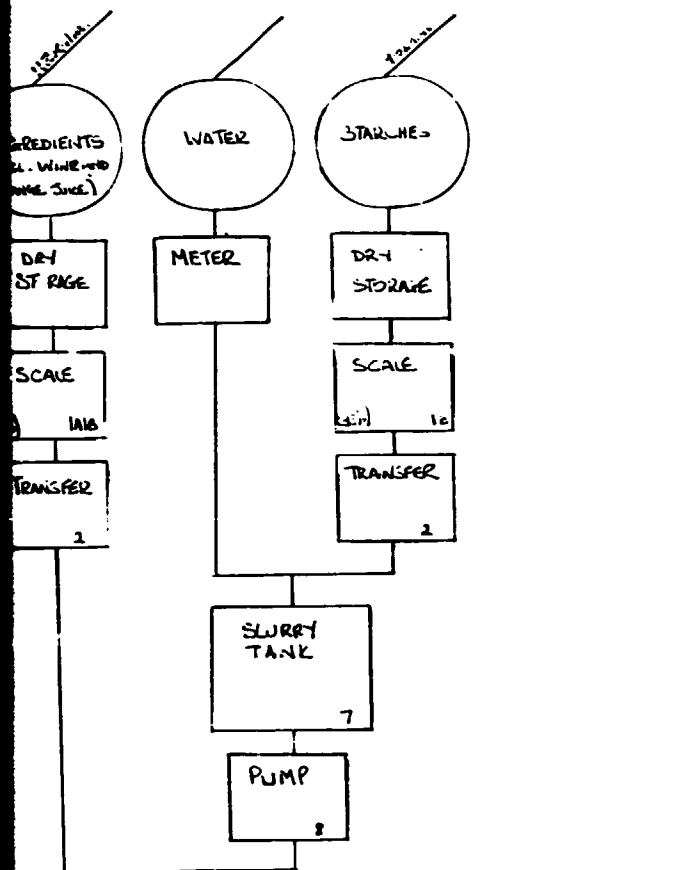


SECTION 1



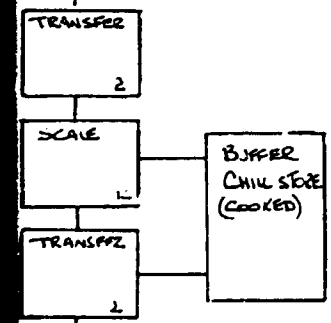
KEBABS

ATTACHMENT 7
BEEF KEBABS
FLOW CHART

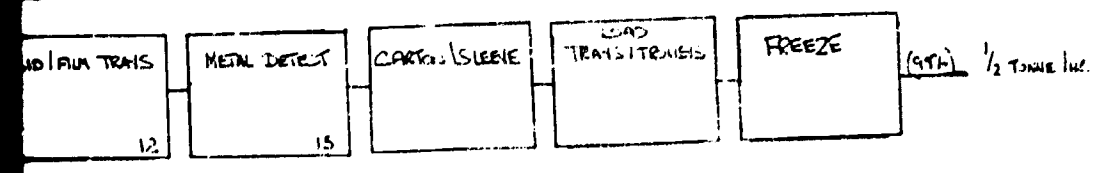


WORKING VESSEL
COOL SAUCE
COOL TIME: 1 1/2 HRS
WINE SAUCE
WINE SAUCE 454 Kg
96

SAUCE RECIPE		
INGREDIENT	%	WEIGHT KG
WINE	4.0	18.2 -
WINE	17.26	77.4 -
WINE SAUCE	0.25	0.9 -
OIL	3.05	13.7 -
BONLON	2.98	2.2 -
W. SAUCE	0.32	1.4 -
WINE SAUCE	25.90	117.6 -
CRACKER SAUCE	11.53	65.8 -
PEPPER	0.02	0.1 -
PARSLEY	0.08	0.4 -
SALT	0.04	0.2 -
LEMON JUICE	0.25	1.1 -
SOY SAUCE	3.60	16.3 -
CORNFLO	3.50	15.9 -
WATER	26.40	119.2 -
	100.0	454 Kg

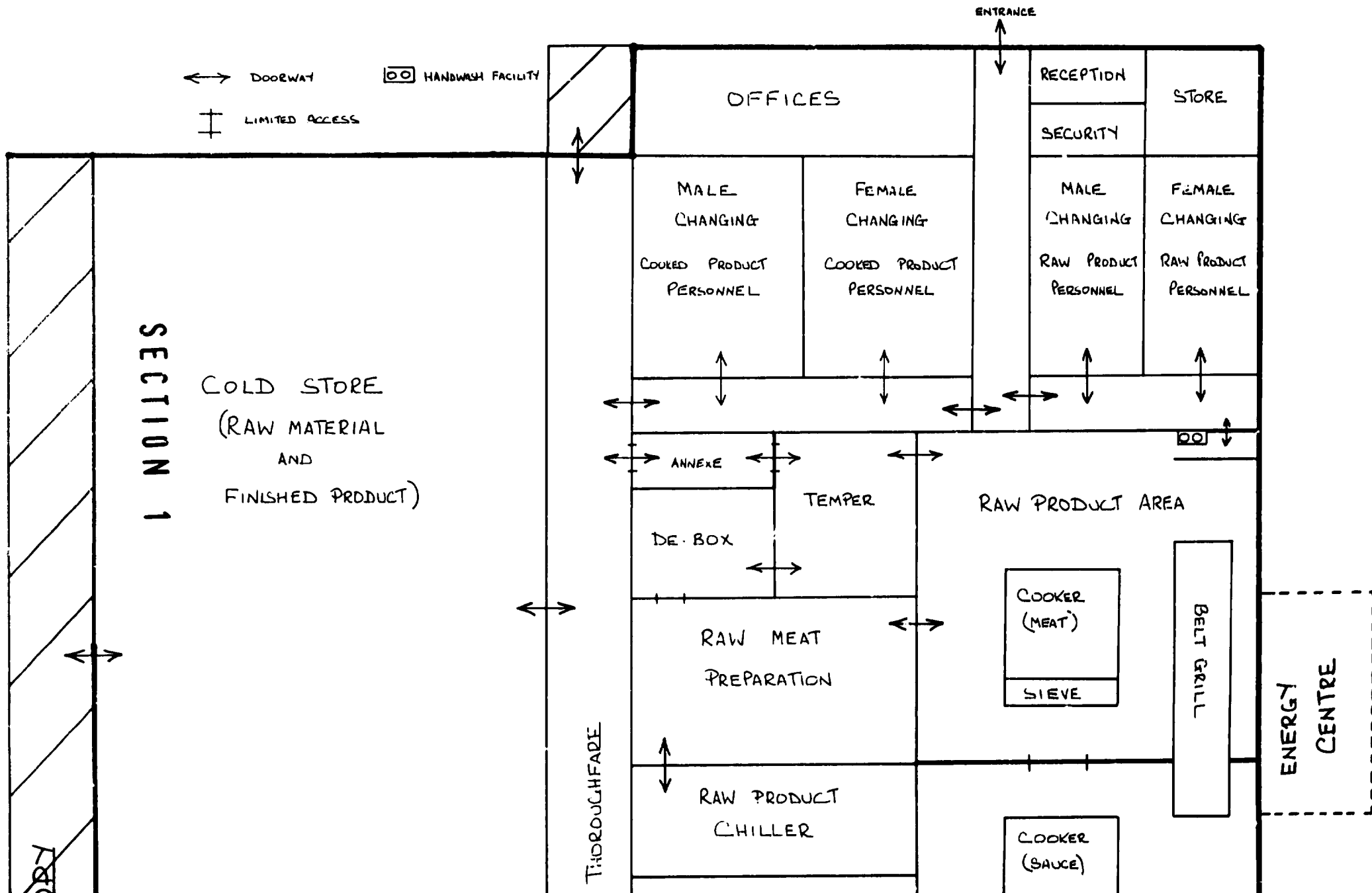


SECTION .2

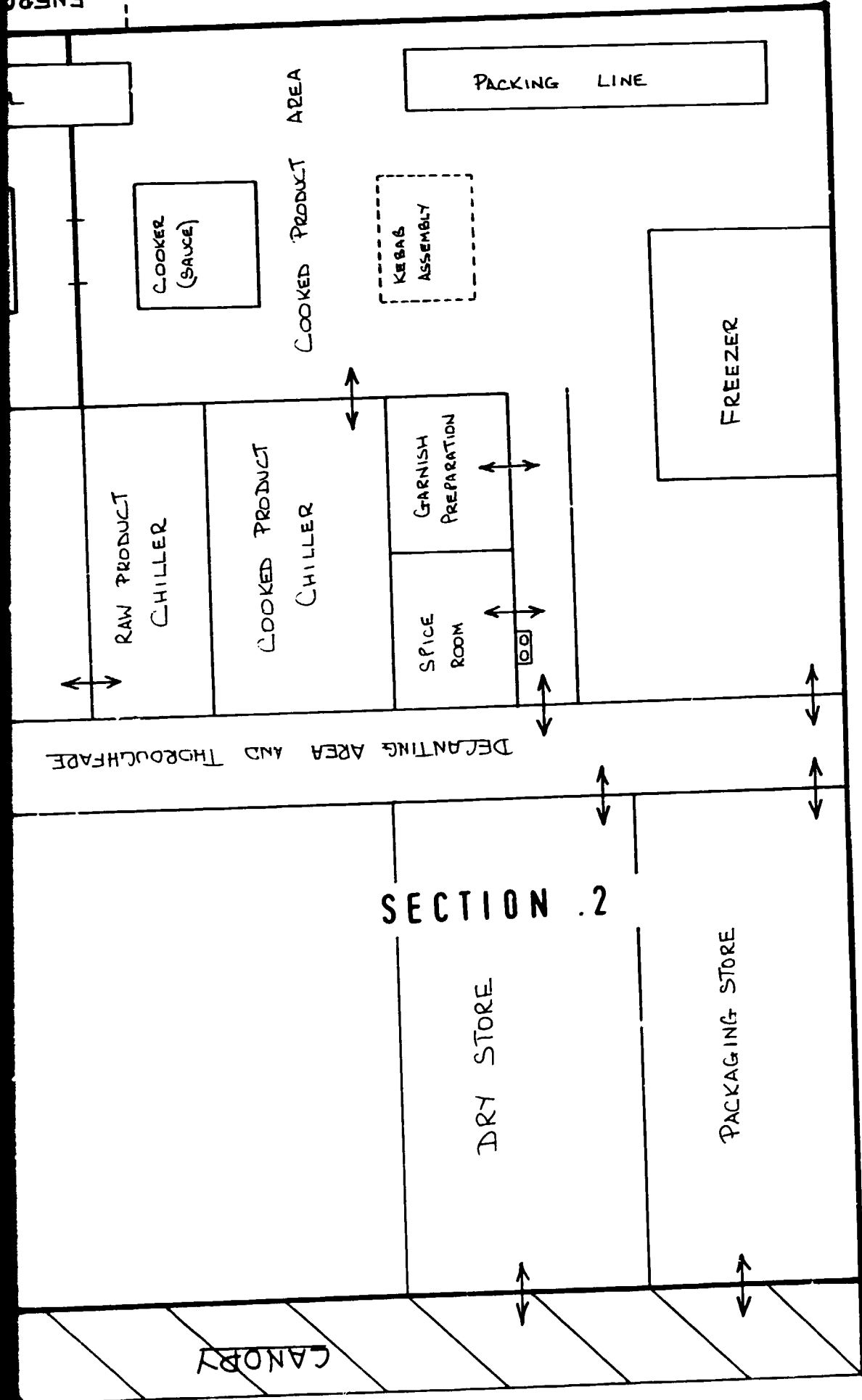


LINE	SAMPLE	TARGET	ACTUAL
1260	PACKING		
21	PACKING		
1800	PACKING		
30	PACKING		

KEBABS



ENERG
GEN



POTENTIAL FACTORY LAYOUT

UNITED NATIONS



ATTACHMENT 9

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNIDO

August 1986

Request from the Government of Uruguay

for Special Industrial Services

JOB DESCRIPTION

SI|URU|85|801|11-01|J13103

Post title Meat Processing Technologist

Duration 1.2 man-months (35 working days)

Date required As soon as possible

Duty station South Humberstone, England (home base)

Purpose of project To identify the potential varieties of processed meat products (non-aphthousic - free from foot and mouth virus) to be developed for export during the forthcoming years, based on the availability of raw materials and the demand of the foreign markets, to determine the technology to be applied and to design meat product samples for the meat processing lines.

Duties

The Expert will be working at a research institute in England and will be responsible for:

- The development of different processed meat products;
- Studying the feasibility of exporting Uruguayan processed meat products to the USA, Europe and Japan, which includes:
 - the study of frozen and sterile packs of different meat quality standards;
 - the definition and specification of technological processes, recipes and necessary food ingredients;
 - the technical specification and cost of plant equipment and necessary packaging.
- The Expert will also be expected to prepare a final report, setting out the findings of his work and his recommendations to the Government.

Qualifications

Food Technologist or Food Engineer with specialization in meat processing, specifically in research and development (R+D) of new products; knowledge of the international market for meat products is also essential.

Language

English. Spanish desirable.

Background Information

The present situation and the short-term perspectives for Uruguay to sell its meat on international markets are very critical. The differences existing nowadays between the prices achieved for apthousic and non-apthousic meat have lately increased considerably. This means that - while the countries producing meat free of apthous obtain US\$ 1,780 FOB for the meat manufactured without bones, Uruguay is having problems in getting US\$ 600 FOB for similar merchandise. Taking the average of the last five years, the Uruguayan meat exports show that only 2 % of what has been embarked on has been commercialized to countries free of apthous, under the form of processed meat. At the same time, throughout the years, meat without bones of up to 60 % of the total of the system of draw-back exports has been sold to Brazil to be industrialized there and re-exported by Brazil to non-apthousic markets, with a corresponding loss of the value added.

Facing this situation and foreseeing that in future years the EEC will continue its policy of subsidizing and intervening actively in the exports of this product to markets which were traditionally supplied by Uruguay, an imaginative and aggressive strategy must be adopted in order that the exports of Uruguayan meat to apthous-free markets be increased.

Presently the Uruguayan cold-storage industry is suffering a considerable deficit in the industrialization of processed meats. Only two of the already working 35 plants have the proper installations for the processing of corned beef and only one for cooked/frozen meat. This limits the possibilities of obtaining access to the countries of the non-apthousic circuit, which apply the theory of "zero-risk" (USA, Canada, Japan, Scandinavian countries, Korea, etc.) to a volume of only 2 - 4 % of the total of the meat exports of the country.

In the short run the Uruguayan Government has decided to give an impulse to the construction of centres for processed meat where technology is applied which guarantees the destruction of the apthousic virus and which would allow Uruguay to compete in the non-apthousic markets with a minor cost of industrial reconversion and avoiding idle capacities of the plants by an adequate planning strategy. For this reason it is necessary to clearly determine which varieties of products will have to be industrialized in the forthcoming years according to the market demand, taking into consideration products such as cooked and frozen veal, sterilized meat products in the different kinds of packaging, oriented towards retail sale or the industrial processing market, dehydrated meat, ready-cooked dishes, etc. In this sense, the Government estimates to reach within a three year period a minimal structure of 50 % of processed meat with the consequent benefit of a major employment of the value added to the products. Diversification of the offers and with the possibility of obtaining better prices. To this effect the central plants for processed meat will have the flexibility which will allow the production of varieties of products which will be better suited for the requirements of the market.

RESTRICTED

16983
(2 of 2)

DP/ID/SER.A/837/Add.1
20 May 1987
ENGLISH

IDENTIFICATION OF ALTERNATIVE MEAT PRODUCTS FOR EXPORT

SI|URU|85|801|11-02

URUGUAY

Technical report: Outline of proposed processing and marketing policy for
Uruguayan FMD beef for domestic consumption and for export *

Volume II

Prepared for the Government of Uruguay
by the United Nations Industrial Development Organization,
acting as Executing Agency for the
United Nations Development Programme

Based on the work of Jimmy T. Keeton,
Meat Industry Expert

Backstopping Officer: B. Galat, Agro-based Industries Branch

United Nations Industrial Development Organization
Vienna

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FOREWORD

The report of this project 'Identification of Alternative Meat Products for Export' is consisting of three volumes, two dealing with the technical aspects of the project and one with the marketing aspects; it has been prepared by three experts, one meat processing expert, one meat industry expert and one meat industry economist.

Volume I is one of the technical parts and has been prepared by Mr. Robert B. Sparnon at the home base in England. It is dealing with the appropriate technologies/techniques for suggested treatment of FMD meat in Uruguay and describes the new beef product samples suitable for local consumption and for export. Subjects like e.g. product identification, development of product recipes, product costings, manufacturing instructions, the factory equipment required and the potential factory layout are being dealt with in that volume.

Volume II is the other technical part prepared by Mr. Jimmy T. Keeton partly in Montevideo and in the USA. This part is dealing with the outline of the proposed processing and marketing policy for Uruguayan FMD beef for domestic consumption and for export. In connection with the development of value-added (for export) processed meats the processing facilities and processing requirements for certain meat products, the changes required to advance the meat industry in Uruguay are subjects which are being dealt with in that volume.

Volume III is the marketing report and has been prepared by Ms. Shirley M. Holt, whose duty station was Montevideo but who also coordinated the work of the other expert in England. The marketing report is dealing with the marketing aspects of the specially treated Uruguayan FMD virus free beef products for export to Europe, USA or Japan. Subjects like e.g. identification of the market, constraints, the situation of the Uruguayan meat industry, the packaging of meat products, the marketing of frozen meat products, the marketing chain or the commercial feasibility of the project are being dealt with in that volume.

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Technical report: Outline of proposed processing and marketing
policy for Uruguayan FMD beef for domestic consumption and for export

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INTRODUCTION

Objectives of the Mission:

Broad

To increase the economic output of the national livestock production and of the meat processing industry through the development of alternative industrial processing methods of meat products free from foot-and-mouth disease virus (FMD) and destined for export.

Specific

To identify the potential varieties of processed meat products, free from FMD, to be developed for export during the forthcoming years, based on the availability of raw materials and the demand of the foreign markets.

To determine the technology to be applied and to design meat product samples for the meat processing lines.

Summary and Recommendations to Achieve Objectives

The following conclusions and recommendations are based on observations made after visiting representative meat plants producing products for the export market and after discussions with key government officials, industry personnel, industry support groups and university faculty.

Short Term

1. Listed below are categories of value-added processed meat products which can be exported immediately from Uruguay under existing USDA regulations. These products may be stored for extended time periods without spoilage or product deterioration and most will fit into niche markets. Detailed formulations, processing procedures, product specifications, equipment requirements and packaging needs are given in Appendix A.

Cured, Dried

Beef Jerky
Dry-Cured Beef
Dried Beef for Slicing
Tasajo

Fermented Dry Sausages

Beef Sticks
Beef Logs
Pepperoni Sticks
Pepperoni

Fully-Cooked, Frozen

Sliced Roast Beef
Meat Balls in Gravy

Canned Product

Meat Toppings and Fillings
Meat Balls in Spaghetti Sauce
Beef and Macaroni in Cheese Sauce
Beef Noodle Dinner
Chili Con Carne (with and without beans)
Ground Beef in BBQ Sauce
Creamed Chipped Beef
Beef Stroganoff
Beef and Gravy
Roast Beef Loaf
Jellied Corned Beef Loaf

To increase meat exports efforts should be made to:

2. Develop prototype value-added products in existing processing plants for presentation to prospective clients or at trade shows (Appendix A and E).
3. Identify niche markets for processed products by contacting individual companies (such as convenience store chains), food brokers, commercial grocery and restaurant suppliers, trade associations and small fast-food chains (Appendix C).
4. Develop colorful brochures with product specifications, possible formula modifications and approximate cost to accompany letters of inquiry to prospective customers. Include product samples of prototypes if possible.
5. Promote products by attending one or two key trade shows in the USA and Europe annually (Appendix C). Have products available for demonstration and testing.
6. Identify new markets in economically emerging countries and provide samples of prototype products at market outlets in population centers.
7. Conduct market surveys among food brokers to determine which products are in demand or have potential for development. Participate in joint surveys such as those underway with Canada.
8. Follow new product trends and current technology by subscribing to trade magazines such as: Meat Industry, Meat Processing, Food Processing, Prepared Foods and Food Engineering. Add additional meat textbooks, technical articles, supplier booklets, market news publications and scientific journals to the INAC library (Appendix D).
9. Obtain new product formulations from ingredient suppliers, equipment companies or modify existing recipes to meet product needs.
10. Send selected personnel to USA or Europe (to universities or research institutes) for specialized training in product development, application of state-of-the-art technology, in-plant visits and to establish relationships with various suppliers. Alternative: employ expert consultants to train Uruguayan industry personnel within existing facilities such as the new LATU laboratories.

Long Term

1. Work toward eradication of FMD in the countries surrounding the Rio de la Plata. Establish a regional monitoring program to ensure compliance with eradication efforts and protect against possible outbreaks of FMD.
2. Continue foot-and-mouth disease virus (FMD) research to identify processing conditions which inactivate the virus in muscle tissue. Initiate collaborative studies with other research centers to confirm results and publish findings in peer reviewed scientific journals.
3. Consider developing the following value-added products for export if minimum heating limits are lowered.

- a. Beef entrees for frozen dinners (fully cooked, microwavable)
 - Beef Stroganoff
 - Beef and Macaroni or Rice
 - Chopped Beef for BBQ
- b. Batter/Breaded Beef Sticks (fully cooked, heat and serve)
 - Batter/Breaded Beef Nuggets
- c. Cured, Meat loaves and beef pies (fully cooked, microwavable)
- d. Coarse ground, low-fat cured sausages
- e. Emulsified sausages, low-fat

4. Establish a Meat Research Institute (MRI) by combining personnel from MGAP, INAC, LATU and the University of the Republic into a new agency whose primary goals would be to provide scientific and technical solutions to common problems in the meat industry and to promote products for export and domestic consumption.

5. Elect a Board of Advisors made up of representatives from MGAP, INAC, LATU, CIF, ARU and the University of the Republic to establish priorities for the MRI. Develop a five-year plan with specific short term and long term goals to be accomplished. For example, within six months develop a low-fat, fermented beef sausage, listing product specifications and label requirements.

List of key people visited:

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Appendix A

Development of Value-Added Meat Products
For Uruguay

Short Term

Because of the present economic circumstances of Uruguay, there is a critical need for increasing the value of meat exports from Uruguay on the international market. Price differences vary considerably for beef free of foot-and-mouth disease virus (FMD) versus beef which has had potential exposure to the disease. Value-added meat products which are suitable for export must be developed to conform to existing USDA regulations regarding heating or curing treatments which inactivate FMD. The reason for this strategy is obvious since many importing markets require that meat from countries with endemic foot-and-mouth disease (FMD) meet the same inspection criteria as those for the U.S. market. The likelihood of changes occurring in the U.S. inspection regulations in the near future is extremely small. However, existing processing technology is available in Uruguay to produce certain value-added products which could increase the export value of Uruguay's raw beef material.

Availability of Raw Materials

Approximately one and one-half to two million head of cattle are slaughtered annually representing 333,426 metric tons (MT) of beef available for domestic consumption and export. At present, only 120,455 MT of beef are exported as chilled (18,049) or frozen (102,406) cuts while 9,506 MT of canned corn beef and 3,538 MT of precooked beef are shipped annually. In 1985, exports of beef represented approximately 40% of the total annual production, but value-added products represented only 10% of total exports.

Two types of cattle are available for use as raw materials, primarily Hereford and Holstein but others such as Angus, Charolais and other European breeds are growing in popularity. Current cattle production practices consist of non-intensive forage feeding with no grain supplementation which produces a market weight animal (473.5 kg) ranging in age from 3.5 to 4.5 years. Most market animals are steers or heifers, and cows not kept as herd replacements. Seasonal marketing and slaughter are typical practices which last from December to June with some plants closing during the off-season. Some packers and processors have frozen storage capacity to hold carcasses for further processing during the slow slaughter period (July to November). If further processed products are developed for export, these must be capable of being held for extended time periods to prevent spoilage and retard product deterioration.

Improved marketing arrangements between cattle producers and packers could extend the supply of fresh beef available for export. At present, market prices are largely influenced by domestic supply-and-demand with the producer receiving the prevailing price based on competition within the market. Under the present system, the meat packer must first secure an export contract and then compete for cattle sold domestically. Both producer and packer could benefit from purchase agreements for cattle if the return to each were based on a proportion of the final product value. On the other hand, agreements between producers and packers for a specified number of cattle to be supplied the following year could be arranged so that each would have some security for their investment. The producer would have a guaranteed income while the packer would have an available supply of cattle for products. However, there are limited incentives for changing the current production or marketing practices.

Beef raw materials for further processing consist primarily of lean,

boneless cuts with little surface fat. External fat is noticeably more yellow in comparison to U.S. beef. Most export products consist of chilled or frozen, boneless, vacuum packaged beef cuts, precooked-frozen roasts or canned corn beef. Each of these products make up 90, 2.6 and 7.1%, respectively, of the total meat exports. Recently, 3.5% of the meat without bones was sold to Brazil further for processing and re-export with a corresponding loss in value to Uruguay.

A. Processing Facilities

A total of 38 meat plants are approved for producing domestic meats with nine of these approved for EEC export and 15 approved for export under USDA inspection standards. Of the plants approved for export to the U.S., two produce canned, cooked beef; one produces cooked, frozen beef and two process Tasajo.

Four meat manufacturing plants were visited as examples of firms capable of producing value-added products for export. These were:

<u>Meat Plant</u>	<u>Products</u>	<u>Capacity</u>
Frigorífico Matadero Carrasco S.A. Carrasco No. 5-Camino	Fresh and Frozen Beef 80% Export 20% Domestic	750 to 900 head/da slaughter 500 head/da cutting Kosher available
Frigorífico Canelones JUJUY 2644/46 Montevideo	Fresh and Frozen Beef Fresh and Frozen Lamb Canned Corn Beef Beef Extract	700 head/da slaughter
Frigorífico Carlos Schneck S.A. Camino Colman 4598 Montevideo	Fresh and Frozen Beef Sausages for domestic market	300 head/da slaughter
Frigorífico Kumis S.A.	Tasajo 100% Export	14,000-18,000 tons/mo

B. Identification of Products for Export (Value-Added)

Under the current USDA regulations, the following requirements are made of foreign cured or cooked meats from countries where Rinderpest or Foot-and-Mouth Disease exists (Code of Federal Regulations, Title 9, Chapter 1, Part 94.4, paragraph a).

§ 94.4 Foreign cured or cooked meats¹ from countries where rinderpest or foot-and-mouth disease exists.

(a) The importation of cured meats derived from ruminants or swine, originating in any country designated in § 94.1 is prohibited unless the following conditions have been fulfilled:

(1) All bones shall have been completely removed in the country of origin.

(2) The meat shall have been held in an unfrozen, fresh condition for at least 3 days immediately following the slaughter of the animals from which it was derived.

(3)(i) The meat shall have been thoroughly cured and fully dried in such manner that it may be stored and handled without refrigeration, as in the case of salami and other summer sausages, tasajo, xarque, or jerked beef, boullion cubes, dried beef, and Westphalia, Italian and similar type hams. The term "fully dried" as used in this paragraph means dried to the extent that the water-protein ratio in the wettest portion of the product does not exceed 2.25 to 1.

(ii) Laboratory analysis of samples to determine the water-protein ratios will not be made in the case of all shipments of cured and dried meats. However, in any case in which the inspector is uncertain whether the meat complies with the requirements of paragraph (a)(3)(i) of this section, he will send a sample of the meat representative of the wettest portion to the Meat Inspection Division for analysis of the water-protein ratio. Pending such analysis the meat shall not be released or removed from the port of entry.

(b) The importation of cooked meats derived from ruminants or swine originating in any country designated in § 94.1 is prohibited unless the following conditions shall have been fulfilled:

(1) All bones shall have been completely removed in the country of origin.

(2) The meat shall have been heated to such an extent that, upon inspection, the meat will have a thoroughly cooked appearance throughout.

(3) When so directed by the Deputy Administrator, Veterinary Services, such meat shall be consigned directly from the port of entry to a meat-processing establishment operating under Federal meat inspection that has been approved by him for the further processing of such meat. Such meat shall be shipped from the port of entry to the approved establishment under Customs seals or seals of Veterinary Services and shall be otherwise handled as the said Deputy Administrator, Veterinary Services may direct. Seals applied under authority of this section shall not be broken except by persons authorized to do so by the said Deputy Administrator, Veterinary Services.

¹This does not include any meat that has been sterilized by heat in hermetically sealed containers.

Because the market for processed meats is very competitive, Uruguayan products should be developed to fill niches as shelf-stable or frozen meat items. These may include snack foods for convenience stores (or supermarkets), gourmet meats for deli shops or institutional products which are precooked and simply require reheating at serving establishments. Small, specialized markets should be sought so as not to develop a market for which companies in Uruguay would be unable to provide an adequate supply. The following meat products conform to USDA specifications regarding processing treatments adequate to inactivate FMD. These items could be manufactured in Uruguay with existing technology and exported as value-added products in niche markets.

<u>Categories</u>	<u>Target Market</u>	<u>Comments</u>
CURED, DRIED:		
Beef jerky	Snack food, convenience stores	Thin, flat strips
Dry-cured beef	Deli (supermarket), gourmet shops	Similar to Proscuitto ham
Dried-beef for slicing	Snack food, convenience stores, supermarkets	Not the same as dry-cured beef
Tasajo	Ethnic specialty (Mexican & Cuban Community)	Thick, dried beef
FERMENTED DRY SAUSAGES:		
Beef sticks (Pencil sausage) (Starter Culture)	Snack food, convenience stores	Very small diameter, 1 cm (finished)
Beef logs (Starter Culture)	Deli (supermarket), gourmet shops	6-7 cm diameter
Pepperoni sticks	Snack food, convenience stores	Very small diameter, 1 cm
Pepperoni (Starter Culture)	Deli (supermarket), gourmet shops, pizza toppings (fast food)	3-4 cm diameter

<u>Categories</u>	<u>Target Market</u>	<u>Comments</u>
CANNED PRODUCTS:		
Meat toppings and fillings (pizza, tacos, egg rolls)	Institutional or fast food	
Meat balls in spaghetti sauce	Institutional or supermarket	Suitable for small single serving cans
Beef and macaroni in cheese sauce	Institutional or supermarket	Suitable for small single serving cans
Beef noodle dinner	Institutional or supermarket	Suitable for small single serving cans
Chili Con Carne (with and without beans)	Institutional or supermarket	
Ground beef in BBQ sauce (or chopped beef)	Institutional or fastfood	
Creamed chipped beef	Institutional	
Beef Stroganoff	Institutional or supermarket	Suitable for small single serving cans
Beef and gravy	Institutional	
Roast beef loaf	Institutional	
Jellied corned beef loaf	Institutional	
FULLY-COOKED. FROZEN:		
Sliced roast beef	Institutional	Frozen dinners
Meat balls (beef) in gravy	Institutional	Frozen dinners

C. Formulation and Processing Requirements

The following formulations, seasonings processing sequences, equipment and packaging requirements are general procedures and can be modified to accommodate different equipment combinations. One source for some of meat formulations given in this report can be found in the textbook entitled:

Food Products Formulary
Vol. 1 Meats, Poultry, Fish, Shellfish
2nd Ed., 1982
Lucy Long, Stephen L. Komarik and Donald K. Tressler

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Additional information can be obtained concerning formulations, processing sequences, equipment capacities and packaging from individual companies which supply these materials. Many of these companies are listed in the "Suppliers Directory" and "Buyers Guide" published annually by "Meat Industry" and "Meat Processing" magazines.

BEEF JERKY

<u>Product Formula</u>	<u>Amount</u>
Beef Top Rounds (boneless, trimmed of fat)	45.5 kg
Alternates: Beef Bottom Rounds Whole Muscle Shoulder Cuts	
Brine Ingredients:	
Water	37.9 l
Salt	2.3 kg
Sugar (For sweeter flavor, increase sucrose content)	1.3 kg
Hydrolyzed Vegetable Protein	45 g
Hickory or Garlic Flavored Salt	41 g
Liquid Smoke (Optional) 0.5-2.0% or see manufacturer's specification	
Prague® Powder (6.25% NaNO ₂ + 93.75% NaCl)	114 g
<u>Pepper (coarse grind) - Optional; sprinkle on surface before drying</u>	

Processing Sequence

Preparation

1. a. Mix brine ingredients in a vat and chill overnight at 2°-4°C.
- b. Slice fresh chilled beef 0.4 cm thick, 2-3 cm wide with the fiber (not across the fiber). Slice thickness may vary depending upon your product specifications.

Curing

2. Soak meat strips 48 to 72 hrs in chill cooler (2°-4°C); place weight on top of brine to submerge meat pieces. Thicker slices may require longer soaking.
3. Remove strips from brine, place individually (not stacked) on stainless steel mesh racks and sprinkle meat surface with coarse ground black pepper (optional). Top rack may be placed on the strip surface to keep flat during drying.

Processing

4. Dry in the smokehouse at 43°-49°C (110°-120°F) and <20% R.H. for 4 to 8 hrs. Apply hardwood smoke (non-resinous) for 2 hrs. or until desired dark red color is achieved. Exact drying time depends upon type of equipment and moisture/A_w specification of the product.

Alternate Method: Drying chambers may be used. Dry at 32°C (90°F), <20% R.H. with moderate air velocity for 12-18 hrs or as determined by trial studies. Include liquid smoke in the curing brine.

Packaging

5. Cool to room temperature (25°C) and vacuum package immediately. Do not keep unpackaged in moist environment or mold will develop.

Equipment Required
(See Appendix B)

Packaging
(See Appendix B)

Commercial Slicer
Vats (Plastic or Stainless)
Smokehouse
Drying Chamber
Vacuum Packager

Product Specifications (Approximate)

Protein	≥ 20%
Moisture	30%
Fat	6-8%
Shelf-life (Vacuumed)	6 mo.
Color	Cured, dark red
M:P Ratio	≤ 2.0:1
NaCl	3-5%

DRY-CURED BEEF

<u>Product Formula</u>	<u>Amount</u>
Beef Top Rounds (boneless, trimmed of fat) 15 cm thick	45.5 kg
Alternate: Beef Bottom Rounds Shoulder Clod	
Dry-Cure Ingredients	
Salt	1.6 kg
Cane Sugar	0.6 kg
Dextrose	0.6 kg
Allspice	227 g
White Pepper	142 g
Black Pepper	57 g
Nutmeg	57 g
Mustard Seed	15 g
Coriander	14 g
Sodium Nitrate (NaNO ₃)	14 g
Sodium Nitrite (NaNO ₂)	7 g
Total	3.3 g

Processing Sequence

Preparation

1. Blend dry spice-cure mix thoroughly to distribute ingredients. Store in a cool, dry place.

Curing

2. Select 45.4 kg of well-chilled (2°-4°C) beef rounds, rub one-half (1.6 kg) the cure mix over the entire meat surface. Save the remaining mix for application later.
3. Layer rounds on shelves no more than six high; sprinkle extra cure mix on the top of each round before layering. Bottom shelf should be elevated 30 cm above the floor and each shelf raised slightly on one end to allow moisture to drain.
4. Hold rounds 10 days at 2-4°C, then apply the last half 1.6 kg of the cure mix to the entire mix surface. Invert the stacking order to flatten pieces equally.
5. Hold rounds 10 additional days at 2-4°C, then cover the surface lightly with extra cure mix (steps 4 and 5 are called overhauling). Keep rounds stacked for a total cure period of 40-45 days.
6. After curing, soak rounds in tap water for 1-2 hrs to remove surface salt and prevent salt streaking. More soaking time may be needed if salt crystalizes on the surface.

Drying/Smoking

7. Place rounds on stainless steel racks or hang on bacon hooks; preheat smokehouse to 55°C then insert rounds for 24 hrs (after drying 12 hr., apply smoke if desired); gradually raise the temperature to 60°C and hold for 8 hr. Discontinue heat and allow the round temperature (internal) to decrease to 38°C.
8. Remove rounds from the smokehouse, let stand at room temperature for 6-8 hr. Rub round surface with equal parts of ground black and white peppers (optional). Place in plastic or cotton netting.

Drying/Aging

9. Transfer rounds to drying room maintained at 21°-24°C and 65% R.H.; hold for 30 days. Air velocity should be 10-15 changes of air/hr. (slow air movement is necessary to remove moisture and prevent excessive drying).
10. Remove when weight loss (from fresh weight) is >35%. Vacuum package and box for shipment. Products should be shelf-stable at room temperature.

Equipment Required
(See Appendix B)

Packaging
(See Appendix B)

Mixer/blender for spices
Smokehouse
Drying Chamber
Vacuum Packager

Product Specifications

Protein	>22%
Moisture	40-50%
Fat	5-7%
Shelf-life (Vacuumed)	6 mo.
M:P Ratio	<2.0:1
NaCl	4.6%

DRIED BEEF FOR SLICING

Product Formula

Amount

Beef Top Rounds (remove all sinews, gristle, connective tissue and fat)

Kg
45.5

Dry-Cure Ingredients:

Kg g

Salt	1.4	
Sodium Nitrite		7
Sodium Nitrate		28
Sodium Erythorbate		25
Corn Sugar	0.5	

Total Wt./45.5 Kg 1.9 Kg

Processing Sequence

Preparation/Grinding

- 1.a. Blend dry cure mix thoroughly before adding to the meat.
- b. Grind 10% of the round (knuckle) through a 6.4 mm grinder plate; mix with 3% chipped ice and regrind through a 1.6 mm grinder plate.
- c. Grind remainder of the meat (90%) through 38.1 mm kidney shaped grinder plate.

Mixing/Molding

2. Combine meats into a mechanical mixer, add the dry cure mixture and blend approximately 2-3 min.
3. Pack blended meat tightly (to eliminate air pockets) into a meat truck, tub or vat. Hold at 2°-4°C for 3-4 days for curing.
4. Transfer meat mixture to a vacuum mixer and blend under 25" vacuum for 3 min.
5. Stuff meat into a 11.4 cm dia. fibrous casing and press into oblong molds.

Cooking

6. Cook stuffed molds in a preheated water tank (71°C) to an internal temperature of 66°C (requires 3 to 3 1/2 hr).
7. Removed cooked meats from the molds, encase in stockinettes, and transfer immediately to a 66°C preheated smokehouse. Maintain smokehouse temperature 4-5 hrs to dry the beef.
8. Cool product at room temperature 4-5 hrs; transfer to a cooler at 4°-7°C and low humidity for drying and chilling. Yield should be 50% of the fresh weight.
9. Vacuum package as whole blocks or slice and package under inert gas.

Equipment Required (See Appendix B)

Grinder
Vacuum Mixer
Vats, Meat Truck
Vacuum Stuffer
Water Cooker
Smokehouse
Vacuum Packager

Packaging (See Appendix B)

Product Specifications (Approximate)

Protein	>2.
Moisture	<50%
Fat	5-8%
Shelf-life (vacuum)	6 mo.
M:P Ratio	<2.0:1
NaCl	5-7%

BEEF STICKS (Snack Sausage)

Product Formulation

	Kg
Lean beef	31.8
Beef flanks or beef trimmings	13.6

Spice Formulation

	Kg	g
Salt	1.1	
Dextrose		557
Ground white pepper		142
Mustard		113
Monosodium glutamate		113
Paprika		142
Ground caraway seed		57
Nutmeg		28
Cure (Prague® Powder)		85
Sodium erythorbate		25

Starter Culture:

See manufacturer's recommendations for processing temperatures and times depending upon the specific product (See Lactacel® 75 enclosure) in Appendix F.

Packaging, Shipping and Storage

Lactacel® is packaged in 113 g and 170 g polystyrene cups, 24 cups per carton and is shipped in insulated shipping cases packed with Dry Ice (which should be present in the Styrofoam container when shipment arrives). Upon arrival at the plant, Lactacel® should be immediately stored in the coldest freezer convenient for use. When stored at -26°C or below, the shelf-life of Lactacel® is in excess of 6 months.

Lactacel® should never be thawed until just before use. Under no circumstances should it be thawed and refrozen, as this will destroy the greater portion of the product activity.

Labeling

The phrase "Lactic Acid Starter Culture" should be included in the list of ingredients on the label.

Use of Product

Make up sausage mixture as usual, adding the recommended amount of cane sugar or dextrose.

Keep Lactacel® cup at room temperature for 2-3 min and then simply "pop out" culture into a clean, stainless steel container.

Use Lactacel® at the rate of 57g per 45.5kg of meat mix and add product to the appropriate amount of water (see literature). Mix solution until thoroughly thawed.

Add Lactacel®-water solution to meat mix and blend thoroughly.

Stuff sausage as soon as possible and transfer to smokehouse. Begin processing as usual but anticipate a shortened fermentation period (see technical bulletin).

Processing

When Using a Mixer

- 1.a. Grind all meat (coarse) through 12.7 mm plate. Put lean beef in mixer; add the cure, spices, and mix for 1-2 min. Add starter culture in solution and mix for 3-4 min. Blend coarse flanks and trim into lean mixture. Regrind through 2.4 mm plate and stuff into small diameter edible casings.

When Using a Chopper

- b. In a suitable chopper, pregrinding of the meat is not necessary; but care should be taken to obtain thorough mixing of all ingredients and obtain correct particle size.

Stuffing

2. Stuff at a rate to keep smear to a minimum. Emulsion temperature should be -2° to 2°C. A slightly wet table surface will help filled strands to slide.
3. Filled casings may be drape hung on smoke rods to minimize waste space, shrink and to maintain round shape.

Smokehouse Schedule

4. See "Dry sausage Processing Schedule" in the Lactacel® 75 technical bulletin.
5. Vacuum package as individual serving pieces (12 to 28g) and box.

Equipment Required (See Appendix B)

Packaging (See Appen < B)

Grinder or Chopper
Mixer-Blender
Vacuum Stuffer
Smokehouse or Fermentation Chamber
Vacuum Packager

Product Specifications (Approximate)

Protein	20-35%
Moisture	< 30%
Fat	30-40%
Shelf-life (Vacuumed)	6 mo.
M:P Ratio	< 2.0:1
NaCl	3-6%
pH (final)	4.8-5.0

PEPPERONI

Accelerated Process Using Lactacel®

There is a wide variation in the meat and spice formulations used to make pepperoni by various processors. The following represent typical formulations and are offered as potential starting points. These formulations are intended to be adapted to suit individual tastes and availability of material. Similarly, the suggested process can with experience, be modified to produce precisely the product desired.

<u>Product Formulation</u>	No. 1 Kg	No. 2 Kg	No. 3 Kg
Lean pork trimmings		22.7	27.3
50% Lean pork trimmings	34.1		
Beef trimmings	11.4		
Regular pork trimmings		9.1	6.8
Boneless chuck		13.6	11.4

Starter Culture

Lactacel®: 56.7 g per 45.5 kg meat mixture.

Spice Formulation

	Medium		Hot		Mild	
	Kg	g	Kg	g	Kg	g
Salt	1.57		1.4		1.18	
Caraway seed		28				57
Sweet spanish pepper	0.5			227		227
Cayenne pepper		28		227		19
Ground white pepper		85				71
Ground anise seed		9				9
Mashed fresh garlic		14		14		14
Pepperoni pepper			0.5			
White anise seed				113		
Dextrose		340		340		340

Cure Formulation

	g
Sodium Nitrite	7
Sodium Erythorbate	25

Procedure

(Choppers or silent cutters may be used to replace the grinder and mixer indicated below.)

1. Grind beef or lean pork through coarse plate, add salt, add nitrite (in solution) and mix thoroughly.
2. Grind fat pork through coarse plate and add to beef or lean pork.
3. Add spices.
4. Add Lactacel® and mix thoroughly until distribution of the Lactacel® has been achieved. (The thawed Lactacel® should be suspended in cool water).
5. Regrind through 3.2 or 4.8 mm plate.
6. Stuff and move directly to smokehouse.

Smokehouse Schedule

The purpose of the following schedule is to develop a pH value of approximately 5.0 and to dry the product to about 65% of green weight (1.6 to 1 ratio of moisture to protein). A light smoke for part of the schedule can be used.

7. The smokehouse should be set on the "steam cycle" with the dampers closed and the fan on low.
8. Set wet bulb controls at 32°-34°C.
9. When internal temperature of the sausage reaches 32°C, maintain house at the following temperatures and times:

Cycle	Time Hr	Wet Bulb °C	Dry Bulb °C	Internal Temp °C	Approx pH
I	15	32°-34°C	35°-37°C	32°-34°C	4.9-5.1
II	3	49°C	54°C	52°C	5.0

III If heating is the treatment of choice to destroy trichinae, Section 313.10, Paragraphs(C), (i) and (ii) of the Meat and Poultry Inspection Regulations, APHIS, USDA, should be followed to achieve an internal temperature of 58°C or higher. We recommend that the relative humidity be maintained at 70%.

10. Remove sausage from smokehouse and place in dry room. Once the 35% shrink has been achieved (1.6 to 1 moisture to protein ratio) the product is ready for handling and shipping, providing the processing meets the Federal regulations for the destruction of trichinae.
11. Vacuum package as individual logs of pepperoni and store in a cool, dry room.

Equipment Required (See Appendix B)

Packaging (See Appendix B)

Grinder or Chopper
Mixer-Blender
Vacuum Stuffer
Smokehouse or Fermentation Chamber
Vacuum Packager

Product Specification (Approximate)

Protein	25%
Moisture	30-35%
Fat	35%
Shelf-life (Vacuumed)	6 mo
M:P Ratio	1.6:1
NaCl	3%
pH (final)	4.8-5.0

BEEF LOGS

(Made with Lactacel®)

<u>Product Formulation</u>	Kg	ppm
Lean beef	18.2	
Beef trimmings	9.1	
Chuck	18.2	
	<u>45.5</u>	
Spices ¹		78
Nitrite (4 g per 45.5 kg)		
Sodium erythorbate (25 g per 45.5 kg)		550
Sodium chloride (0.9 kg per 45.5 kg)	0.9	
Dextrose (227 g per 45.5 kg)		
Sucrose (1-2% if preferred)	0.9	
Liquid smoked Lactacel® Plus (57 g per 45.5 kg)		57g

¹Commercial spice houses offer excellent spice blends for this type of sausage.

Procedure

See Pepperoni processing sequence for grinding and mixing lean and fat beef portions.

Smokehouse Schedule

Time Hr	Product Temp °C	Smokehouse Temp °C Wet Bulb	RH %
0-4	Initial: 2°C Allow for equil- bration	27°C	90
4-24	27°C pH = 5.2 or less	Raise to 32°C	90
24-25	32°C	Raise to 38°C	90
25-26	38°C	Raise to 43°C	85
26-27	43°C	Raise to 52°C	80
27-40	52°C	Maintain temperature Decrease humidity	70
40-42	52°C		50
42-48	52°C		30

Final pH	4.8-4.9
Final moisture content	48-50%
Final protein content	23-24%
*M/P ratio	2.1 to 1.0

Product made in this way and vacuum packaged can be shipped in the USA without refrigeration; however, it will not tolerate high temperatures, i.e., 38°-43°C warehouse temperatures.

*For lower M:P ratios, increase the drying time to reduce the moisture content.

Vacuum package as individual logs and store in a cool, dry room.

Equipment Needed
(See Appendix B)

Packaging
(See Appendix B)

Grinder or Chopper
Mixer-Blender
Vacuum Stuffer
Smokehouse or Fermentation Chamber
Vacuum Packager

Product Specification (Approximate)

Protein	20-25%
Moisture	40-50%
Fat	25-30%
Shelf-life (Vacuumed)	6 mo
M:P ratio	<2.0:1
NaCl	3-6%
pH (final)	4.8-5.0

Canned Products

Consideration may also be given to processing and packing canned goods into microwavable plastic containers for the snack food market. In addition, many of the formulations would be suitable for the institutional market or as prepared meats for certain fast food outlets.

BROWN GRAVY WITH SLICED BEEF

(Semicold Pack)

Prepare Beef Slices

Use a commercial grade of beef rounds or clods and remove sinews, connective tissues, gristle, and fat. Cut meat into strips approximately 50.8-76.2 mm. Place each strip on the shelf of an open truck in single layers in such a manner that they do not touch each other. Move truck to freezer and keep strips at freezer temperature just long enough to solidify (but not thoroughly freeze) them so they can be sliced on a slicing machine. Slice beef 6.4 mm thick.

Prepare Gravy

Ingredients	Kg	g	ml	l
Salt	6.4			
Pepper (dry soluble, sugar base)	0.5			
Cane sugar	1.8			
Oleoresin celery (water-soluble)		28		
Garlic powder		57		
Hydrolyzed plant protein liquid			473	
Tomato paste (28% solids)				7.5
Caramel coloring			473	
Oleoresin paprika (HCV, water-soluble)		57		
Wheat flour	21.4			
Onion powder	1.8			

Place 208 l of water in a steam-jacketed kettle, apply steam and bring temperature to 82°C. Add all ingredients except the flour and onion powder. Put 56.8 l of water in a bakery mixer and while the machine is running, slowly add the flour and onion powder; mix until the slurry is free from lumps. Add slurry to other ingredients in kettle while mixer is running and bring volume of the gravy up to 265 l. Temperature in the kettle will drop with the addition of the slurry, so bring temperature up to 93°C and keep gravy cooking for 10-15 min.

Pack 60% hot gravy with 40% sliced beef. Close under 15 in. vacuum.

Suggested Process

300 x 409 cans (454 g) 90 min at 116°C
404 x 200 cans (340 g) 60 min at 116°C

Check process times and temperature with can supplier or the National Food Processors Association.

**BEEF AND GRAVY
(Cold Pack)**

(70% Beef, 30% Gravy)

Ingredients	Kg	g
Carcass beef (canner-cutter grade)	159.1	
Wheat flour	8.1	
Pregelatinized wheat flour	2.6	
Salt	3.4	
Onion powder		255
Plant protein hydrolyzate		213
Black pepper (34-mesh)		128
Powdered caramel coloring		128
Monosodium glutamate		43
Water	43.2	
Tomato paste (26-28% solids)	10.5	

Procedure

Dice raw beef into 50.8 mm cubes or grind it through the 38.1 mm plate of the grinder.

Make a uniform mixture of flours, caramel coloring, and flavorings. Put water in a mixer and slowly add the flour-flavoring mixture; run the mixer until gravy is smooth and free from lumps. Then add tomato paste. Place cubed or ground beef in a mechanical mixer and add the gravy mix (68.2 kg). Mix until meat is evenly coated with gravy.

Hand pack in cans. After cans have been filled and before they go through the vacuum closing machine, run a spatula or similar instrument down the side of each can so that any entrapped air on the bottom can be eliminated. Close cans under 27 in. vacuum.

Suggested Process

- 404 x 404 cans (850 g) 2 hr 30 min at 116°C
- 401 x 411 cans (850 g) 2 hr 30 min at 116°C
- 300 x 409 cans (454 g) 95 min at 116°C

BEEF STEW WITH DEHYDRATED POTATOES

Ingredients	%
Trimmed carcass beef	27.4
Beef suet	1.0
Dehydrated potato dice	18.8
Onion flakes	1.0
Carrots, diced	8.4
Peas	6.9
Tomato paste (25% solids)	1.5
Water	23.0
Amioca starch (Clearjel)	1.7
Flour	1.7
Salt	0.8
Black pepper	0.1
Additional water	7.6
Caramel coloring	0.1

Procedure

1. Fill trimmed beef and suet into cans manually.
2. Bring to a boil the following ingredients: the large quantity of water designated in the ingredients (23%), dehydrated potatoes, onion flakes, carrots, peas, and tomato paste.
3. Mix the following ingredients thoroughly in a Hobart Mixer: amioca starch (Clearjel), flour salt, pepper, water (7.6%), and caramel coloring. Add to vegetable mixture and bring back to a boil.
4. Fill over meat in cans, seal, and retort: No. 303's for 90 min. at 116°C; No. 404's for 110 min at 116°C. Check processing times and temperature with can supplier or with National Food Processors Association.

**BEEF STROGANOFF
(Hot Pack)**

Ingredients	Kg	g	l
Braised diced beef, canner cutter grade (181.8 kg raw weight minus 35% shrink)	119.2		
Tomato puree (sp. gr. 1.035)	2.7		
Sour Cream	13.6		
Wheat flour	6.8		
Salt	2.7		
Sliced canned mushrooms	5.5		
Spanish paprika (microfine)	0.9		
Onion powder	0.5		
Monosodium glutamate		340	
Plant protein hydrolyzate		340	
Garlic powder		57	
Dry soluble pepper (salt base)	0.5		
Worcestershire sauce		227	
Sherry cooking wine			0.19
Beef broth and water	86.4		

Prepare Meat

Dice meat into 25.4 mm cubes. Transfer to jacketed kettle. Add 3.3 l of water and braise meat approximately 10 min or until 35% shrink is obtained. If shrink is over 35% adjust it with added beef stock which meat will absorb. Remove meat but hold beef stock in the kettle.

Prepare Gravy

Add 75.7 l of water to beef stock in jacketed kettle. Add puree, sour cream, mushrooms, sherry wine, and all dry ingredients except flour. Raise temperature to 82-85°C.

Make a slurry of 18.9 l of water and flour in a bakery mixer. Run machine until the slurry is free from lumps. Add slurry to sauce mixture and bring volume up to 124.9 l. Cook gravy for an additional 10-15 min at 82°C.

Pack

Pack equal weights of braised beef and gravy in 454 g cans. Close cans under 15-20 in vacuum.

Suggested Process

300 x 409 cans (454 g) 90 min at 116°C

Check process time and temperature with can supplier or the National Food Processors Association.

CREAMED CHIPPED BEEF
(Hot Pack)

Ingredients	Kg	g
Chipped beef	22.7	
Nonfat dry milk	3.6	
Shortening or vegetable oil	5.5	
Wheat flour	8.6	
Salt	1.2	
Dry soluble pepper		171
Monosodium glutamate		142
Ground celery seeds		7
Water to make	151.4 l	

¹See Dried Beef for Slicing

Procedure

Grind beef through the 12.7 mm plate of the grinder. Heat shortening or oil in a steam kettle and add chipped beef. With a wooden paddle, stir meat until the chips are covered with the heated oil. Add half of the water to the kettle; then add salt and seasonings and bring up temperature to 82°C.

In a bakery mixer make a smooth slurry with the remaining water slowly adding the flour and nonfat dry milk. Run machine until slurry is free of lumps. Add slurry to the heated stock with continuous stirring.

Bring volume up to 151.4 l. Keep temperature at 82-93°C for 15 min, or until the product is thick enough to carry the chipped beef in suspension. Can while product is hot. Internal temperature should not drop below 71°C in the cans before they are closed.

Suggested Process

300 x 409 cans (454 g) 90 min at 116°C

Check process time and temperature with can supplier or the National Food Processors Association.

MEAT BALLS IN BROWN GRAVY
(Institutional Pack in NO. 10 tins)

Prepare Meat Balls

The ingredients for meat balls and their preparation are identical with the formula given afterward for Meat Balls in Spaghetti Sauce.

Prepare Gravy

Ingredients	Kg	g
Tomato paste (26-28% solids)	19.1	
Wheat flour	7.7	
Bread crumbs (finest mesh)	5.9	
Salt	3.2	
Toasted onion powder	1.4	
Monosodium glutamate	1.4	

	Kg	g
Garlic powder		227
Ground Jamaica ginger		7
Dry soluble pepper		113
Dry soluble thyme		4
Dry soluble celery		28
Dry soluble mace		7
Beef extract	1.4	
Plant protein hydrolyzate (liquid)	1.4	
Worcestershire sauce	0.9	
Cane sugar	0.9	
Dehydrated caramel coloring	1.4	
Water to make 378.5 l		

Blend flour, bread crumbs, salt, sugar, and seasonings together. Measure 283.9 l of water in a steam-jacketed kettle, add tomato paste, plant protein hydrolyzate, beef extract, Worcestershire sauce, and caramel coloring. Apply steam and, with steady stirring using a "Lightning" mixer, add the bread crumbs-seasoning mixture. Bring volume up to 378.5 l with added water. Raise temperature to 96-99°C and cook gravy 10-15 min with steady stirring.

Fill, Close, Process, and Chill (See Processing Schedule for Meat Balls in Spaghetti Sauce).

MEAT BALLS IN SPAGHETTI SAUCE

Prepare Meat Balls

Ingredients	Kg
Beef chucks, canner-cutter grade	68.2
Beef flanks, trimmed	68.2
Fresh onions	13.6
Frozen whole eggs	6.8
Cracker meal	18.2
Black pepper (62-mesh)	3.2

Grind chucks, flanks, onions, and frozen eggs through the 3.2 mm plate of the grinder. Transfer mixture to a mixer. Start machine and add cracker meal evenly over the mixture. Mix salt with pepper and add to mixture. Mix for 3 min.

Put mixture through forming machine and make into balls, 14 g in size. Dust balls with flour as they come down the conveyor to prevent their sticking together.

Prepare sauce

Ingredients	Kg	g
Tomato paste	154.5	
Cane sugar	20.5	
Wheat flour	9.1	
Cornstarch	4.5	
Bread crumbs	13.6	
Salt	10.5	
Cheddar cheese, aged	6.8	
Garlic powder		170
Onion powder	0.5	

Plant protein hydrolyzate	Kg	g
	4.1	
Black pepper		283
Ground red pepper		113
Ground sweet basil		57
Bicarbonate of soda		227
Imitation cheese flavoring		43
Dry soluble seasoning mixture (see below)	0.5	
Cottonseed or corn oil	5.5	
Water to make 757 l		
Dry Soluble Seasoning Mix	Kg	ml
Oleoresin capsicum		4.00
Oleoresin ginger		1.40
Oleoresin mace		0.16
Oil of dill seed		0.20
Oil of cloves		3.60
Oil of cardamom		0.80
Oil of cassia		2.40
Oil of pimento		26.40
Oil of bay		0.80
Salt to mix	0.9	
Use 4 gm mixture per 0.3 l sauce		

Grind cheese through 6.4 mm plate of the grinder. Blend together sugar, salt, flour, cornstarch, bread crumbs, and seasonings. In a bakery mixer, put 76 l of warm water (60°C) and add ground cheese; make a slurry free of lumps. Put 567.3 l of water in a steam-jacketed kettle, add tomato paste and bicarbonate of soda. Use of "Lightning" mixer and agitate sauce as sugar-seasoning mixture is slowly added; then add cheese slurry and oil with continued agitation. Raise temperature to 82°C, continuing agitation, and add water to bring sauce volume up to 757 l. When temperature reaches 82°C, cook an additional 15 min.

Fill Cans and Process

For 454 g cans, pack 227 g meat balls and 227 g sauce. Close under vacuum and process.

Suggest Process

300 x 409 cans (454 g) 90 min at 116°C.

Check process time and temperature with can supplier or the National Food Processors Association.

BEEF AND MACARONI IN CHEESE SAUCE (Hot Pack)

Ingredients	Kg	g
Macaroni (raw)	45.5	
Beef chucks	81.8	
Cheddar cheese (2 years old)	11.4	
Wheat flour	11.4	
Vegetable oil	2.7	

	Kg	g
Carrots	2.7	
Whey powder	2.7	
Butter	2.3	
Salt	2.7	
Cane sugar	2.3	
Onion powder		227
Sodium citrate	0.5	
Monosodium glutamate		227
Dry soluble pepper (sugar base)		227
Water to make	189.2 l	

Prepare Meat

Grind meat through the 6.4 mm plate of the grinder. Transfer ground meat to a steam-jacketed kettle; add 2.8 l of water and by steady stirring braise meat to effect an approximate 25-30% shrink. Remove from kettle.

Prepare Cheese Sauce

In another vessel, precook carrots until tender, then grind through the smallest plate of the grinder. Grind cheese through the 3.2 mm plate.

Put 37.9 l of water in the jacketed kettle; add sodium citrate, ground carrots and cheese, vegetable oil, butter, and salt which is previously mixed with the seasonings and flavorings. Cook at low temperature (not over 71°C) until cheese is melted and the sauce is smooth. Then add 37.9 l more of water and bring temperature up to 82°C. Add braised meat.

Put 37.9 l of water in a bakery mixer and slowly add whey powder and flour and let mixer run until slurry is free of lumps.

With steady agitation of the sauce, add slurry and bring volume of the sauce up to 189.2 l. Then raise temperature to 93°C.

Prepare Macaroni

Use 3.8 l of water per 0.5 kg of macaroni or 373.5 l for this prescribed batch. Add 2% salt to the cooking water and bring to a boil. Break macaroni sticks into thirds and add to the boiling water. Cook for 12 min. Wash and rinse in cold water immediately after cooking; then drain. Never let the macaroni stand in cold water longer than 30 min. Yield 300%.

Pack

Fill 142 g of cooked macaroni and 312 g hot sauce in each 454 g can. Internal temperature should not drop under 71°C during closing. If this happens close cans under vacuum.

Suggested Process

300 x 409 cans (454 g) 90 min at 116°C.

Check process time and temperature with can supplier or the National Food Processors Association.

BEEF AND NOODLE DINNER

Prepare Meat

Ingredients	Kg	l
Beef Rounds	90.9	
Precooked egg noodles	79.5	
Gravy		189.2

Grind beef through the 25.4 mm plate of the grinder. Transfer to a steam-jacketed kettle and add 7.6 l of water; braise meat until it is free flowing. The shrink will be approximately 30%. Remove meat and save meat juices.

Prepare Egg Noodles

Use best quality egg noodles specially manufactured for canning purposes (12.7 mm width, 10% eggs). Cook in boiling water containing 2% salt for 10 min; then drain and wash. Use 3.8 l of cooking water to each pound of noodles.

Prepare Gravy

Ingredients	Kg	g
Wheat flour	8.6	
Cornstarch	3.6	
Rendered beef fat (oleo stock)	5.5	
Salt	3.2	
Plant protein hydrolyzate	1.4	
Monosodium glutamate	0.5	
Onion powder	2.3	
Garlic powder		7
Ground celery seed		28
Dry soluble pepper		113
Spanish paprika		57
Caramel color (powder)		340
Water to make	189.2	l

Add 94.6 l of water to the beef stock in the same kettle in which the meat was braised. Add remainder of the ingredients except flour and cornstarch. Raise temperature to 71°C. Make a slurry with the flour and cornstarch in 37.9 l of water in a bakery mixer. Add slurry to the hot batch, stirring the gravy with a "Lightning" mixer. Bring volume up to 189.2 l with added water. Raise temperature to 94-96°C and cook gravy for 20 min.

Pack

Fill each 454 g net can with 85 g braised beef, 113 g cooked noodles, and 255 g hot gravy. Close cans. If the internal temperature of the filled cans is 71°C or higher, close cans without drawing any vacuum. If the temperature is lower, close cans under 10-15 in. vacuum.

Suggested Process

300 x 409 cans (454 g net) 90 min at 116°C.
Check Process time and temperature with the can supplier or the National Food Processors Association.

CHILI CON CARNE WITH OR WITHOUT BEANS

Ingredients	Kg	g	l
Beef kidney suet (ground through 1 cm plate)	9.1		
Fresh beef (ground through 1 cm plate)	36.4		
Salt (to taste)	0.5		
Powdered onion (optional)	1.8		
Water ¹			22.7
Chili powder (Gentry)	2.3		
Garlic powder (Gentry "CO") (optional)		128	
Mexican or red kidney beans (optional)	9.1		

¹Tomato juice or the equivalent amount of tomato puree may be substituted in part for the water.

Yield: Approximately 75.7 l without beans; approximately 104.1 l with beans.

Procedure

Render suet either in a steam-jacketed or gas-fired kettle. Remove cracklings. Add meat and salt and cook until the meat is tender and the water in the meat has evaporated. The mixture should be stirred at all times to keep it from adhering to the sides of the kettle. Add water gradually together with powdered onion and cook for at least 20 min. Add chili powder and garlic powder and finish cooking (approx 10 min).

Simmer beans separately until nearly soft. Beans may either be mixed with the other ingredients or weighed into cans which are then filled with the hot mixture. If the latter procedure is used, beans should be hot when added to the cans.

Processing and Cooling.--The following processes are suggested for chili con carne, chili con carne with beans, and meatless chili.

Can Size	Initial Temp °C	Processing Time in Min at	
		116°C	121°C
No 1 211 x 400	82°C	75	55
No 300 300 x 407	82°C	90	65
No 2 307 x 409	82°C	105	80
No 2 1/2 401 x 411	82°C	125	95
No 10 603 x 700	82°C	240	200

Processes longer than those listed above are sometimes used in order to produce a softer bean. A process which is at all questionable in sterilizing value should never be used for a product of this kind, inasmuch as the quality is in no way impaired by an adequate cook. In order to attain the desired sterilizing value it is essential that the initial temperature (can center at the start of the process) be at least as high as indicated above. If lower temperatures are used the process time must be increased. Check process times and temperatures with the can supplier on the National Food Processors Association.

This type of product is subject to thermophilic spoilage if not properly cooled. In order to reduce the danger from this type of spoilage, cans should be promptly and thoroughly cooled in water after the process. All cans larger than No. 2 1/2 size should be pressure cooled in order to prevent buckle formation and strained ends.

SLOPPY JOE
(Cold Pack)

Ingredients	Kg	g
Carcass beef	90.9	
Trimmed beef flanks	45.5	
Tomato puree (sp. gr. 1.045)	66.8	
Sweet pickle relish	21.8	
Cider vinegar (45-grain)	16.4	
Pregelatinized starch	5.5	
Light brown sugar	5.5	
Cane sugar	5.5	
Salt	4.5	
Plant protein hydrolyzate		284
Monosodium glutamate	0.5	
Ground chili pepper	3.2	
Ground cumin seeds	0.5	
Garlic powder		114
Onion powder		341
Black pepper		114
Red pepper		28
Ground oregano		199
Ground cloves		43
Ground cinnamon		43
Smoke flavoring, if desired could be used sparingly		

Procedure

Grind meats through 12.7 mm plate of the grinder. Mix salt with the seasonings, plant protein hydrolyzate, and monosodium glutamate. Put ground meat in a mechanical mixer. Start machine; add tomato puree; then add slowly and evenly the precooked starch and mix until the starch is uniformly distributed and there are no lumps. Add vinegar, sugars, sweet relish, add mixed seasonings and let machine run until all the ingredients are uniformly distributed. Fill and close cans under 27 in. vacuum.

Suggested Process

300 x 409 cans (454 g net) 95 min at 116°C.

Check process time and temperature with can supplier or the National Food Processors Association.

GROUND BEEF IN BARBECUE SAUCE
(Hot Pack)

This product is made up of 50% braised beef and 50% barbecue sauce.

SLICED BEEF IN BARBECUE SAUCE (Hot Pack)

Prepare Meat

Use a commercial grade of beef rounds or clods. Remove sinews and connective tissues, gristle, fat. Cut meat into approximately 50.8 x 76.2 mm oblong strips. Lay each strip on the shelf of an open truck in single layers. Cuts should not touch each other. Put truck into the freezer and keep it there just long enough to solidify the meat (but not completely freeze it) so it can be sliced on a slicing machine. Slice meat 6.4 mm.

Put 56.8 l water in a steam-jacketed kettle equipped with a perforated basket. Bring temperature to 82°C during the cooking. Lift basket out of the kettle by means of a hoist and move it to the canning line. To obtain the beef stock concentration needed for preparing the sauce, repeat this operation three times with fresh sliced meat.

It is important to keep the sliced, cooked meat hot during the canning operation. If it gets cold, it will lose its pliability and will be hard to pack into cans without breaking.

Prepare Sauce

Ingredients and procedure are identical with the barbecue sauce given above for Ground Beef in Barbecue Sauce (Hot Pack).

Fill Cans

Fill 227 g of sliced beef and 227 g of hot barbecue sauce in 300 x 409 cans. Use spatula or some other instrument around the side of the can before closing to eliminate air pockets which may be trapped on the bottom of the can. Internal temperature of product should be maintained at least at 71°C when cans are closed. If closing temperature drops below 71°C, close cans under 15 in. vacuum.

Suggested Process

300 x 409 cans (454 g net) 90 min at 116°C.

Check process time and temperature with can supplier or the National Food Processors Association.

ROAST BEEF LOAF USING NONFAT DRY MILK

Ingredients	Kg	g
Boneless chuck	34.1	
Beef plate meat	11.4	
Nonfat dry milk	5.5	
Salt	1.6	
Ground white pepper		227
Bay leaves, crushed		57
Grated onions	0.9	
Tomato Catsup	4.5	
Worcestershire sauce		85

Procedure

Grind meat through large lard plate. Put into steam-jacketed kettle with enough water to cover meat. Bring to a boil, then add remaining ingredients except nonfat dry milk. Cook slowly until tender. Reserve

cooking broth. Then place all in mixer. While mixing, sprinkle with nonfat dry milk and add 18.2-20.5 kg cooking broth. Mix well. Put in 2.3-2.7 kg pans and chill thoroughly. When firmly set, stuff into artificial casings.

This product should be kept under refrigeration or frozen until consumed.

JELLIED ROAST BEEF LOAF

Ingredients	Kg	g	ml
Lean beef (yield after cooking approx. 40 Kg)	65.9		
Beef stock from cooked beef	13.6		
Salt	0.9		
Sugar	0.5		
Granular gelatin (250 Bloom)	1.8		
Dry soluble pepper		113	
Sodium erythorbate		25	
Onion powder		28	
Garlic powder		2	
Ground celery seed		4	
Worcestershire sauce		57	
Vinegar			237
Catsup (optional)			473

Procedure

Trim fat, sinews, and connective tissues from beef and cut into 6.4 mm chunks. Transfer to a steam-jacketed kettle and add just enough water to cover meat. Slowly bring up temperature to 100°C and cook at this temperature until meat is very tender. Remove meat from kettle and grind through the 25.4-38.1 mm plate of the grinder directly into a meat truck. Skim foam and fat off of beef stock and cook (concentrate) to 13.6 kg and allow to cool to 71°C.

Mix together the salt, dry seasonings, sugar, and granular gelatin. When stock has cooled to 71°C, slowly sift in the salt-seasonings-gelatin mixture with steady agitation. Then add Worcestershire sauce, vinegar, and catsup (if used) and mix until added ingredients are thoroughly incorporated with beef stock. If this step is done carefully, the gelatin will not lump.

Pour gelatin-stock mixture evenly over the ground meat in the meat truck and mix thoroughly with a meat shovel or wooden paddle. Let product cool just enough to make stuffing easy.

Stuff material into Cellophane casings which loosely fit the molds. Before placing stuffed casings into molds, wash with a vinegar solution to remove any gelatin on outside of casings so that the loaves can be removed from molds easily. Place stuffed casings in molds. cover, press down lid and fasten springs.

Transfer molds to chill room (4-7°C) for overnight. Next day, remove loaves from molds.

Product may be sold in the casings in bulk or sliced and vacuum packaged for retail sale.

Product is perishable and should always be kept under refrigeration throughout storage and marketing channels.

D. Market Strategies for Increasing Meat Exports

Contact with individual fast-food retailers, convenience store operations, institutional food companies, wholesale suppliers, food brokers and other food outlets should be initiated to survey their needs for products which can be produced in Uruguay under the current USDA regulations. Products prototypes or samples could be presented by describing the range of products (through colorful brochures of prototypes or small samples would be desirable) which could be manufactured to suit a buyer's specification. Targeted markets to be supplied could include convenience stores (beef sticks) or pizza/taco restaurant chains (pizza/ taco toppings). Initial contacts could be developed through letters of inquiry sent directly to the company president or general manager, association commodity groups (Appendix C) or through trade shows. In addition, consideration should be given to advertising products in food industry trade journals which are distributed to food brokers, wholesale suppliers and other retail outlets. Product exhibits and demonstrations at distributor shows, grocery marketing groups, restaurant association meetings and supplier trade shows are useful but may be too costly based on the expected return to Uruguay. However, one or two key meetings in the USA and Europe will assist product promotion and enable contacts to be established quicker. Following new product developments in the USA can be accomplished through subscriptions to trade magazines such as "Food Technology", "Prepared Foods" and "Food Processing" (Appendix D).

Cooperative surveys should be conducted to identify potential markets for value-added meats and close ties developed with countries which may prove to be potential buyers. Examples of these countries are: Canada, India, China, Korea (North and South), Japan, Malaysia, Indonesia, Thailand and Taiwan.

Joint trade ventures with countries surrounding the Rio de la Plata should be considered to supply products to large markets. Proportionate tonnages of beef could be pooled to fulfill contracts in arrangements somewhat similar to the EEC. Beef product contracts could be equally distributed among Uruguayan suppliers and administered through the MGAP.

Long Term

E. Changes to Advance the Meat Industry

Foot-and-Mouth Disease Research

Efforts should continue at the Meat Institute, University of the Republic to establish safe and practical processing conditions which inactivate food-and-mouth disease virus (FMD) in meat tissues. If lower processing temperatures or other conditions are found to inactivate the virus, then a greater variety of value-added meat products destined for export from Uruguay could be produced. However, collaborative research among various centers which study FMD is essential to confirm that specific processing methods do indeed inactivate the virus. Confirmatory studies must then be published in peer reviewed scientific journals and safety margins established which are sufficient to prevent a disease outbreak in countries free of FMD. Practical production of value-added products for FMD free countries would necessitate that maximum heating requirements be within the range of 70 to 76°C to maintain product integrity for reheating. A greater variety of products could then be produced under these heating requirements.

A coordinated FMD eradication program should be emphasized among the countries situated on the Rio de la Plata and a control program implemented to protect against FMD outbreaks. Restrictions against importation of livestock from countries with endemic FMD must be enforced once eradication has been accomplished.

Establishment of a Meat Research Institute

A collective and concerted effort is needed to establish a Meat Research Institute (MRI) in Uruguay which would serve to enhance and promote domestic production and export of meat products. At present, several agencies or

organizations such as MGAP, INAC, LATU and CIF regulate or serve different segments of the meat industry. Application of new technologies, development of new products, compliance with export standards and scientific solutions to problems within the meat industry could best be served by an organization which would be supported and advised by representatives from each segment involved in the production of meat.

Segments of existing agencies could be combined to form the new MRI whose purpose would be to increase the value of Uruguay's meat resources and promote the export of these products. The MRI would most likely be the positioned under the MGAP drawing part-time personnel from other agencies.

The following organization scheme is suggested for a board of advisors which is made up of members appointed from their respective groups associated with meat production in Uruguay.

BOARD OF ADVISORS

Made up of representatives from:

Laboratorio Technologica del Uruguay (LATU)

Ministerio de Granaderia. Agridultura Y Pesca (MGAP)

Camera de Industria Frigorifica (CIF)

Instituto Nacional de Carnes (INAC)

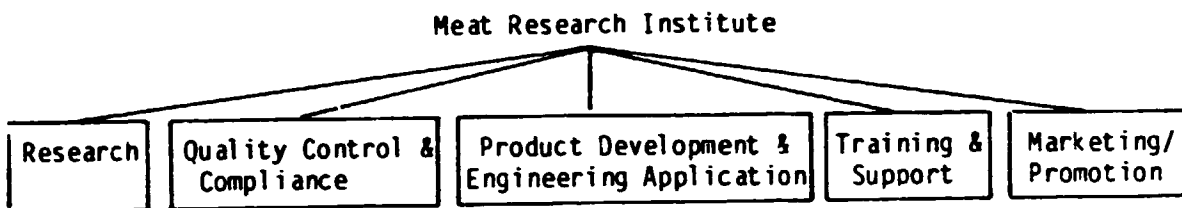
Asociacion Rural del Uruguay (ARU)

Facultad de Veterinaria

The Advisors would establish goals, designate priorities, plan for future needs of the industry and see that each of these tasks are accomplished. The board would also suggest policies which could provide economic incentives for cattle producers and meat processors to export more products. A five-year plan should be developed and evaluated annually to measure the progress of the goals to set for that year. An independent review should also be performed by an advisory committee appointed from the office of the President of the Republic to keep him appraised of the progress made in utilizing Uruguay's agricultural resources.

EXECUTIVE DIRECTOR

The executive director of the MRI would be appointed by the office of the President of the Republic to coordinate different departments within the MRI and ensure that the policies and goals of the advisory board are accomplished. Segments of existing agencies or organizations should be consolidated into the following departments to form the MRI.



Functions of the MRI departments and suggested personnel are listed below:

Research - Facultad de Veterinaria, LATU

1. Develop research programs to solve common problems within the meat industry.
2. Publish technical articles for publication in peer reviewed journals.
3. Serve as a resource for technical personnel and develop appropriate analytical techniques as needed.
4. Attend scientific conferences, international meetings and appropriate shortcourses.

Quality Control and Compliance - INAC, LATU, DIA

1. Establish standards for products, sanitation requirements and proper handling procedures.
2. Ensure that products meet certification standards for export or domestic consumption.
3. Monitor quality control procedures in plants to ensure product safety.
4. Determine if labels are in compliance with regulations.
5. Work with on-site plant inspectors to prevent spread of disease.

Product Development and Engineering Applications-LATU, INAC Facultad de Veterinaria

1. Develop product formulas, processing procedures and publish technical manuals.
2. Test new prototype products
3. Test equipment design, packaging and process requirements.
4. Provide technical assistance to meat plants (trouble shooting).
5. Attend shortcourses, technical conferences and international trade shows to identify new technologies.

Training and Extension Support - INAC, DIA

1. Plan and conduct annual shortcourses, seminars and conferences.
2. Train in-plant personnel concerning safety, hygiene and proper meat handling procedures.
3. Certify workers for specific skills.
4. Improve animal production practices to market younger cattle on a year-round basis.
5. Assist in identifying research problems.
6. Sponsor annual conferences and shortcourses.

Marketing and Promotion - INAC

1. Assist meat producers in securing new export markets.
2. Provide demonstrations of new products at trade shows and expositions.
3. Develop promotional materials for trade shows or prospective clients.
4. Identify new products to be developed and appropriate markets for the products.

The MRI could be housed adjacent to the new LATU laboratory facilities and the pilot plant utilized by personnel from LATU and MRI. Staff of the MRI in some cases may hold appointments with other government agencies, university departments or industry organizations.

(Appendix B)

Listing of Equipment/Companies

Bacon Press

Anco/Votator \$100,000 w/parts 1/2 to 3/4 million lbs. Bacon/week

Bettcher Ind. Inc. \$40,000 (reconditioned) 2-4 bellies/min; \$54,000, (new) 2-4 bellies/min; \$72,260 6-8 bellies/min

Cans

American Can Co. \$97.00/1000 cans and tops
Vienna Sausage Can 208 x 207

Choppers

T.W. Kutter \$25,700 (80 lb capacity); \$40,150 (130 lb); \$66,000 (240 lb);
\$90,000 (400 lb)

Robert Reiser Co. \$51,400 (200 lb capacity) \$76,600-98 300 (350 lb);
\$183,000-203,000 (1400 lb)

Films/Pouches

Cryovac \$5.50/head of cattle or .25¢/bag

T.W. Kutter Films i.e. .07¢/1 lb pkg of hot dog that has two flexible sides
.12¢/pkg if one side is flexible and one side is rigid

Grinders

Robert Reiser & Co. \$30,000 (600 lb/hopper capacity)

Koch Supplies Inc \$2 943 (5 hp/4" plate size); \$3 645 (7 1/2 hp/5 1/8");
\$4,887 (15 hp/6"

Biro Mfg. Co. \$3,600 (7 hp)

Massagers/Tumblers

Johnston Equip. Corp. \$16,000-24,000 (1300 lb); \$22,000-30,000 (3,000 lb);
\$36,000-46,000 (5,000 lb)

RMF Steel Products \$36,625 (1800 lb); \$40,300 (2800 lb); \$53,300 (5,000 lb)

Mixer/Blender (Vacuum)

Beucon Enterprises Inc. \$22,000 (1000 lb); \$25,965 (2000 lb); \$165,000 (22,000lb)

RMF Steel Products \$27 200 (1000 lb); \$43,500 (2000 lb); \$55,700 (5,000 lb)

Weiler & Co. (not vacuum) \$35,616 (1000 lb); \$38,738 (2000 lb); \$99,000
(10,000 lb)

Retorts

Stock America Inc. \$138,236 to \$175,574

Slicers

Bettcher Ind. Inc. \$9,700 (88 slices/min); \$13,401 (100 slices/min)

Toby Enterprises Inc. \$22,000 (100 slices/min); \$35,000 w/conveyor (400 slices/min)

Beacon Enterprises Inc. \$67,500 (1,100 slices/min)

Smokehouse/Drying Systems

Alkar \$11,000 (1 truck); \$32,000 (2 truck); \$60,000-200,000 (custom built to specifications)

Enviro Pak Div. \$8,000-20,000 (1 truck); \$20,000-30,000 (2 truck)

Vacuum Packagers

Cryovac \$4,000-5,000, 4 bags/min (chamber type); \$20,000 18 inch boneless cuts (20 bag/min); \$275,000 24 in. bone-in blade (20 bags/min) Multi head rotary heat seal (New)

Robert Reiser & Co. \$2,695-19,195 (double chamber); \$50,000-100,000 (Roll stock)

T.W. Kutter \$4,000, 4 bag/min, base price \$55,000

Vacuum Stuffers

Kartridg Pak Co. \$47,250 (1000 lb)

Robert Reiser Co. \$26,300-36,900 (200 lb) \$53,800-67,200 (600 lb)

Water Cookers

Bettcher Ind. Inc. \$50,000-60,000 (1000-1500 lb/hr)

Johnston Equip. Corp. \$26,000 (75 gal); \$30,000 (150 gal); \$41,000 (400 gal); \$53,000 (650 gal)

Company Name/Address
(All companies USA)

Phone

Telex

1. Alkar Div. of DEC Intl. Inc. 608-592-3211
105 Spring St.
Lodi, WI 53555
2. Anco/Votator 502-491-4310
(Div Cherry-Burrell)
P.O. Box 35600
Louisville, KY 40232
3. Beacon Enterprise Inc. 312-762-8100
2001 S. Kilbourn Ave.
Chicago, IL 60623

4. Biro Mfg. Co. 419-798-4451 (241 003)
1114 Main St.
Marblehead, OH 43440-2095
5. Bettcher Ind. Inc. 216-965-4422 (687-0103)
P.O. Box 336
Vermilion, OH 44089
6. Cryovac Div. (W.R. Grace & Co). 803-433-2000 (outside U.S. 212-819-6736)
Box 464
Duncan, SC 29334
7. Enviro-Pak Div. 503-655-6117
(Div of Tech-Mark)
15495 SE For-Mor Ct.
Clackamas, OR 97015
8. Johnston Equipment Corp. 515-287-5714
2400 Thornton
Des Moines, IA 50321
9. Kartridge Pak Co. 319-391-1100
807 W. Kimberly Rd.
Davenport, IA 52808
- 10 Koch Supplies Inc. 816-753-2150
1411 W. 29th St.
Kansas City, Mo 64108
- 11 RMF Steel Products 816-765-4101
4417 E. 119th St.
Grandview, MO 64030
12. Robert Reiser Co. 617-588-2600
725 Dedham St.
Canton, MA 02021
13. Stock America Inc. 414-272-5551
2025 N. Summit Ave.
Milwaukee, WI 53208
14. Toby Enterprises 415-583-9828
407 Cobot Rd., P.O. Box 2327
South San Francisco, CA 94083
15. T.W. Kutter 617-588-2600
91 Wales Ave.
Avon, MA 02322
16. Urschel Laboratories Inc. 219-592-3211 (258 337)
2503 Calumet Ave, P.O. Box 220
Valparaiso, IN 46384
17. Weiler & Co. 414-473-5254 (265 442)
214 S. Second St.
White Water, WI 53190

NATIONAL ASSOCIATIONS

Related to the Food Industry

For your convenience, FOOD PROCESSING has compiled a comprehensive listing of national associations, with complete address and phone number when furnished by the organization, as well as a person you may contact for more information.

AGRICULTURAL RESEARCH INSTITUTE
9650 Rockledge Pk
Bethesda, MD 20814
301-530-7122
Edwin A. Cross

ALUMINUM POLYMER CONTAINER ASSN
P.O. Box 1
Waukegan, IL 60087
414-275-6838

AMERICAN ASSN. OF CEREAL CHEMISTS
3340 Birch Knoll Rd
St. Paul, MN 55121
612-454-7250
Raymond J. Tareton

AMERICAN ASSN. OF MEAT PROCESSORS
P.O. Box 259
E. Jaccardtown, PA 17032
717-367-7158
Stephen R. Kuhl

AMERICAN BAKERS ASSN.
2020 K St. NW, Suite 850
Washington, DC 20006
202-295-5800
Robert Wager

AMERICAN BUTTER INSTITUTE
599 Prince St
Suite 100
Alexandria, VA 22304
703-849-2030
Robert F. Anderson

AMERICAN BUTTER-FAT OIL ASSN.
P.O. Box 34
Jackson, MS 39201
601-353-7919
Hugh Purne

AMERICAN CHEMICAL SOCIETY
1155 16th St. NW
Washington, DC 20036
202-872-4357

AMERICAN COCOA RESEARCH INSTITUTE
7900 Westpark Dr
Suite 314
McLean, VA 22101
703-790-5011
Richard T. O'Connell

AMERICAN CORN MILLERS FEDERATION
6707 Old Dominion Rd
Suite 240
McLean, VA 22101
703-821-3025
Robert D. Fondann

AMERICAN COUNTRY DAIRY PRODUCTS INSTITUTE
388 16th St. NW
Washington, DC 20006
202-223-1931
Gerrit F. Wise

AMERICAN DAIRY PRODUCTS INSTITUTE
130 N. Franklin
Chicago, IL 60606
312-782-4886
Warren E. Clark, Jr.

AMERICAN DAIRY SCIENCE ASSN.
319 W. Oak St.
Champaign, IL 61820
217-355-3192

AMERICAN DEHYDRATED ONION AND GARLIC ASSN.
175 S. State St.
Suite 100
San Francisco, CA 94105
415-352-7077
L. Dennis McQuaid

AMERICAN EGG BOARD
1660 Renaissance Dr.
Suite 101
Park Ridge, IL 60066
312-296-7044
Louis B. Rife

AMERICAN FEED MIXERS ASSN. INC.
1700 N. Pl. Meyer Dr.
Arlington, VA 22209
703-526-0810
Carter M. Ray

AMERICAN FROZEN FOOD INSTITUTE
1764 Old Meadow Ln., Suite 350
McLean, VA 22101
703-821-0770
Thomas E. House

AMERICAN INSTITUTE OF BAKING
1213 Baker's Way
Mannahan, KS 66502
913-537-4750
Dr. William Hoover

AMERICAN INSTITUTE OF FOOD DISTRIBUTION INC.
28-12 Broadway
Far Lawn, N.J. 07410
201-791-5570
Frank Parvix

AMERICAN MEAT INSTITUTE
1700 N. Moore St.
Arlington, VA 22206
703-841-2400
D. Marly McQuis
See Calendar, Oct. 20-23, 86 Oct. 5-11, 87

AMERICAN MEAT SCIENCE ASSN.
244 N. Michigan Ave.
Chicago, IL 60611
312-467-5520
Michael E. Drummer

AMERICAN MUSHROOM INSTITUTE
307E Baltimore Pike
Kenneth Square, PA 19348
215-386-7806
Charles R. Hams

AMERICAN OIL CHEMISTS SOCIETY
508 S. Sixth St.
Champaign, IL 61820
217-359-2344
Lester Lyon

AMERICAN PEANUT PRODUCTS MFRS. INC.
412 First St. SE
Suite 40
Washington, DC 20003
202-484-2771

AMERICAN PEANUT RESEARCH & EDUCATION SOCIETY
175 A. G. Hall
Alabama State University
Tuscaloosa, AL 35688
205-624-6423
L. R. Sneed

AMERICAN PRODUCERS OF ITALIAN TYPE CHEESE ASSN.
45 E. 53rd
Reno, IL 61844
414-921-3500

AMERICAN PRODUCTION & INVENTOR CONTROL SOCIETY INC.
500 W. Amundson Rd.
Fairfax, VA 22030
703-237-8344
Karen McMullen

AMERICAN SCHOOL FOODSERVICE ASSN.
410 E. 17th Ave.
Denver, CO 80222
303-757-8555
Vera Adkins

AMERICAN SHRIMP PROCESSORS ASSN.
P.O. Box 50774
New Orleans, LA 70150
504-368-1157
Wm. D. Chauvin

AMERICAN SOCIETY OF AGRICULTURAL CONSULTANTS
Enterprise Center
5300 Greensboro Dr., Suite 477
McLean, VA 22101
703-356-2455
Frank Prazler

AMERICAN SOCIETY OF AGRICULTURAL ENGINEERS
2950 N. 6th St.
St. Joseph, MO 64506
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See Calendar, Oct. 11-17, 87

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3340 Birch Knoll Rd
St. Paul, MN 55121
612-454-7250
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AMERICAN SOCIETY OF HEAVY REFRIGERATION & AIR CONDITIONING ENGINEERS
1791 University Ave.
Atlanta, GA 30303
404-256-7400
Rach. Suloway

AMERICAN SOCIETY OF MECHANICAL ENGINEERS
345 E. 47th St.
New York, NY 10017
212-705-7700

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200 W. Wacker
Chicago, IL 60601
312-257-2274
Ernie P. H. Jones

AMERICAN SOCIETY OF QUALITY CONTROL ENGINEERS
187 Busse Hwy.
Park Ridge, IL 60066
312-692-9407

AMERICAN SOCIETY OF QUALITY TESTING MATERIALS
1916 Race St.
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AMERICAN SOYBEAN ASSN.
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314-432-1500
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AMERICAN SPICE TRADE ASSN
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201 568-2162
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504 525-3956

AMERICAN WINE ASSN
10 E 40th St
Rm 2000
New York NY 10016
212 953-0440
Abraham M Buchmann

ASSN OF CONSULTING
CHEMISTS & CHEMICAL
ENGINEERS INC
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IMPORTERS ASSN
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A Dewey Bond

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McLean VA 22101
703 821-1118
John E Camp

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IRRADIATION
1401 New York Ave NW
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202 639-5900

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1742 N Street NW
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152 Polk St Ave
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C Parsler

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202 337-1634
Robert C Leppertow

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NUTRITION
2100 M St NW
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Washington DC 20037
202 878-1466
J E Conrad

DAIRY & FOOD INDUSTRIES
SUPPLY ASSN INC
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Rockville MD 20850
301 984-1444
J M Vann

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6300 River Rd
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Ray Mvkenedy

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707 433-1864
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209 466-4851

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See Calendar - May 3-6 '87

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See Calendar - June 16-19 '87

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919-548-8411
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703-442-8850
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INTL ASSN OF ICE CREAM MFRS
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Alexandria, VA 22314
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Wm. Deal

INTL DAIRY & DELI ASSN
313 Phoe St. - Suite 202
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U.S. of America Natl. Commissee
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703-281-5155
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5330 N. Euston Ave.
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312-286-2575
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INTL WHEAT GLUTEN ASSN
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913-341-1155
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608 231-3444
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MATERIAL HANDLING INSTITUTE, INC
8720 Red Oak Blvd
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704 522-8644
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Laf Orlas

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L Martin

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703 532-9400
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R Werner

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Oak Park, IL 60303

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Dr. Le Sweet

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303 373-5639
Mary Ramsey

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R Barnes

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NATIONAL RED CHERRY INSTITUTE
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Lansing, MI 48909
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Harry Foster

1987 Guide & Directory

1986-'87 CALENDAR

A Guide to Major Conventions, Expositions & Meetings

To help you better plan your schedules for the coming year, FOOD PROCESSING has compiled this comprehensive listing of important events, both national and international, related to the food processing industry. The meetings can provide forums for helpful exchange of information and views among its individual members and with government officials and others who participate in these meetings and conventions.

Aug 3-6 47th Annual Convention American Assn. of Meat Processors, MGM Grand Reno NV
 Aug 3-7, 73rd Annual Meeting Intl. Assn. of Milk, Food & Environmental Sanitarians, Radisson South, Minneapolis, MN
 Aug 5-7 59th Annual Meeting National Food Distributors Assn., Hyatt Regency, Chicago, IL
 Aug 17-20 Third Conference for Food Protection: The Michigan League, Ann Arbor, MI
 Aug 29-Sept 2 Food Pacific 86 (Canada Int. Trade Show of Food), B.C. Place Stadium Vancouver Can

Sept 3-5 Annual Meeting National Pecan Shellers Assn., Colonial Williamsburg Williamsburg, VA
 Sept 5-6 Annual Meeting United Dairy Industry Assn., Hyatt Regency Woodfield Schaumburg IL
 Sept 5-7 4th USIFS 86 (U.S. Int. Food Show), Moscone Center, San Francisco CA
 Sept 7-9 Fall Meeting & Convention National Ice Cream Mix Assn., Harrah's Lake Tahoe Stateville NV
 Sept 7-10 Annual Meeting Council for Responsible Nutrition, W. Marriott Hotel, Washington DC
 Sept 10-12 CAP 86 Second Int. Conference on Controlled Atmosphere Packaging, Loews Grandpoints Hotel, Teaneck NJ
 Sept 11-12 National Meeting American Chemical Society, Convention Center Anaheim CA
 Sept 14-16 Annual Meeting National Perishable Transportation Assn., Otsego Hotel Cooperstown, NY
 Sept 14-17 Annual Meeting Closure Mfrs. Assn., The Greenonor White Sulphur Springs WV
 Sept 14-17 Distributor Manufacturer Conference, Food Industries Suppliers Assn., Marquette Hotel, Minneapolis, MN
 Sept 15-17 Annual Meeting, Glass Packaging Institute, The Greenonor, White Sulphur Springs, WV
 Sept 15-18, 100th Annual Meeting and Exposition, Association of Official Analytical Chemists, The Registry, Scottsdale AZ

Sept 15-20 China PACKEX 86 (China Int. Packaging Exhibition), Shenzhen, Peoples Republic of China
 Sept 16-18 Fall Meeting National Design Engineering Show & Conference American Society of Mechanical Engineers, Jacob K. Javits Convention Center NYC
 Sept 19-24 KOFA 86 16th Int. Trade Fair of the Food Industry, Trade Fair Centre, Munich, West Germany
 Sept 20-23 81st Annual Convention American Meat Institute, Hyatt Grand Cypress Orlando FL
 More details are available. Please circle 588 opposite last page.

Sept 21-24 Scientific Conference Corn Refiners Assn., Marriott Crystal Gateway Hotel Arlington VA
 Sept 22-23 8th Annual Midwest Food Processing Conference IFT sections (Iowa, Minnesota, Wisconsin, and Chicago), Radisson Hotel, LaCrosse WI
 Sept 24-26 COEX America 86 Int. Coextrusion Conference, The Hamilton Chicago IL
 Sept 24-25 Annual Convention National Assn. of Fruits, Flavors & Syrups, Inc., Harrah's Marina Atlantic City NJ
 Sept 24-25 Annual Convention National Pretzel Bakers Institute, Manners Inn, Winter Head Island SC
 Sept 25-26 Semi-Annual Meeting Conveyor Equipment Mfrs. Assn., Chase Hilton Chicago
 Sept 27-Oct 1 Annual Convention American Bakers Assn., Westin, Cooley Hotel Boston MA
 Sept 28-Oct 1 Annual Meeting Valve Mfrs. Assn. of America, Colonial Williamsburg Williamsburg, VA
 Sept 29-Oct 3 MACHEVO 86 (Int. Exhibition for Dairy and Foods Processors), Jaapou's Exposition Center, Utrecht Holland
 More details are available. Please circle 590 opposite last page. See advertisement pg 180

Sept 29-Oct 3, IDC 86 (22nd Int. Dairy Congress) International Dairy Federation, The Hague Netherlands
 Sept 30-Oct 2, Fall Meeting Research & Development Associates for Military Food & Packaging Systems, Inc., Howard Johnson's 57 Park

Piazza Hotel Boston VA and the US Army, Research Development & Engng Center Natick MA
 Sept 30-Oct 3 InterFood 86 Göteborg, Sweden

Oct 1-3 Food Parts 86 Chem. H. and Radisson Conference Center Cherry Hill NJ
 Oct 1-3 Annual Conference National Broker Council, W. Marriott Hotel Washington DC
 Oct 3-7 JIFES 3rd Japan Int. Food Engg & Industry Show, International Expositon Center Osaka Japan
 Oct 5-9 71st Annual Meeting American Assn. of Cereal Chemists, Harbour Castle Toronto Can
 Oct 5-9 Annual Meeting American Society of Brewing Chemists, Harbour Castle Toronto Can
 Oct 5-9 InterBev 86 2nd Int. Beverage Industry Exhibition and Congress, National Soft Drink Assn., Convention Center Dallas TX
 More details are available. Please circle 600 opposite last page.

Oct 5-9 Annual Meeting Agricultural Research Institute, Washington DC
 Oct 7-9 5th APP Int. Conference on Packaging, Grand Hotel Bristol England
 Oct 9-11 28th Annual Convention & Trade Show Intl. Bottled Water Assn., Caesars Palace Las Vegas NV
 Oct 9-15 Economic & Trade Exposition 86 Beijing Peoples Republic of China
 Oct 12-16 100th Annual Int. Meeting Assn. of Official Analytical Chemists, Shoreham Hotel Washington DC
 Oct 12-16 SA 86 Instrument Society of America, Astoria Houston TX
 Oct 14-17 Annual Meeting American Society of Agricultural Consultants, Canon Hotel St. Louis MO
 Oct 15-17 SCAN-TECH 86 Automatic Identification Mfrs. Assn., Moscone Center San Francisco CA
 Oct 15-18 National Frozen Food Convention & Exposition co-sponsored by the American Frozen Food Institute and the National Frozen Food Assn., Balms Grand Hotel Las Vegas NV
 More details are available. Please circle 601 opposite last page.

Oct 15-19 Annual Meeting American Corn Millers Federation, Mandarin Hotel Boston MA
 Oct 16-21 20th Annual Convention Intl. Natural Sausage Casing

Assn., Broadmoor Hotel Colorado Springs CO
 Oct 19-21 Annual Meeting Assn. for Dressing & Sauces, Holiday House W. Amstburg PA
 Oct 19-23 44th Annual Convention National Assn. of Meat Purveyors, Desert Springs Palm Desert CA
 Oct 20-23 Annual Meeting Gummed Industries Assn., Inc. Camelback Inn Scottsdale AZ
 Oct 20-23 76th National Safety Congress National Safety Council Hyatt Regency Chicago IL
 Oct 21-23 PROFITQUEST 86 (Forum Bienna Suppliers Exco), U.S. and Wisconsin Cheese Makers Assn., Mecca Milwaukee WI
 Oct 22-24 Annual Meeting National Single Service Food Assn., Holiday House W. Amstburg PA
 Oct 22-26 Annual Educational Conference Intl. Sanitary Assn., Astoria Houston TX
 Oct 22-26 National Convention Exhibit on Trends & Foodservice Management National Automatic Merchandising Assn., McCormick Place Chicago
 Oct 22-26 Int. Wine Product Conference American Dairy Products Institute, U.S. National Committee of IDF and the International Dairy Federation, Chicago Marriott, Chicago
 Oct 25-27 Natural Foods Expo Soyfoods Pavilion Soyfoods Assn. of America, Convention Center Washington DC
 Oct 27-31 89th Annual Convention National Renderers Assn. Boca Raton FL

Nov 16 89th Annual Meeting European Conference Food Sanitation Institute, Safari Continental Center Scottsdale AZ
 Nov 18-19 71st Int. Home Mfg. & Restaurant Show, Jacob K. Javits Convention Center NYC
 Nov 20-26 Annual Convention National Assn. of Meat Purveyors, Ramada Las Palmas Ramada Village CA
 Nov 4-5 EUROPAK 86 Second European Conference on Packaging Packaging Intl. InterContinental Cologne West Germany
 Nov 4-5 COEX 86 Seventh Int. Coextrusion Conference Intl. InterContinental Cologne West Germany
 Nov 4-6 Winter Nat. Part Engng & Maintenance Show Convention Center Anaheim CA
 Nov 8-11 Annual Convention Peanut Butter & Nut Processors Assn., Bonaventure Hotel Ft. Lauderdale FL

1986-87 CALENDAR

Nov 9-11 Annual Convention Biscuit & Cracker Distributors Assn., Grenade Resort Hotel, Grenade FL

Nov 9-11 Annual Meeting, Calorie Central Council, Orlando FL

Nov 10-13 WASTE-TECH '86 (1st Exhibition for Waste Management and Pollution Control), National Exhibition Centre, Birmingham, England

Nov 12-14 Annual Meeting Single Service Institute, Willard Hotel, Washington, DC

Nov 12-15 POWER CLEAN '86, Cleaning Equipment Mfrs. Assn., Hyatt Hotel, Sarasota, FL

Nov 13-14 TEPCON '86 (First Int. Conference on Temper Evaporant Packaging), The Packaging Group Inc., The Meadows Hilton Hotel, Secaucus, NJ

Nov 13-16 GIA (Int. Exhibition of Food Processing Machinery), Porte de Versailles, Paris, France

Nov 16-20, 10th Int. Congress of Essential Oils, Fragrance and Flavors, Flavor & Extract Mfrs. Assn. of the U.S., and Fragrance Materials Assn. of the U.S., Omni Shoreham, Washington, DC

Nov 17-19 Fall Meeting, Scale Mfrs. Assn., Nordic Hotel, Chicago, IL

Nov 17-21 PACK EXPO '86 Packaging Machinery Mfrs. Institute, and Packaging Education Foundation, Jacob K. Javits Convention Center, NYC

Nov 24-28 HOGATEC '86 (Int. Trade Fair for Hotels, Restaurants and Catering), Dusseidorf, West Germany

DECEMBER

Dec 3-5 Future-Pak '86 Fourth Int. Conference on Packaging Innovations, Hyatt Regency Hotel, Atlanta, GA

Dec 4 Annual Meeting Canadian Dairy & Food Industries Supply Assn., Toronto, Can

Dec 5-10 Sales and Marketing Convention & Marketplace Expo National Food Brokers Assn., Hyatt Regency, Chicago

Dec 9-10, 30th Annual Educational Conference, Food & Drug Law Institute, J. W. Marriott Hotel, Washington, DC

Dec 9-10 Annual Meeting, Natl. Sunflower Assn., Convention Center, Aberdeen, SD

Dec 10-11 Annual Meeting Food Additives Council, Washington, DC

Dec 10-16 IFP '86 (1st Food & Pharmaceutical Processing and Packaging Exhibition), Foreign Trade Centre, Guangzhou, China

JANUARY

Jan. 11-14 Annual Convention, Northwest Food Processors Assn., Portland Marriott Hotel, Portland, OR

Jan. 14-18 Annual Convention, Natl. Turkey Federation, Hilton at Walt Disney World Village, Lake Buena Vista, FL

Jan. 17-21, SaudFood '87 (Fourth Food, Equipment & Catering Exhibi-

tion), Riyadh Exhibition Centre, Saudi Arabia

Jan. 18-21 Annual Meeting Natl. Ice Cream Mfrs. Assn., Jago Marriott Resort Club, Ft. Lauderdale, FL

Jan. 24-26 Annual Meeting Tuna Research Foundation, McCormick Place, Chicago

Jan. 24-26 Int. Confectionery Exhibition, Exhibition Centre, Hamburg, Germany

Jan. 24-28 Annual Convention National Food Processors Assn., McCormick Place, Chicago, IL

Jan. 24-28 First Biennial (IEP) International Exposition for Food Processors, Food Processing Machinery & Supplies Assn., McCormick Place, Chicago

More details are available. Please circle 603 opposite last page.

Jan. 24-28 KONDI '87 Int. Trade Fair for the Confectionery Trade, Exhibition Centre, Hamburg, Germany

Jan. 24-27 Annual Meeting Carbonated Beverage Institute, Palmas Del Mar, Humacao, Puerto Rico

Jan. 26-30 Annual Convention National Soft Serve & Fast Food Assn., Americana Dutch Resort Hotel, Orlando, FL

Jan. 27-30 Annual Convention Natl. Assn. of Wheat Growers, Tour & Country Hotel, San Diego, CA

Jan. 29 - Feb. 1 60th Annual Meeting Soap & Detergent Assn., Boca Raton Hotel & Club, Boca Raton, FL

Jan. 29-31 International Poultry Trade Show, Southeastern Poultry & Egg Assn., World Congress Center, Atlanta, GA

More details are available. Please circle 604 opposite last page.

FEBRUARY

Feb. 3-5 Annual Meeting Wheat Quality Council, Holiday Inn, Holmdel, Manassas, VA

Feb. 4 Annual Meeting Calif. Canning Peach Assn., The Red Lion Inn, Sacramento, CA

Feb. 8-11 COEX '87 Int. Food-services Mfrs. Assn., Fontainebleau Hilton Hotel, Miami Beach, FL

Feb. 9-12 ProMar '87 The Materials Handling Institute, McCormick Place, Chicago, IL

Feb. 14-16 SaudFood '87 Fourth Int. Food and Equipment Show, Riyadh Exhibition Centre, Saudi Arabia

Feb. 15-17 Int. Fancy Food & Confectionery Show, Natl. Assn. for the Specialty Food Trade, Inc., Convention Center, Anaheim, CA

Feb. 15-18 Annual Meeting North America Blueberry Council, Pan Pacific, Vancouver, BC

Feb. 15-18, 83rd Annual Convention United Fresh Fruit & Vegetable Assn., Convention Center, Orlando, FL

Feb. 17-20 Annual Meeting Process Equipment Mfrs. Assn. (to be announced)

Feb. 15-19 62nd Annual Technical Conference, Biscuit & Cracker Mfrs. Assn., Westin Hotel, Chicago

Feb. 19-21 7th Annual Conference & Expo, The Sealed Mfrs. Assn., Opryland Hotel, Nashville, TN

Feb. 22-25 Int. Sweetener Consortium Sweetener Users Group, Marriott's Desert Springs Resort, Palm Springs, CA

Feb. 25-27 Annual Meeting Popcorn Institute, Scottsdale Hilton, Scottsdale, AZ

Feb. 25-Mar. 1 Annual Convention Western Steaks Meet Assn., MGM Reno, NV

MARCH

Mar. 1-4 Annual Meeting American Society of Bakery Engineers, Chicago Marriott Hotel, Chicago

Details are available. Please circle 605 opposite last page.

Mar. 3-5 FOODPLUS '87 Marriot, Orange Arden, Orange, FL

Mar. 4-6 Annual Meeting Calif. Pistachio Commission, Doubletree Inn, Monterey, CA

Mar. 4-8 Annual Convention Natl. Institute of Oiled Products, Marriott Harbor Beach, Ft. Lauderdale, FL

Mar. 8-11 SNAXPO '87 Potato Chip Snack Food Assn., Dollywood, Nashville, TN

More details are available. Please circle 606 opposite last page.

Mar. 8-11 Int. Conference & Exhibition Grain Elevator & Processing Society, Ohio Center, Columbus, OH

Mar. 14-20 IFP Expo '87 China Int. Food Processing & Packaging Equipment Exhibition, International Exhibition Centre, Beijing, China

Mar. 15-18 Annual Meeting American Cultured Dairy Products Institute, Omni Hotel, Nashville, TN

Mar. 18-20 Annual Convention Intl. Food Service Distributors Assn., Hyatt Regency, Chicago, IL

Mar. 21-24 Annual Meeting Retail Bakers of America, Convention Center, Baltimore, MD

Mar. 22-25 Annual Convention National-American Wholesale Grocers Assn., Hyatt Regency, Chicago

Mar. 22-25 Annual Convention National Pasta Assn., Rio Center, Laguna Niguel, CA

Mar. 29-Apr. 1 Annual Meeting Intl. Institute of Ammonia Refrigeration, Marriott San Diego Mission Bay, San Diego, CA

APRIL

Apr. 4-6 Annual Meeting Society of Soft Drink Technologists, Las Vegas Hilton, Las Vegas, NV

Apr. 5-9 1987 National Meeting American Chemical Society, Convention Center, Denver, CO

Apr. 5-7 Annual Meeting National Cheese Institute, Hyatt Regency, O'Hare, Rosemont, IL

Apr. 5-7 Annual Meeting American Butter Institute, Hyatt Regency, O'Hare, Rosemont, IL

Apr. 7-9 PACK ALIMENTAIRE '87 First Int. Food & Beverage Packaging Show, O'Hare Exhibition Center, Chicago, IL

Apr. 8-11 ProPak '87 (2nd Int. Food Processing & Packaging Technology Exhibition & Conference for South East Asia), World Trade Centre, Singapore

Apr. 21-23 8th Annual Meeting Research & Development Associates for Military Food & Packaging Systems, Inc., Omni Hotel, Nashville, TN

Apr. 26-30 FOOD UPDATE '87 Food & Drug Law Institute, Sedgewick Resort, Asheville, Chapel, NC

Apr. 27-29 79th Annual Convention American Feed Mfrs. Assn., Convention Center, Indianapolis, IN

Apr. 28-30 Annual Production Conference, Pennsylvania Mfrs. Confectioners Assn., West Tower Hotel, Lancaster, PA

MAY

May. 3-6 Sweetmaker Industry Convention & Educational Exhibition, Food Marketing Institute, McCormick Place, Chicago

More details are available. Please circle 607 opposite last page.

May. 3-6 95th Annual Convention Intl. Assn. of Refrigerated Warehouses, Hotel De Coronado, San Diego, CA

May. 3-6 44th Annual Meeting Refrigeration Research Foundation, Hotel De Coronado, San Diego, CA

May. 6-9 WASTE TECH '87 Nat. Solid Wastes Management Assn., Convention Center, Dallas, TX

May. 10-13 SOUTH-PACK '87 Southern Packaging Exposition, Georgia World Congress Center, Atlanta, GA

May. 14-16 65th Nat. Restaurant Hotel Show, National Restaurant Assn., McCormick Place, Chicago, IL

May. 14-16 INTERPACK '87 Int. Packaging Exhibition, Dusseidorf, West Germany

May. 15-20 Annual Conference Assn. of Operative Milkers, Exhibition Centre, Toronto, Can

May. 19-23 23rd Annual Meeting Exoc Int'l Dairy-Deli Assn., Fontainebleau, Miami Beach, FL

May. 17-20 65th Annual Convention National Meat Canners Assn., The Greenleaf, White Sulphur Springs, W. Va.

May. 17-21 Annual Meeting American Society of Brewing Chemists, Hyatt Regency, Chicago

May. 18-22 COFFEE '87 Int. Exhibition on Coffee and Catech, Sheraton, Las Vegas, NV

May. 18-22 COFFEE '87 Int. Exhibition on Coffee and Catech, Sheraton, Las Vegas, NV

JUNE

June 14-17 Annual Meeting National Soybean Processors Assn., Williamsburg Inn, Williamsburg, VA

June 15-19 87 Annual Meeting and FOOD EXPO Institute of Food Technologists, Convention Center, Las Vegas, NV

More details are available. Please circle 608 opposite last page.

June 17-20 Annual Meeting Rice Millers Assn., Sheraton, Marriot, S. and East, San Diego, CA

June 19-25 Annual Convention Assn. of Food & Drug Officials, Westin Hotel, Tulsa, OK

1986-'87 CALENDAR

June 27-29 Annual Meeting, Intl. Wheat Gluten Assn., The Lodge at Vt. vs. CO

June 29-July 1 Annual Convention Intl. Apple Institute, Arway Grand Hotel, Grand Rapids, MI

June 28-July 1 Redrocca Meat Conference, American Meat Science Assn., University of Minnesota, St. Paul, MN

JULY

July 12-15 Intl. Fancy Food & Confection Show, Intl. Assn. for the Specialty Food Trade, Inc., Jacob K. Javits Convention Center, NYC

July 25-29 48th Annual Convention, American Assn. of Meat Processors, Galt House, Louisville, KY

AUGUST

Aug. 2-6 74th Annual Meeting, Intl. Assn. of Milk, Food & Environmental Sanitarians, Disney and More Anaheim, CA

Aug. 3-5 22nd Microwave Power Symposium, Intl. Microwave Power Institute, Hyatt Regency Cincinnati, OH

Aug. 31-Sept. 4 71st Annual Sessions of the International Dairy Federation, Helsinki, Finland

SEPTEMBER

Sept. 1-3 WESTPAK '87 Convention Center, Anaheim, CA

Sept. 14-17 101st Annual Meeting, Assn. of Official Analytical Chemists, Camino Hill Hotel, San Francisco, CA

Sept. 19-22 NAFEM '87 National Assn. of Food Equipment Mfrs., Convention Center, Las Vegas, NV

Sept. 26-30 FOOD & DAIRY EXPO '87 Dairy & Food Industries Supply Assn., McCormick Place, Chicago, IL

Details are available. Please circle 609 opposite last page. See advertisement pg 35

Sept. 27-Oct. 1 100th Anniversary Convention, Master Brewers Assn. of the Americas, Exhibition Center, Milwaukee, WI

Sept. 27-Oct. 1 15th Intl. Brewing Exhibition, Exhibition Center, Milwaukee, WI

OCTOBER

Oct. 5-10 FOOD INDUSTRY '87, Göteborg, Sweden

Oct. 8-11 AM Convention, American Meat Institute, McCormick Place, Chicago, IL

More details are available. Please circle 610 opposite last page.

Oct. 11-14 National Frozen Food Show, co-sponsored by American Frozen Food Institute and National

Frozen Foods Assn., Inc., Lowry Arizona, Dallas, TX

Oct. 25-28 Productivity Conference, Exposition, National American Wholesale Grocers Assn. Convention Center, Rosemont, IL

NOVEMBER

Nov. 1-5 Annual Meeting, American Assn. of Cereal Chemists, Oryon Hotel, Nashville, TN

Nov. 1-5 Annual Convention, Nat. Assn. of Meat Purveyors, Marco Beach Hotel, Marco Beach, FL

Nov. 17-19 Annual Meeting, Composite Can & Tube Institute, Grand Island Hotel, Charleston, SC

DECEMBER

Dec. 1-5 3rd Packaging & Food Processing, Mexico & Jamaica, Mexico

1987

Mar. 1-5 54th Annual Meeting, American Society of Bakers, Chicago Marriott Hotel, Chicago, IL

June 19-22 77th Annual Meeting and FOOD EXPO, Institute of Food Technologists, Convention Center, New Orleans, LA

Sept. 18-22 Annual Meeting, American Assn. of Cereal Chemists, Intercontinental Hotel, San Diego, CA

Oct. 1-4 AM Annual Convention, American Meat Institute, Las Vegas Motor Hotel, Las Vegas, NV

Oct. 5-12 National Frozen Food Convention, American Frozen Food Institute and National Frozen Foods Assn., Hyatt Regency, Chicago

Nov. 14-15 PACK EXPO, Packaging Machinery Mfrs. Assn., McCormick Place, Chicago

1988

Jan. 26-Feb. 1 IFEP International Exposition for Food Processors, Food Processing Machinery & Supplies Assn., Convention Center, Anaheim, CA

June 25-29 78th Annual Meeting, FOOD EXPO, Institute of Food Technologists, McCormick Place, Chicago

Sept. 15-19 International Baking Expo, American Bakers Assn. and Bakery Equipment Mfrs. Assn., Convention Center, Las Vegas, NV

Oct. 1-5 FOOD & DAIRY EXPO, Dairy & Food Industries Supply Assn., Convention Center, Anaheim, CA

Oct. 22-25 National Frozen Food Show, American Frozen Food Institute and National Frozen Food Assn., Atlanta, GA

Although all information is as up to date and correct as possible at press time, the announced dates and sites of meetings and conventions are occasionally changed by sponsoring associations. An additional reference is provided each month in FOOD PROCESSING's Conventional & Exhibits Calendar

ARCHITECTS & ENGINEERS

Serving the Food Industry

For your convenience, FOOD PROCESSING has compiled a comprehensive listing of selected architects and engineers with complete address and phone numbers involved in pre-planning new facilities and the design and construction of new food plants.

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312.693-4000

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Reading Ontario
CANADA M9W 5N6
416.675-6166

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2121 Spring Arbor Rd
Jackson MI 48203
517.784-4733

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3653 Mayfield Rd
Cleveland OH 44121
216.382-5600

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53 Wallace Ave
St Fortard ME 04106
207.775-6533

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135 S Maryland Ave
Gensco CA 91205
918.240-3160

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501 W 1st St
Detroit MI 48226
313.963-2300

EDWARD A BONE & ASSOCIATES
1000 Brannan St
5th Floor
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PO Box 1432
Spartanburg SC 29604
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Minneapolis MN 55440
612.546-1401

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PO Box 419173
Kansas City MO 64141
816.330-4375

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Butler PA 16001
412.285-4761

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Kansas City KS 64141
816.568-6219

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Denver CO 80222
303.771-0900

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8700 Bryn Mawr
South Tower Suite 400
Chicago IL 60637
312.693-1030

CRS SHIRINE INC
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222 N Dearborn St
Chicago IL 60607
312.431-6800

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600 Alexander Rd
Pittsford NY 14854
609.452-1212

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Lansing MI 48912
517.371-1200

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2400 Lake Park Drive
Smyrna GA 30080
404.432-2424

CLEAN WATER ENGINEERS INC
7 E Main St
PO Box 218
Friscoes VA 24090
703.473-2122

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1324 Phynose Way
Cupertino CA 95014
316.883-4439

COLEMAN CASKEY ASSOCIATES INC
2082 Business Center Dr
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Irvine CA 92715
714.476-1010

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1500 Foshey Tower
Minneapolis MN 55402
612.332-8326

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402.391-6656

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PO Box 477
La Grange IL 60525
312.352-2060

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108 F Daniel Bldg
301 N Main St
Tomball TX 29602
281.298-3145
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DAVY MCKEE CORPORATION
300 S Riverside
Suite 1800
Chicago IL 60606
312.922-1218

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1818 Market St
Philadelphia PA 19103
215.299-8193

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Cedar Falls IA 50613
319.277-3110

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4738 N 40th St
Sheboygan WI 53081
414.456-8711

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2320 Elmwood Ave
Buffalo NY 14217
716.873-9334

E GROUP
115 Evergreen Pl
East Orange NJ 07028
201.672-5100

EMI CORPORATION
3166 Des Plaines Ave
Des Plaines IL 60018
312.827-3164

EMS
645 9th St NW
Salem OR 97304
503.378-0104

EPI ENVIRONMENTAL PROCESS INC
1220 Glenwood Ave N
Minneapolis MN 55405
612.377-9317
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Engineering Services Inc
10 Douglas Ct
Suite 100
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415.372-8600

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101 E M Walker
Jamesville WI 53546
608.754-1222

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Proctorville OH 45650
509.927-1925

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312.454-9100

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One Eview Plaza
Cleveland OH 44114
216.523-5600
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PO Box 1300
5580 21st Ave SW
Edmonton AB T6C 2T1
403.392-8791

FLOOR PLAN INC
1000 West 10th St
Winnipeg MB R2T 1V6
204.975-8880

FOOD PLANT ENGINEERING INC
1710 S 24th Ave
PO Box 9906
Tulsa OK 74109
505.246-5530

FOTH & LANDYKE INDUSTRIAL SYSTEMS DIV
Food Plant Sector
2731 S Hope Road
PO Box 10414
Green Bay WI 54307
414.497-1903

WM F FRELIC INC
6450 Guion Rd
PO Box 68097
Minneapolis MN 55468
317.291-6130

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Barrington MO 63011
314.391-8866

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Glasgow KY 42141
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290 S. Main St
Caro, MI 48106
312 665-5500

HENSCHEN JOHNSON CROMBIE
INC
140 S. Dearborn St
Chicago, IL 60603
312 368-1870

HERTEL JOHNSON EPPER &
STORA
920 Waukegan Rd. Room 206
Geneseo, IL 60025
312 724-8200

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144 Merchants St
Suite 300
Cincinnati, OH 45246
513 771-5700
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1001 E. 101st Ter
Suite 395
Kansas City, MO 64131
816 941-3206

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201 987-4700

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Suite C
San Rafael, CA 94901
415 459-5911

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5060 S. Alpers St
Charlotte, NC 28217
704 553-3225

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50 Geneva Dr
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416 444-6656
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Oakland, CA 94623
415 268-6000

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A. M. Kinney Affiliates
2900 Vernon Pl
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803 575-2000

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Oklahoma City, OK 73127
405 785-7190

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Overland Park, KS 66225
913 642-5255
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catalog reference file pg 406

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301 296-7252

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Hamburg, NY 14075
716 548-5290

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608 754-8354

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San Jose, CA 95118
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901 345-8760

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Process Technology Inc
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214 638-0625

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416 498-2382

DENNISE ROBY & ASSOCIATES
INC
1900 E. Eldorado St
P.O. Box 1425
Decatur, IL 62525
217 429-4412

RUST INTERNATIONAL CORP
1130 S. 22nd St
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Birmingham, AL 35201
205 930-1000

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P.O. Box 29
Hudson, WI 54016
715 386-9501

ST. ONGE RUFF & ASSOCIATES
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677 Main St
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York, PA 17405
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503 226-3921

SIEBERT ENGINEERS INC
One San Creek Lane
Mundelein, IL 60521
312 325-6560

SUNDT CORP
4101 E. Irvington Rd
P.O. Box 26685
Tucson, AZ 85726
602 748-7555

SVERDRUP CORPORATION
801 N. Eavent
St. Louis, MO 63107
314 436-7600
See advertisement pg 000

TODD S. INC
4413 NE 14th
P.O. Box 4827
Des Moines, IA 50305
515 266-2276

THE TURNBULL COMPANY
4731 South Ave
P.O. Box 7292
Tomboc, OH 43075
419 535-8757

WEBBER SMITH ASSOCIATES
INC
1921 Wheatland Ave
Lancaster, PA 17603
717 291-2256

WEYHER LUYSEY
CONSTRUCTORS INC
Subs. of Drac Corp
775 N. 700 W
Salt Lake City, UT 84116
801 521-7030

WILLIAMS TREE LOCK
WHITEHEAD ARCHITECTS &
INTERIOR DESIGNERS
Timber Ct
Pittsburgh, PA 15210
412 321-0550

WINSETT ENGINEERING INC
P.O. Box 1008
Decatur, GA 30001
404 378-1392

WISBECK ARCHITECTS
10821 NE 2nd Pl
Bellevue, WA 98004
206 455-3436

YOUNGLOVE CONSTRUCTION
CO
2015 E. Seventh
Sioux City, IA 51102
712 277-3906

ZURHEIDE-HERMANN INC
4333w. Cayton Ave
St. Louis, MO 63110
314 652-6805

FOOD LABORATORIES/SERVICES

The following categorical guide and directory of organizations performing testing, analysis, research and associated services for food products/operations was compiled using information received from companies providing **FOOD PROCESSING** with information on their capabilities. Comments and suggestions regarding the categories and companies listed are welcome by the editorial staff.

BACTERIOLOGICAL TESTING

A & L Midwest Agricultural Laboratories, Inc.
 Allied Laboratories Ltd
 American Interpac Corp
 American Standards Testing Bureau, Inc.
 Amertech Laboratories
 Analytic & Biological Laboratories, Inc.
 Analytical Labs & Services Inc
 Anstach
 Applied Microbiological Services, Inc.
 Applied Research Laboratories of Florida, Inc.
 Aquilab Inc.
 Arizona Testing Laboratories
 Associated Analytical Laboratories, Inc.
 Associated Laboratories
 BASCAL - Bay Area Bio Chemical Analytical Laboratory
 Bact-Chem Labs., Inc.
 Bacto-Free, Inc.
 Becker Laboratories Inc
 Biological Consultants
 Biological Services, Inc.
 F. C. Broeman & Co., Inc.
 Buffalo Testing Laboratories, Inc.
 Carolina Biologicals Ltd
 Central Analytical Labs, Inc.
 Carsted Laboratories Inc
 Chem Bio Consultants & Laboratories
 Columbia Laboratories, Inc.
 Commercial Testing Laboratory, Inc.
 Commodity Labs, Inc.
 Contech Laboratories, Inc.
 Croppen Laboratories, Inc.
 Curtis & Tompkins, Ltd. Good-Labs Div.
 Dairy & Food Labs, Inc.
 Diversified Research Laboratories, Ltd.
 Dory Laboratories, Inc.
 Eastern Laboratory Service Associates
 Environmental Protection Systems, Inc.
 Erie Testing Laboratories
 Feltg Laboratories
 Fritson Laboratories, Inc.
 Food Quality Analysts, Inc.
 Food Quality Lab
 Foods Research Laboratories, Inc.
 Foodworks Inc.
 Friend Laboratory, Inc.
 General Testing Laboratories
 Great Lakes Scientific, Inc.
 Hama Laboratories
 Hazleton Laboratories America, Inc.
 Chemical & Biochemical Sciences Div.

Hill Top Research, Inc.
 Industrial Laboratories
 Industrial Testing Laboratories
 Ingman Laboratories, Inc.
 Ingredient Control Laboratories
 Institute for Research, Inc.
 Intech Biotech, Inc.
 J. H. M. Laboratories, Inc.
 Kentucky Testing Laboratory Corp.
 Lancaster Laboratories, Inc.
 La Rocca Science Laboratories, Inc.
 Lauck Testing Laboratories, Inc.
 Leatherhead Food RA
 Lebensmittel Consulting
 The Lehigh Valley Laboratories, Inc.
 Louisville Testing Laboratory, Inc.
 MacMillan Research Ltd
 Medication Laboratories
 See advertisement pg 54
 Michelson Laboratories, Inc.
 Microbac Laboratories, Inc.
 Microbiology Consultants
 Midwest Food & Water Analysts, Inc.
 Minnesota Valley Testing Laboratories
 Morning Star Laboratories, Inc.
 Morse Laboratories Incorporated
 The National Food Laboratory
 See advertisement pg 55, 57, 58, 61
 Nebraska Testing Laboratories Scientific Div.
 New Jersey Laboratories
 New York Testing Laboratories, Inc.
 Northeast Laboratories, Inc.
 Northwest Laboratories, Inc.
 Orlando Laboratories, Inc.
 Part Laboratories, Inc.
 Pope Testing Laboratories, Inc.
 Professional Service Industries, Inc.
 Analytical Services Div., Florida Testing
 Q. C. Inc. - Quality Control Laboratory
 R & D Laboratory
 SP Engineering
 Semi-Pure Laboratories
 Sanitation Consultants, Inc.
 So-Tek Laboratories
 Scott Laboratories, Inc.
 Water E. Seidman, Ph.D. & Associates
 Sherman Laboratories
 Shilker Laboratories, Inc.
 Southern Testing & Research Laboratories, Inc.
 Strasburger & Siegel, Inc.
 Suburban Laboratories, Inc.
 Tri-Tech Laboratories, Inc.
 Truesdell Laboratories, Inc.
 Ungar Consultation & Inspection Services
 United States Testing Company, Inc.
 WW Laboratories, Inc.

Webb Foodlab, Inc.
 Wells Laboratories, Inc.
 J. C. Wilcox Associates
 Winston Laboratories, Inc.
 Wood Laboratory Ltd
 Woodson-Tenant Laboratories, Inc.

CHEMICAL ANALYSIS

A. B. C. Research Corp.
 A & L Mid West Agricultural Laboratories, Inc.
 Allied Analytical & Research Laboratories
 Allied Laboratories, Ltd.
 American Interpac Corp.
 American Standards Testing Bureau, Inc.
 Amertech Laboratories
 Analytic & Biological Laboratories, Inc.
 Analytical Labs & Services Inc.
 Anstach
 Applied Microbiological Services, Inc.
 Applied Research Laboratories of Florida, Inc.
 Aquilab Inc.
 Arizona Testing Laboratories
 Associated Analytical Laboratories, Inc.
 Associated Laboratories
 BASCAL - Bay Area Bio Chemical Analytical Laboratory
 BC Laboratories, Inc.
 Bact-Chem Labs, Inc.
 Bacto-Free, Inc.
 Bioenergecs, Inc.
 Biological Consultants
 Bjorksten Research Laboratories, Inc.
 F. C. Broeman & Co., Inc.
 Buffalo Testing Laboratories, Inc.
 Cambrian Processes
 Carolina Biologicals Ltd
 Central Analytical Labs, Inc.
 Century Laboratories, Inc.
 Certified Laboratories, Inc.
 Chem Bio Consultants & Laboratories
 Columbia Laboratories, Inc.
 Commercial Testing & Engrg. Co.
 Commercial Testing Laboratory, Inc.
 Commodity Labs, Inc.
 Contech Laboratories
 Controls for Environmental Pollution, Inc.
 Croppen Laboratories, Inc.
 Curtis & Tompkins, Ltd. Good-Labs Div.
 Dairy & Food Labs, Inc.
 Diversified Laboratories, Inc.
 Diversified Research Laboratories, Ltd.
 Dory Laboratories, Inc.
 EIS Environmental Engineers, Inc.
 Eastern Laboratory Service Associates
 Environmental Protection Systems, Inc.
 Erie Testing Laboratories
 Feltg Laboratories
 Fritson Laboratories, Inc.
 Food Quality Analysts, Inc.
 Food Quality Lab
 Food Technology Laboratory, Inc.
 Foods Research Laboratories, Inc.
 Friend Laboratory, Inc.
 General Testing Laboratories
 Great Lakes Scientific, Inc.
 Hama Laboratories
 Hazleton Laboratories America, Inc.
 Chemical & Biochemical Sciences Div.
 Heron Testing Laboratories, Inc.
 Industrial Laboratories
 Industrial Testing Laboratories
 Ingman Laboratories, Inc.
 Institute for Research, Inc.
 Intech Biotech, Inc.
 J. H. M. Laboratories, Inc.
 Kentucky Testing Laboratory Corp.
 Krueger Food Laboratories
 Lancaster Laboratories, Inc.
 Lauck Testing Laboratories, Inc.
 Leatherhead Food RA
 Lebensmittel Consulting
 Louisville Testing Laboratory, Inc.
 MacMillan Research
 Medication Laboratories
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 Michelson Laboratories, Inc.
 Microbac Laboratories, Inc.
 Minnesota Valley Testing Laboratories
 Morning Star Laboratories, Inc.
 Morse Laboratories Incorporated
 The National Food Laboratory
 See advertisement pg 55, 57, 58, 61
 Nebraska Testing Laboratories Scientific Div.
 New Jersey Laboratories
 New York Testing Laboratories, Inc.
 Northeast Laboratories, Inc.
 Northwest Laboratories, Inc.
 Northwest Pacific Laboratories, Inc.
 Northwest Laboratories, Inc.
 Nutrition International, Inc.
 Orinda Research Services, Inc.
 Orlando Laboratories, Inc.
 Patison's Laboratories, Inc.
 Part Laboratories, Inc.
 Pollution Laboratories
 Professional Service Industries, Inc.
 Analytical Services Div., Florida Testing
 Q. C. Inc. - Quality Control Laboratory
 R & D Laboratory
 SP Engineering
 Sanitation Consultants, Inc.
 So-Tek Laboratories
 Scott Laboratories, Inc.
 Southern Testing & Research Laboratories, Inc.
 Stillwell & Gladding, Inc.
 Strasburger & Siegel, Inc.
 Suburban Laboratories, Inc.
 TEI Analytical, Inc.
 Tri-Tech Laboratories, Inc.
 Truesdell Laboratories, Inc.
 Ungar Consultation & Inspection Services
 United States Testing Company, Inc.
 Webb Foodlab, Inc.
 Wells Laboratories, Inc.
 J. C. Wilcox Associates
 Winston Laboratories, Inc.
 Wood Laboratory Ltd
 Woodson-Tenant Laboratories, Inc.

FOOD LABORATORIES/SERVICES

COMPLETE FOODS

MEAT TESTING

A B C Research Corp.
A & L Mid West Agricultural Laboratories, Inc.
American Interplex Corp.
American Standards Testing Bureau, Inc.
Ameritech Laboratories
Analytic & Biological Laboratories, Inc.
Analytical Labs & Services Inc.
Analytical Services Group
Anresco, Inc.
Applied Microbiological Services Inc.
Applied Research Laboratories of Florida, Inc.
Associated Analytical Laboratories, Inc.
Associated Laboratories
BABCAL - Bay Area Bio Chemical Analytical Laboratory
Bacti-Chem Labs, Inc.
Bacti-Free, Inc.
Biological Consultants
F C Broeman & Co., Inc.
Buffalo Testing Laboratories, Inc.
Cardinal Biologicals Ltd.
Centra Analytical Labs, Inc.
Certified Laboratories, Inc.
Chem Bio Consultants & Laboratories
Columbia Laboratories, Inc.
Commercial Testing Laboratory, Inc.
Commodity Labs, Inc.
Curts & Tompkins, Ltd. Gooch Labs Div.
Diversified Research Laboratories, Ltd.
Ene Testing Laboratories
Fetig Laboratories
Freslon Laboratories, Inc.
Food Quality Analysts, Inc.
Food Quality Lab
Food Technology Laboratory, Inc.
Foods Research Laboratories, Inc.
Foodworks Inc.
Friend Laboratory, Inc.
General Testing Laboratories
Great Lakes Scientific, Inc.
Hazelton Laboratories America Inc.
Chemical & Biomedical Sciences Div.
Industrial Laboratories
Ingman Laboratories, Inc.
Ingredient Control Laboratories
Intech Biolabs, Inc.
Kentucky Testing Laboratory Corp.
Lancaster Laboratories, Inc.
Laucks Testing Laboratories, Inc.
Leatherhead Food RA
Lebensmittel Consulting
Medallion Laboratories
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Michelson Laboratories, Inc.
Microbec Laboratories, Inc.
Minnesota Valley Testing Laboratories
Morning Star Laboratories, Inc.
The National Food Laboratory
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New Jersey Laboratories
Northeast Laboratories, Inc.
Northwest Pacific Laboratories, Inc.
Northwest Laboratories, Inc.
Nutrition International, Inc.
Professional Service Industries, Inc.
Analytical Services Div., Florida Testing
Professional Service Industries, Inc., Bio Search Laboratories
Q.C. Quality Control Laboratory

R & D Laboratory
Sani-Pure Laboratories
Sci-Tek Laboratories
Water E. Seideman, Ph.D. & Associates
Sensory Resources, Inc.
Herbert V. Shuster, Inc.
Saliker Laboratories, Inc.
Southern Testing & Research Laboratories, Inc.
Strasburger & Siegel, Inc.
Suburban Laboratories, Inc.
United States Testing Company, Inc.
Webb Foodlab, Inc.
Winston Laboratories, Inc.
J. C. Wilcox Associates
Wood Laboratory, Ltd.
Winterson-Tenent Laboratories, Inc.

A & L Mid West Agricultural Laboratories, Inc.

Ametech
Commercial Testing Laboratory, Inc.
Food Technology Laboratory, Inc.
Foodworks Inc.
W. A. Gooms & Associates
M. H. Katz Consulting, Inc.
The National Food Laboratory
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R & D Management Systems, Inc.
Sensory Resources, Inc.

CONSUMER TESTING

ABIC Int. Consultants, Inc.
Amed Laboratories, Ltd.
American Interplex Corp.
American Standards Testing Bureau, Inc.
Analytic & Biological Laboratories, Inc.
Andy Andarman Consulting Services
Antech
Applied Research Laboratories of Florida, Inc.
Beckart Laboratories, Inc.
Biological Consultants
Boian International, Ltd.
F. C. Broeman & Co., Inc.
Cardinal Biologicals, Ltd.
Chem...
Chem Bio Consultants & Laboratories
Commercial Testing Laboratory, Inc.
Commodity Labs, Inc.
Davis Research, Inc.
Diversified Research Laboratories, Ltd.
Bradley Eagerman
Fetig Laboratories
Food Evaluation Center
Food Quality Analysts, Inc.
Food Technology Laboratory, Inc.
Foodworks Inc.
General Testing Laboratories
Harms Laboratories
Hazelton Laboratories America Inc.
Chemical & Biomedical Sciences Div.
Hill Top Research, Inc.
Institute for Research, Inc.
Ishier Test Services, Inc.
Knecht Laboratories
Lancaster Laboratories, Inc.
Med-Check, Inc.
Michelson Laboratories, Inc.
Microbiology Consultants

The National Food Laboratory
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Nebraska Testing Laboratories Scientific Div.
New Jersey Laboratories
Northeast Laboratories, Inc.
Northwest Pacific Laboratories, Inc.
Nutrition International, Inc.
Pleaser, Inc.
Pearson Research Associates
Ernest Poleschman, Inc.
Q. C. Inc. - Quality Control Laboratory
Barbara A. Rainey
Regu-Tech Associates, Inc.
Arnold S. Roseman, Ph.D.
R. F. Schmitt Associates
Sci-Tek Laboratories
Sensory Resources, Inc.
Herbert V. Shuster, Inc.
Lawrence S. Sojega, Ph.D. Consultants
Stilwell & Gladding, Inc.
Strasburger & Siegel, Inc.
Tragon Corporation
United States Testing Company, Inc.
Valley Engineers, Inc. Laboratory Div.
Webb Foodlab, Inc.
Weiss Laboratories, Inc.
J. C. Wilcox Associates
Winston Laboratories, Inc.

CONTRACT RESEARCH

A B C Research Corp.
ABIC Int. Consultants, Inc.
A & L Mid West Agricultural Laboratories, Inc.
Ametech, Inc.
Amed Laboratories, Ltd.
American Institute of Baking
American Standards Testing Bureau, Inc.
Ameritech Laboratories
Analytic & Biological Laboratories, Inc.
Analytical Labs & Services, Inc.
Analytical Services Group
Andy Andarman Consulting Services
Antech
Applied Microbiological Services, Inc.
Aqualab, Inc.
Associated Analytical Laboratories, Inc.
Bacti-Chem Labs, Inc.
Bacti-Free, Inc.
C. V. Bianco Associates, Inc.
Bioenergetics, Inc.
Bio-Technical Resources, Inc.
Biorsten Research Laboratories, Inc.
Boian International, Ltd.
Buffalo Testing Laboratories, Inc.
Cambrian Processes
Cardinal Biologicals, Ltd.
Certified Laboratories, Inc.
Chem Bio Consultants & Laboratories
Commodity Labs, Inc.
Consech Laboratories
Crippen Laboratories
Curry Corp.
Curts & Tompkins, Ltd. Gooch Labs Div.
Davis Research
Diversified Research Laboratories, Ltd.
Bradley Eagerman
Eter, Inc.
Food Science Associates, Inc.
Food Technology Laboratory, Inc.

Foodworks, Inc.
General Testing Laboratories
Great Lakes Scientific, Inc.
Harms Laboratories
Hazelton Laboratories America, Inc.
Chemical & Biomedical Sciences Div.
Hill Top Research, Inc.
Institute for Research, Inc.
M. H. Katz Consulting, Inc.
Knecht Laboratories
Krueger Food Laboratories
Leatherhead Food RA
Lebensmittel Consulting
Arthur D. Libe, Inc.
Med-Check, Inc.
Microbec Laboratories, Inc.
Midwest Food & Water Analysts, Inc.
The National Food Laboratory
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Northeast Laboratories, Inc.
Nutrition International, Inc.
Onaco Research Sciences, Inc.
Orlando Laboratories, Inc.
Part Laboratories, Inc.
Polyneuron Laboratories
Q. C. Inc. - Quality Control Laboratory
R & D Management Systems, Inc.
Regu-Tech Associates, Inc.
Richardson Researchers, Inc.
R. F. Schmitt Associates
Sci-Tek Laboratories
Water E. Seideman, Ph.D. & Associates
Sensory Resources, Inc.
Summer Laboratories, Inc.
Lawrence S. Sojega, Ph.D. Consultants
Strasburger & Siegel, Inc. T.P.S., Inc.
Technical Food Consultants
Valley Engineers, Inc. Laboratory Div.
Van Dyke & Associates
Webb Foodlab, Inc.
Weiss Laboratories, Inc.
J. C. Wilcox Associates
Williams Laboratories
Winston Laboratories, Inc.
Dr. M. Yacowicz & Company

A B C Research Corp.
American Interplex Corp.
American Standards Testing Bureau, Inc.
Ameritech Laboratories
Analytic & Biological Laboratories, Inc.
Analytical Labs & Services, Inc.
Anresco, Inc.
Antech
Aqualab, Inc.
Associated Analytical Laboratories, Inc.
Bacti-Chem Labs, Inc.
Bacti-Free, Inc.
F. C. Broeman & Co., Inc.
Century Laboratories, Inc.
Certified Laboratories, Inc.
Chem Bio Consultants & Laboratories
Columbia Laboratories, Inc.
Commodity Labs, Inc.
Fetig Laboratories
Freslon Laboratories, Inc.
Food Quality Analysts, Inc.
Food Quality Lab
Foodworks, Inc.

Friend Laboratory, Inc.
 Hazleton Laboratories America Inc.
 Chemical & Biomedical Sciences
 Div.
 Industrial Laboratories
 Kentucky Testing Laboratory Corp.
 Madison Laboratories
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 Michigan Laboratories, Inc.
 Morning Star Laboratories, Inc.
 The National Food Laboratory
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 New York Testing Laboratories, Inc.
 Northeast Laboratories, Inc.
 Nuuron International, Inc.
 Professional Service Industries Inc.
 Analytical Services Div. Florida
 Testing
 San-Pure Laboratories
 Sci-Tex Laboratories
 Walter E. Seideman, Ph.D. &
 Associates
 Sinker Laboratories, Inc.
 Southern Testing & Research
 Laboratories, Inc.
 Strasburger & Siegel, Inc.
 Wells Laboratories, Inc.
 J. C. Wilcox Associates
 Winston Laboratories, Inc.
 Woodson-Tenent Laboratories, Inc.

EFFLUENT ANALYSIS

A.B.C. Research Corp.
 A & L Mid West Agricultural
 Laboratories, Inc.
 Allied Laboratories, Ltd.
 American Interplex Corp.
 American Standards Testing Bureau
 Inc.
 Ameritech Laboratories
 Analytic & Biological Laboratories
 Inc.
 Analytical Labs & Services Inc.
 Antech
 Aquatlab, Inc.
 Arizona Testing Laboratories
 Associated Analytical Laboratories
 Inc.
 Associated Laboratories
 BC Laboratories, Inc.
 Bacti-Chem Labs, Inc.
 F. C. Broeman & Co., Inc.
 Buffalo Testing Laboratories, Inc.
 Campan Processes
 Central Analytical Labs, Inc.
 Century Laboratories, Inc.
 Certified Laboratories, Inc.
 Clean Water Engineers, Inc.
 Columbia Laboratories, Inc.
 Commercial Testing Laboratory, Inc.
 Commodity Labs, Inc.
 Controls for Environmental Pollution
 Inc.
 Croppen Laboratories, Inc.
 Curtis & Tompkins, Ltd. Gooch
 Labs, Div.
 Diversified Laboratories, Ltd.
 Diversified Research Laboratories
 Ltd.
 EIS Environmental Engineers, Inc.
 ESA Laboratories, Inc.
 Eastern Laboratory Service
 Associates
 Environmental Protection Systems,
 Inc.
 Erie Testing Laboratories
 Food Quality Analysts, Inc.
 Food Quality Lab
 Food Research Laboratories, Inc.
 Friend Laboratory, Inc.
 General Testing Laboratories

Hazleton Laboratories America Inc.
 Chemical & Biomedical Sciences
 Div.
 Industrial Laboratories
 Institute for Research, Inc.
 Inter-Broads, Inc.
 J. H. M. Laboratories, Inc.
 Kentucky Testing Laboratory Corp.
 Lancaster Laboratories, Inc.
 Laux's Testing Laboratories, Inc.
 Leachmead Food RA
 Louisville Testing Laboratory, Inc.
 MacMillan Research, Ltd.
 Microbac Laboratories, Inc.
 Minnesota Valley Testing
 Laboratories
 Morning Star Laboratories, Inc.
 The National Food Laboratory
 See advertisement pg 55, 57, 59, 61
 Nebraska Testing Laboratories, Inc.
 Scientific Div.
 New Jersey Laboratories
 New York Testing Laboratories, Inc.
 Northeast Laboratories, Inc.
 Northwest Laboratories, Inc.
 Oneida Research Services, Inc.
 Orlando Laboratories, Inc.
 Pope Testing Laboratories, Inc.
 Professional Service Industries, Inc.
 Analytical Services Div. Florida
 Testing
 Q.C. Inc. Quality Control
 Laboratory
 SP Engineering
 Sanitation Consultants, Inc.
 Sci-Tex Laboratories
 Shankman Laboratories
 Southern Testing & Research
 Laboratories, Inc.
 Strasburger & Siegel, Inc.
 Suburban Laboratories, Inc.
 TE Analytical, Inc.
 Tri-Tech Laboratories, Inc.
 Truesdale Laboratories, Inc.
 United States Testing Company, Inc.
 Wecc Foodlab, Inc.
 Wells Laboratories, Inc.
 J. C. Wilcox Associates
 Winston Laboratories, Inc.
 Wood Laboratory Ltd.
 Woodson-Tenent Laboratories, Inc.

A.B.C. Research Corp.
 A & L Mid West Agricultural
 Laboratories, Inc.

Don't be left out . . .

The January issue of **FOOD PROCESSING** will spotlight Processing Developments. If your company has been involved in a new processing technology or unusual application, we would like to hear from you. Contact Processing Editor **FOOD PROCESSING Magazine**, 301 E. Erie St., Chicago, IL 60611.

Alex Analytical & Research Laboratories
 Alex Laboratories Inc
 American Interplex Corp
 American Standards Testing Bureau, Inc
 Ameritech Laboratories
 Analytic & Biological Laboratories Inc
 Analytical Labs & Services Inc
 Andy Andaman Consulting Services
 Anresco, Inc
 Antec
 Applied Research Laboratories of Florida, Inc
 Aquasol Inc
 Arizona Testing Laboratories
 Associated Analytical Laboratories, Inc
 Associated Laboratories
 BC Laboratories, Inc
 Bact-Chem Labs Inc
 Bacto-Free, Inc
 Biological Consultants
 Biological Services, Inc
 F C Brozman & Co., Inc
 Buffalo Testing Laboratories Inc
 Central Analytical Labs Inc
 Certified Laboratories, Inc
 Clean Water Engineers, Inc
 Columbia Laboratories, Inc
 Commercial Testing & Engrg Co
 Commercial Testing Laboratory Inc
 Commodity Labs, Inc
 Controls for Environmental Pollution Inc
 Crocker Laboratories, Inc
 Curtis & Tompkins, Ltd., Gooch Labs Div
 Diversified Research Laboratories, Ltd
 EIS Environmental Engineers, Inc
 ESA Laboratories, Inc
 Eastern Laboratory Service Associates
 Environmental Health Science, Inc
 Environmental Protection Systems, Inc
 Ene Testing Laboratories
 Food Sanitation Institute
 Friend Laboratory, Inc
 General Testing Laboratories
 Hazleton Laboratories America, Inc.
 Chemical & Biomedical Sciences Div
 H-Tec Research, Inc
 Industrial Laboratories
 Ingmar Laboratories, Inc
 Institute for Research, Inc
 Intech Biotech, Inc
 J H M Laboratories, Inc
 Knechtel Laboratories
 Laboratory Quality Systems, Ltd
 Lancaster Laboratories, Inc
 La Rocca Science Laboratories, Inc
 Laucks Testing Laboratories, Inc
 Leatherhead Food RA
 Leobenmiller Consulting
 The Lehigh Valley Laboratories, Inc
 MacMillan Research Ltd
 Microbac Laboratories, Inc
 Microbiology Consultants
 Minnesota Valley Testing Laboratories
 The National Food Laboratory
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 Neoraska Testing Laboratories, Scientific Div
 New Jersey Laboratories
 New York Testing Laboratories, Inc
 Northeast Laboratories, Inc

Northwest Laboratories, Inc
 Oneida Research Services, Inc
 Professional Service Industries, Inc
 Analytical Services Div, Florida Testing
 SP Engineering
 Semi-Pure Laboratories
 Sanitation Consultants, Inc
 Shankman Laboratories
 Southern Testing & Research Laboratories, Inc
 Spivell & Gladding, Inc
 Strasburger & Siegel, Inc
 Suburban Laboratories, Inc
 TEI Analytical, Inc
 Tri-Tech Laboratories, Inc
 Trueblood Laboratories, Inc
 United States Testing Company, Inc
 Webb Foodlab, Inc
 Wells Laboratories, Inc
 J C Wilcox Associates
 Winston Laboratories, Inc
 Wood Laboratory, Ltd
 Woodson-Tenert Laboratories, Inc

IN PLANT SANITATION

A B C Research Corp
 American Institute of Baking
 American Interplex Corp
 American Standards Testing Bureau, Inc
 Ameritech Laboratories
 Analytic & Biological Laboratories, Inc
 Analytical Labs & Services, Inc

Andy Andaman Consulting Services
 Antec
 Applied Microbiological Services, Inc
 Jack Aronowicz & Associates
 Associated Laboratories
 Bact-Chem Labs, Inc
 Bacto-Free, Inc
 L J Bianco Associates
 Biological Consultants
 Biological Services, Inc
 Bozell International, Ltd
 F C Brozman & Co, Inc
 Buffalo Testing Laboratories, Inc
 Carolina Biologicals Ltd
 Central Analytical Labs, Inc
 Certified Laboratories, Inc
 Chem Bio Consultants & Laboratories
 Clean Water Engineers, Inc
 Commercial Testing Laboratory, Inc
 Commodity Labs, Inc
 Contech Laboratories
 Creative Technological Services
 Curtis & Tompkins, Ltd Gooch Labs Div
 Dairy & Food Labs, Inc
 Diversified Research Laboratories, Ltd
 Eastern Laboratory Service Associates
 Ene Testing Laboratories
 Fatsig Laboratories
 Frierson Laboratories, Inc
 Food Quality Analysts, Inc
 Food Quality Lab
 Food Sanitation Institute
 Food Service Associates, Inc

Food Research Laboratories, Inc
 Foodworks, Inc
 Friend Laboratory, Inc
 Great Lakes Scientific, Inc
 Hamt Laboratories
 Har-Tec Research, Inc
 J H M Laboratories, Inc
 Kentucky Testing Laboratory Corp
 H B Krohn Consultants, Inc
 Laboratory Quality Systems, Ltd
 Lancaster Laboratories, Inc
 La Rocca Science Laboratories, Inc
 Laucks Testing Laboratories, Inc
 Leatherhead Food RA
 Leobenmiller Consulting
 Medation Laboratories
 Morning Star Laboratories, Inc
 The National Food Laboratory
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 Neoraska Testing Laboratories, Scientific Div
 New Jersey Laboratories
 Northeast Laboratories, Inc
 Northwest Laboratories, Inc
 Orlando Laboratories, Inc
 Pine Consultants, Inc
 Professional Service Industries, Inc
 Analytical Services Div, Florida Testing
 Q C Inc - Quality Control Laboratory
 J Rakosky Services, Inc
 Regu-Tech Associates, Inc
 Semi-Pure Laboratories
 R F Schifmann Associates

FOOD LABORATORIES SERVICES

Sensation Consultants Inc
 Sci-Tek Laboratories
 Walter E. Seideman, Ph.D. & Associates
 Herbert V. Shuster Inc
 Siliker Laboratories Inc
 Lawrence S. Soeget, Ph.D. Consultants
 Strasburger & Siegel, Inc.
 Suburban Laboratories Inc
 Tuesday Laboratories Inc
 United States Testing Company
 Haric Wellness & Associates
 Webb Foodlab Inc
 Wells Laboratories Inc
 J. C. Wilcox Associates
 Winston Laboratories Inc
 Wood Laboratory Ltd

MARKET STUDIES

ABIC Int'l Consultants, Inc
 AgriTech Inc
 American Standards Testing Bureau, Inc
 Antech
 Applied Microbiological Services Inc
 Bofal, International, Ltd
 Born & Co
 Cardinal Biologicals Ltd
 Check II
 Davis Research, Inc
 Ete, Inc
 Daniel F. Fariss Associates
 Food & Agrosystems, Inc
 Food Science Associates, Inc
 Foodworks Inc
 Hill Top Research, Inc
 Knechtel Laboratories
 Leathmead Food RA
 Med-Check, Inc
 New Jersey Laboratories
 Pearson Research Associates
 Ernest Poeschman Inc
 J. Rasosky Services, Inc
 Sanitation Consultants, Inc
 R. F. Schifmann Associates
 Sensory Resources, Inc
 Siliker Laboratories Inc
 Lawrence S. Soeget, Ph.D. Consultants
 United States Testing Company, Inc
 Value Engineers, Inc Laboratory Div
 Webb Foodlab Inc

A B C Research Corp.
 American Interplex Corp.
 American Standards Testing Bureau, Inc
 Amertech Laboratories
 Analytic & Biological Laboratories Inc
 Analytical Labs & Services Inc
 Antech
 Applied Microbiological Services Inc.
 Bacto-Chem Labs Inc
 Bacto-Free, Inc.
 L. J. Blanco Associates, Inc
 Biological Consultants
 Biological Services, Inc
 F. C. Broeman & Co., Inc
 Buffalo Testing Laboratories, Inc.
 Cardinal Biologicals Ltd
 Central Analytical Labs, Inc
 Certified Laboratories, Inc.
 Chem Bio Consultants & Laboratories
 Commodity Labs, Inc
 Curtis & Tompkins, Ltd., Gooch Labs Div

Dairy & Food Labs, Inc
 Diversified Research Laboratories Ltd
 Eastern Laboratory Service Associates
 Fassion Laboratories, Inc
 Food Quality Analysts, Inc
 Food Quality Lab
 Food Sanitation Institute
 Food Science Associates, Inc
 Foods Research Laboratories Inc
 Foodworks Inc
 Great Lakes Scientific Inc
 Haric Laboratories
 Hazleton Laboratories America Inc.
 Chemical & Biomedical Sciences Div
 Hill Top Research, Inc
 Industrial Testing Laboratories
 Ingman Laboratories Inc
 Laboratory Quality Systems Inc
 La Rocca Science Laboratories, Inc
 Leathmead Food RA
 Lebensmittel Consulting
 The Leigh Valley Laboratories, Inc
 Louisville Testing Laboratory Inc
 MacMillan Research Ltd
 Michelson Laboratories Inc
 Microbac Laboratories Inc
 Microbiology Consultants
 Micro-Biotrol Company
 Morning Star Laboratories, Inc
 The National Food Laboratory
 See advertisement pg 55, 57, 58, 61
 New Jersey Laboratories
 Northeast Laboratories, Inc
 Pine Consultants, Inc
 O.C. Inc - Quality Control Laboratory
 Regu-Tech Associates, Inc
 SP Engineering
 San-Pure Laboratories
 Sanitation Consultants, Inc
 R. F. Schifmann Associates
 Sci-Tek Laboratories
 Walter E. Seideman, Ph.D. & Associates
 Siliker Laboratories Inc
 Southern Testing & Research Laboratories Inc
 Strasburger & Siegel, Inc
 Tuesday Laboratories, Inc
 United States Testing Company, Inc
 WW Laboratories, Inc
 Haric Wellness & Associates
 Webb Foodlab Inc
 Wells Laboratories Inc
 J. C. Wilcox Associates
 Winston Laboratories, Inc

MINERAL ANALYSIS

A.B.C. Research Corp.
 A & L Mid West Agricultural Laboratories Inc
 Allied Analytical & Research Laboratories
 American Interplex Corp
 Amertech Laboratories
 American Standards Testing Bureau, Inc
 Amertech Laboratories
 Analytic & Biological Laboratories, Inc
 Analytical Labs & Services Inc
 Analytical Services Group
 Antech
 Applied Microbiological Services Inc
 Applied Research Laboratories of Florida, Inc
 Aqualed Inc
 Arizona Testing Laboratories
 Associated Analytical Laboratories, Inc
 Associated Laboratories
 BCI Laboratories Inc
 Bacto-Chem Labs Inc
 Bacto-Free Inc
 F. C. Broeman & Co. Inc
 Buffalo Testing Laboratories, Inc
 Cardinal Biologicals Ltd
 Century Laboratories Inc
 Certified Laboratories, Inc
 Chem Bio Consultants & Laboratories
 Columbia Laboratories Inc
 Commercial Testing & Engrg. Co
 Commercial Testing Laboratory, Inc
 Commodity Labs, Inc
 Curtis & Tompkins, Ltd., Gooch Labs Div
 Diversified Laboratories Inc
 Diversified Research Laboratories Ltd
 Doty Laboratories Inc
 ESA Laboratories Inc
 Eastern Laboratory Service Associates
 Environmental Protection Systems Inc
 Fatsig Laboratories
 Fission Laboratories Inc
 Food Quality Analysts Inc
 Food Quality Lab
 Foodworks Inc
 Friend Laboratory Inc
 General Testing Laboratories
 Great Lakes Scientific Inc
 Haric Laboratories
 Hazleton Laboratories America Inc
 Chemical & Biomedical Sciences Div
 Industrial Laboratories
 Industrial Testing Laboratories
 Ingman Laboratories Inc
 Intech Biotech Inc
 International Foods Corp.
 M. H. Katz Consulting Inc

Shanahan Laboratories
 Silver Laboratories Inc
 Southern Testing & Research Laboratories Inc
 Steiner & Gidding Inc
 Strasburger & Siegel Inc
 Suburban Laboratories Inc
 Tuesday Laboratories Inc
 United States Testing Company, Inc
 Webb Foodlab Inc
 Wells Laboratories Inc
 J. C. Wilcox Associates
 Winston Laboratories Inc
 Wood Laboratory Ltd
 Woodson-Tenent Laboratories, Inc

A B C Research Corp.
 ABIC Int'l Consultants, Inc
 A & L Mid West Agricultural Laboratories, Inc
 American Interplex Corp
 American Standards Testing Bureau, Inc
 Amertech Laboratories
 Analytic & Biological Laboratories Inc
 Analytical Labs & Services Inc
 Analytical Services Group
 And Archman Consulting Services
 Anresco Inc
 Antech
 Applied Microbiological Services Inc
 Aqualed Inc
 Arizona Testing Laboratories
 Associated Analytical Laboratories, Inc
 Associated Laboratories
 BABCAL - Bay Area Bio Chemical Analytical Laboratory
 Bacto-Chem Labs Inc
 Bacto-Free Inc
 Beckert Laboratories Inc
 F. C. Broeman & Co. Inc
 Buffalo Testing Laboratories, Inc
 Cardinal Biologicals Ltd
 Certified Laboratories, Inc
 Chem Bio Consultants & Laboratories
 Columbia Laboratories, Inc
 Commercial Testing Laboratory, Inc
 Commodity Labs, Inc
 Curtis & Tompkins, Ltd., Gooch Labs Div
 Dairy & Food Labs, Inc
 Diversified Research Laboratories Ltd
 Doty Laboratories, Inc
 Eastern Laboratory Service Associates
 Dr. R. E. Einger & Associates
 Ete Testing Laboratories
 Ete, Inc
 Fatsig Laboratories
 Fission Laboratories, Inc
 Food Quality Analysts, Inc
 Food Quality Lab
 Food Science Associates, Inc
 Food Technology Laboratory, Inc
 Foods Research Laboratories, Inc
 Foodworks Inc
 Friend Laboratory Inc
 Hazleton Laboratories America Inc
 Chemical & Biomedical Sciences Div
 Industrial Laboratories
 Industrial Testing Laboratories
 Ingman Laboratories Inc
 Intech Biotech Inc
 International Foods Corp.
 M. H. Katz Consulting Inc

Nucleus Testing Laboratory Corp
 H B Krohn Consultants Inc
 Lyncaster Laboratories Inc
 Laurus Testing Laboratories Inc
 Leavenworth Food RA
 MacMillan Research Ltd
 Madison Laboratories
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 E Elexis Maclester Associates
 Maclester Laboratories Inc
 Microbac Laboratories Inc
 Minnesota Valley Testing Laboratories
 Morning Star Laboratories Inc
 Morse Laboratories Incorporated
 The National Food Laboratory
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 Nebraska Testing Laboratories
 Scientific Div
 New Jersey Laboratories
 Northwest Laboratories Inc
 Northwest Laboratories Inc
 Northwest Pacific Laboratories Inc
 Northwest Laboratories Inc
 Pure Consultants Inc
 Pops Testing Laboratories Inc
 Professional Service Industries Inc
 Analytical Service Div Florida Testing
 Q C Inc - Quality Control Laboratory
 R & D Laboratory
 J Raskony Services Inc
 Regu-Tech Associates Inc
 Americ S Rosenman Ph D
 SP Engineering
 San-Pure Laboratories
 R F Schriham Associates
 So-Tex Laboratories
 Walter E Schneider Ph D & Associates
 Shigemur Laboratories
 Herbert V Shuster Inc
 Silver Laboratories Inc
 Straburger & Siegel Inc
 Suburban Laboratories Inc
 Webb Foodac Inc
 Wells Laboratories Inc
 J C Whitcox Associates
 Windsor Laboratories Inc
 Woodson-Tenent Laboratories Inc

Laboratories
 Columbia Laboratories Inc
 Connolly Labs Inc
 Contech Laboratories
 Cropper Laboratories Inc
 Curtis & Tompkins Ltd Goodrich Labs Div
 Diversitech Laboratories Inc
 Diversitech Research Laboratories Ltd
 Duty Laboratories Inc
 Etec Laboratories
 Faison Laboratories Inc
 Food Quality Analysts Inc
 Food Quality Lab
 Foods Research Laboratories Inc
 Foodworks Inc
 Frank Laboratory Inc
 Harris Laboratories
 Hazleton Laboratories America Inc
 Chemistry & Biomedical Sciences Div
 Industrial Laboratories
 Industrial Testing Laboratories
 Ingram Laboratories Inc
 Intech Biotech Inc
 Kentucky Testing Laboratory Corp
 Laurus Testing Laboratories Inc
 Leavenworth Food RA
 Leavenworth Food RA
 Maclester Research Inc
 Mediator Laboratories
 See advertisement pg 54
 Microbac Laboratories Inc
 Microbac Laboratories Inc
 Minnesota Valley Testing Laboratory
 Morning Star Laboratories Inc
 Morse Laboratories Incorporated
 The National Food Laboratory
 See advertisement pg 55, 57, 58, 61

Nebraska Testing Laboratories Scientific Div
 New Jersey Laboratories
 New York Testing Laboratories Inc
 Northeast Laboratories Inc
 Northwest Laboratories Inc
 Northwest Pacific Laboratories Inc
 Northwest Laboratories Inc
 Nutrition International Inc
 Analytical Services Div Florida Testing
 Q C Inc - Quality Control Laboratory
 Romer Labs Inc
 San-Pure Laboratories
 Scientific Laboratories
 Herbert V Shuster Inc
 Silver Laboratories Inc
 Southern Testing & Research Laboratories Inc
 Straburger & Siegel Inc
 Suburban Laboratories Inc
 T P S Inc
 United States Testing Company Inc
 Webb Foodac Inc
 Wells Laboratories Inc
 J C Whitcox Associates
 Windsor Laboratories Inc
 Wood Laboratory Ltd
 Woodson-Tenent Laboratories Inc

Laboratories Inc
 Atec Analytical & Research Laboratories
 Atec Laboratories Inc
 Atec Laboratories Inc
 American Interiors Corp
 American Standards Testing Bureau Inc
 Ameritac Laboratories
 Analytic & Biological Laboratories Inc
 Analytical Labs & Services Inc
 Analytical Services Group
 Amesco Inc
 Arizona Testing Laboratories
 Associated Analytical Laboratories Inc
 Associated Laboratories
 Bacti-Chem Labs Inc
 Bacto-Free Inc
 Battelle Memorial Institute
 Biological Consultants
 F C Brauman & Co Inc
 Buretic Testing Laboratories Inc
 Campaign Processes
 Central Analytical Labs Inc
 Century Laboratories Inc
 Certified Laboratories Inc
 Chem Bio Consultants & Laboratories
 Columbia Laboratories Inc
 Commercial Testing & Entry Co
 Cropper Laboratories Inc
 Curtis & Tompkins Ltd Goodrich Labs Div
 Diversitech Laboratories Inc
 Diversitech Research Laboratories Inc

ORGANIC INORGANIC

ANALYSIS

A B C Research Corp
A B - Mc West Agriculture

NUTRITIONAL & VITAMIN ASSAYS

ABC Research Corp
 ABIC Int Consultants Inc
 A B - Mc West Agriculture Laboratories Inc
 American Interiors Corp
 American Standards Testing Bureau Inc
 Ameritac Laboratories
 Analytic & Biological Laboratories Inc
 Analytical Labs & Services Inc
 Analytical Services Group
 Amesco Inc
 Ameritac
 Applied Microbiological Services Inc
 Associated Analytical Laboratories Inc
 Associated Laboratories
 BABCAL - Bay Area Bio Chemical Analytical Laboratory
 Bacti-Chem Labs Inc
 Bacto-Free Inc
 Battelle Laboratories Inc
 F C Brauman & Co Inc
 Buretic Testing Laboratories Inc
 Carolina Biologicals Ltd
 Certified Laboratories Inc
 Chem Bio Consultants &

FOOD LABORATORIES/SERVICES

Gov Laboratories, Inc.
 ESA Laboratories, Inc.
 Eastern Laboratory Service
 Associates
 Environmental Protection Systems,
 Inc.
 Ene Testing Laboratories
 Fetteg Laboratories
 Fitecon Laboratories, Inc.
 Food Quality Analysts, Inc.
 Foodworks, Inc.
 Friend Laboratory, Inc.
 General Testing Laboratories
 Harms Laboratories
 Hazleton Laboratories America, Inc.,
 Chemical & Biomedical Sciences
 Div.
 Industrial Laboratories
 Industrial Testing Laboratories
 Ingman Laboratories, Inc.
 Institute for Research, Inc.
 Intech Biotabs, Inc.
 J. H. M. Laboratories, Inc.
 Kentucky Testing Laboratory Corp.
 Krueger Food Laboratories
 Lancaster Laboratories, Inc.
 Laucks Testing Laboratories, Inc.
 Leatherhead Food RA
 MacMillan Research Ltd.
 Medallion Laboratories
 See advertisement pg 54
 Microbac Laboratories, Inc.
 Minnesota Valley Testing
 Laboratories
 Morning Star Laboratories, Inc.
 Morse Laboratories Incorporated
 The National Food Laboratory
 See advertisement pg 55, 57, 59, 61
 Nebraska Testing Laboratories,
 Scientific Div.
 New Jersey Laboratories
 New York Testing Laboratories, Inc.
 Northeast Laboratories, Inc.
 Northview Pacific Laboratories, Inc.
 Northwest Laboratories, Inc.
 Nutron International, Inc.
 Oneda Research Services, Inc.
 Orlando Laboratories, Inc.
 Patison's Laboratories, Inc.
 Polyhedron Laboratories
 Professional Service Industries, Inc.,
 Analytical Services Div., Florida
 Testing
 Q. C. Inc. - Quality Control
 Laboratory
 Sani-Pure Laboratories
 Sanitation Consultants, Inc.
 Sci-Tek Laboratories
 Southern Testing & Research
 Laboratories, Inc.
 Stillwell & Gladding, Inc.
 Strasburger & Siegel, Inc.
 Suburban Laboratories, Inc.
 Tri-Tech Laboratories, Inc.
 Truesdail Laboratories, Inc.
 United States Testing Company, Inc.
 Weed Foodlab, Inc.
 Weiss Laboratories, Inc.
 J. C. Wilcox Associates
 Winston Laboratories, Inc.
 Wood Laboratory Ltd.
 Woodson-Tenent Laboratories, Inc.

PACKAGE TESTING

A. B. C. Research Corp.
 American Standards Testing Bureau,
 Inc.
 Andy Andermani Consulting
 Services
 Antech
 Applied Research Laboratories of
 Florida, Inc.

Bacto-Chem Labs, Inc.
 Barteck
 Buffalo Testing Laboratories, Inc.
 Central Analytical Labs, Inc.
 Chem Bio Consultants &
 Laboratories
 Commodity Labs, Inc.
 Davis Research, Inc.
 Diversified Research Laboratories,
 Ltd.
 Fitecon Laboratories, Inc.
 Food Evaluation Center
 Foodworks, Inc.
 Hazleton Laboratories America, Inc.,
 Chemical & Biomedical Sciences
 Div.
 Hill Top Research, Inc.
 MacMillan Research Ltd.
 Medallion Laboratories
 See advertisement pg 54
 Med-Check, Inc.
 Microbac Laboratories, Inc.
 The National Food Laboratory
 See advertisement pg 55, 57, 59, 61
 Nebraska Testing Laboratories,
 Scientific Div.
 New York Testing Laboratories, Inc.
 Northwest Laboratories, Inc.
 Polyhedron Laboratories
 Regu-Tech Associates, Inc.
 Sani-Pure Laboratories
 R. F. Schmittmann Associates
 Strasburger & Siegel, Inc.
 Truesdail Laboratories, Inc.
 Ungar Consultation & Inspection
 Services
 United States Testing Company, Inc.
 J. C. Wilcox Associates
 Winston Laboratories, Inc.
 Wm. E. Young Company, Inc.

PESTICIDES

A. B. C. Research
 A & L Mid West Agricultural
 Laboratories, Inc.
 Allied Analytical & Research
 Laboratories
 Allied Laboratories, Ltd.
 American Interlab Corp.
 American Standards Testing Bureau,
 Inc.
 Ameritech Laboratories
 Analytic & Biological Laboratories,
 Inc.
 Analytical Labs & Services, Inc.
 Anresco, Inc.
 Antech
 Applied Microbiological Services, Inc.
 Associated Analytical Laboratories,
 Inc.
 Associated Laboratories
 BC Laboratories, Inc.
 Bacto-Chem Labs, Inc.
 F. C. Broeman & Co., Inc.
 Buffalo Testing Laboratories, Inc.
 Central Analytical Labs, Inc.
 Certified Laboratories, Inc.
 Chem Bio Consultants &
 Laboratories
 Columbia Laboratories, Inc.
 Commodity Labs, Inc.
 Controls for Environmental Pollution,
 Inc.
 Crippen Laboratories, Inc.
 Curtis & Tompkins, Ltd., Gooch
 Labs Div.
 Diversified Laboratories, Inc.
 ESA Laboratories, Inc.
 Eastern Laboratory Service
 Associates
 Environmental Protection Systems,
 Inc.

Ene Testing Laboratories
 Fetteg Laboratories
 Fitecon Laboratories, Inc.
 Food Quality Analysts, Inc.
 Food Quality Lab
 Friend Laboratory, Inc.
 General Testing Laboratories
 Harms Laboratories
 Hazleton Laboratories America, Inc.,
 Chemical & Biomedical Sciences
 Div.
 Industrial Testing Laboratories
 Institute for Research, Inc.
 Intech Biotabs, Inc.
 J. H. M. Laboratories, Inc.
 Kentucky Testing Laboratory Corp.
 Lancaster Laboratories, Inc.
 Laucks Testing Laboratories, Inc.
 Leatherhead Food RA
 Louisville Testing Laboratory, Inc.
 Medallion Laboratories
 See advertisement pg 54
 Michelson Laboratories, Inc.
 Microbac Laboratories, Inc.
 Minnesota Valley Testing
 Laboratories
 Morning Star Laboratories, Inc.
 Morse Laboratories Incorporated
 The National Food Laboratory
 See advertisement pg 55, 57, 59, 61
 Nebraska Testing Laboratories
 New Jersey Laboratories
 New York Testing Laboratories, Inc.
 Northeast Laboratories, Inc.
 Northwest Laboratories, Inc.
 Nutron International, Inc.
 Orlando Laboratories, Inc.
 Patison's Laboratories, Inc.
 Professional Service Industries, Inc.,
 Analytical Services Div., Florida
 Testing
 Q. C. Inc. - Quality Control
 Laboratory

SP Engineering
 Sani-Pure Laboratories
 Sanitation Consultants, Inc.
 Shankman Laboratories
 Southern Testing & Research
 Laboratories, Inc.
 Stillwell & Gladding, Inc.
 Strasburger & Siegel, Inc.
 Suburban Laboratories, Inc.
 Tri-Tech Laboratories, Inc.
 Truesdail Laboratories, Inc.
 United States Testing Company, Inc.
 Weed Foodlab, Inc.
 J. C. Wilcox Associates
 Winston Laboratories, Inc.
 Wood Laboratory Ltd.
 Woodson-Tenent Laboratories, Inc.

POLLUTION CONTROL

A & L Mid West Agricultural
 Laboratories, Inc.
 Allied Laboratories, Ltd.
 American Interlab Corp.
 American Standards Testing Bureau,
 Inc.
 Analytic & Biological Laboratories,
 Inc.
 Analytical Labs & Services, Inc.
 Andy Andermani Consulting
 Services
 Antech
 Ar buckle and Company, Inc.
 Baselle Memorial Institute
 Biological Consultants
 F. C. Broeman & Co., Inc.
 Buffalo Testing Laboratories, Inc.
 Cambion Processes
 Central Analytical Labs, Inc.
 Clean Water Engineers, Inc.

Commercial Testing Laboratory, Inc.
 Commodity Labs, Inc.
 Controls for Environmental Pollution,
 Inc.
 Crippen Laboratories, Inc.
 Curtis & Tompkins, Ltd., Gooch
 Labs Div.
 EIS Environmental Engineers, Inc.
 Environmental Health Science, Inc.
 Environmental Protection Systems,
 Inc.
 Daniel F. Farkas Associates
 Friend Laboratory, Inc.
 General Testing Laboratories
 Hazleton Laboratories America, Inc.,
 Chemical & Biomedical Sciences
 Div.
 J. H. M. Laboratories, Inc.
 Laboratory Quality Systems, Inc.
 Lebersmittle Consulting
 Louisville Testing Laboratory, Inc.
 E. Everett Meschter Associates
 Microbac Laboratories, Inc.
 New Jersey Laboratories
 New York Testing Laboratories, Inc.
 Northwest Laboratories, Inc.
 Nutron International, Inc.
 Orlando Laboratories, Inc.
 Professional Service Industries, Inc.
 Analytical Services Div., Florida
 Testing
 SP Engineering
 Stillwell & Gladding, Inc.
 Strasburger & Siegel, Inc.
 Tri-Tech Laboratories, Inc.
 United States Testing Company, Inc.
 Weiss Laboratories, Inc.
 J. C. Wilcox Associates
 Winston Laboratories, Inc.
 Wood Laboratory Ltd.

PRODUCT LITIGATION

ABIC Int'l Consultants, Inc.
 American Interlab Corp.
 American Standards Testing Bureau,
 Inc.
 Andy Andermani Consulting
 Services
 Anresco, Inc.
 Antech
 Bacto-Free, Inc.
 L. J. Bianco Associates, Inc.
 Bioenergetics, Inc.
 Born & Co.
 Buffalo Testing Laboratories, Inc.
 Cardinal Biologicals, Ltd.
 Certified Laboratories, Inc.
 Chem Bio Consultants &
 Laboratories
 Commodity Labs, Inc.
 Curtis & Tompkins, Gooch Labs Div.
 Dr. R. H. Ellinger & Associates
 Fetteg Laboratories
 Fitecon Laboratories, Inc.
 Food Science Associates, Inc.
 Food Technology Laboratory
 General Testing Laboratories
 Hazleton Laboratories America, Inc.,
 Chemical & Biomedical Sciences
 Div.
 Industrial Laboratories
 Institute for Research, Inc.
 Lebersmittle Consulting
 E. Everett Meschter Associates
 Microbac Laboratories, Inc.
 Microbiology Consultants
 The National Food Laboratory
 See advertisement pg 55, 57, 59, 61
 Nebraska Testing Laboratories,
 Scientific Div.
 New York Testing Laboratories, Inc.
 Northwest Laboratories, Inc.

Pine Consultants, Inc.
 San-Pure Laboratories
 Sanitation Consultants, Inc.
 Sci-Tek Laboratories
 Walter E. Seideman, Ph.D. & Associates
 Herbert V. Shuster, Inc.
 Sinker Laboratories, Inc.
 Lawrence S. Siegel, Ph.D. Consultants
 Shtivel & Gladding, Inc.
 Strassburger & Siegel, Inc.
 Truesdale Laboratories, Inc.
 Ungar Consultation & Inspection Services
 United States Testing Company, Inc.
 Valley Engineers, Inc., Laboratory Div.
 Harold Weiness & Associates
 Weiss Laboratories, Inc.
 Winston Laboratories, Inc.
 Dr. H. Yacowitz & Company

PRODUCT PROCESS DEVELOPMENT

A B C Research Corp.
 ABIC Int'l. Consultants, Inc.
 Allied Laboratories, Ltd.
 American Institute of Baking
 American Standards Testing Bureau, Inc.
 Ameritech Laboratories
 Analytic & Biological Laboratories, Inc.
 Analytical Labs & Services Inc.
 Andy Andarmam Consulting Services
 Anetech
 Arbuttle and Company, Inc.
 Jack Aronowicz & Associates
 Bacto-Free, Inc.
 Battelle Memorial Institute
 Beckart Laboratories, Inc.
 L. J. Bianco Associates, Inc.
 Bioenergecs, Inc.
 Bio-Technical Resources, Inc.
 Bicksten Research Laboratories, Inc.
 Bofafi International, Ltd.
 Buffalo Testing Laboratories, Inc.
 Cambrian Processes
 Cardinal Biologicals Ltd.
 Central Analytical Labs, Inc.
 Certified Laboratories, Inc.
 Chem Bio Consultants & Laboratories
 Contech Laboratories
 Creative Technological Services
 Diversified Research Laboratories, Ltd.
 Eastern Laboratory Service Associates
 Bradley Eagerman
 Dr. R. H. Elinger & Associates
 Eitel, Inc.
 Fertig Laboratories
 Food & Agrosystems, Inc.
 Food Science Associates, Inc.
 Food Technology Laboratory
 Foodworks Inc.
 W. A. Golemski & Associates
 Hazleton Laboratories America Inc., Chemical & Biomedical Sciences Div.
 Institute for Research, Inc.
 Peter Kautsan Associates, Inc.
 M. H. Katz Consulting, Inc.
 Knechtel Laboratories
 H. B. Krohn Consultant, Inc.
 Laboratory Quality Systems, Inc.
 Leathersmead Food RA
 Lebensmittel Consulting
 The National Food Laboratory
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Nebraska Testing Laboratories Scientific Div.
 New Jersey Laboratories
 Northeast Laboratories, Inc.
 Northwest Laboratories, Inc.
 Paryt Laboratories, Inc.
 Polyhedron Laboratories
 R & D Management Systems, Inc.
 Regu-Tech Associates, Inc.
 Richardson Researches, Inc.
 Rodale Food Consultants
 Arnold S. Roseman, Ph.D.
 R. F. Schiffmann Associates
 Sci-Tek Laboratories
 Walter E. Seideman, Ph.D. & Associates
 Herbert V. Shuster, Inc.
 Lawrence S. Siegel, Ph.D. Consultants
 William F. Stoll Consulting Service
 Strassburger & Siegel, Inc.
 Technical Food Consultants
 Ungar Consultation & Inspection Services
 Valley Engineers, Inc., Laboratory Div.
 Van Dyke & Associates
 Webb Foodlab, Inc.
 J. C. Wilcox Associates
 Roslyn Willett Associates, Inc.
 Williams Laboratories
 Winston Laboratories, Inc.
 Wood Laboratory Ltd.

PRODUCT TESTING

A B C Research Corp.
 ABIC Int'l. Consultants, Inc.
 Allied Analytical & Research Laboratories
 Allied Laboratories, Ltd.
 American Interplex Corp.

American Standards Testing Bureau, Inc.
 Ameritech Laboratories
 Analytic & Biological Laboratories, Inc.
 Analytical Labs & Services Inc.
 Andy Andarmam Consulting Services
 Anresco, Inc.
 Anetech
 Applied Microbiological Services Inc.
 Applied Research Laboratories of Florida, Inc.
 Associated Analytical Laboratories, Inc.
 BABCAL - Bay Area Bio-Chemical Analytical Laboratory
 Bacto-Chem Labs, Inc.
 Bacto-Free, Inc.
 Biological Consultants
 F. D. Biceman & Co., Inc.
 Buffalo Testing Laboratories, Inc.
 Cambrian Processes
 Cardinal Biologicals Ltd.
 Certified Laboratories, Inc.
 Chem Bio Consultants & Laboratories
 Columbia Laboratories, Inc.
 Commodity Labs, Inc.
 Croppen Laboratories, Inc.
 Curtis & Tompkins, Goodrich Labs Div.
 Diversified Research Laboratories, Ltd.
 Eastern Laboratory Service Associates
 Bradley Eagerman
 Fertig Laboratories
 Frerison Laboratories, Inc.
 Food & Agrosystems, Inc.
 Food Evaluation Center
 Food Quality Analysts, Inc.
 Food Quality Lab

Food Science Associates, Inc.
 Food Technology Laboratory, Inc.
 Foodworks Inc.
 French Laboratories, Inc.
 General Testing Laboratories
 Great Lakes Scientific, Inc.
 Hazleton Laboratories America Inc., Chemical & Biomedical Sciences Div.
 Hill Top Research, Inc.
 Industrial Laboratories
 Industrial Testing Laboratories
 Institute for Research, Inc.
 J. H. M. Laboratories, Inc.
 M. H. Katz Consulting, Inc.
 H. B. Krohn Consultants, Inc.
 Knechtel Laboratories
 Laboratory Quality Systems, Ltd.
 Lancaster Laboratories, Inc.
 Leathersmead Food RA
 Lebensmittel Consulting
 Louisville Testing Laboratory, Inc.
 MacMillan Research Ltd.
 Medication Laboratories
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 Med-Check, Inc.
 Michelson Laboratories, Inc.
 Microbac Laboratories, Inc.
 Microbiology Consultants
 Midwest Food & Water Analysts, Inc.
 Minnesota Valley Testing Laboratories
 Morning Star Laboratories, Inc.
 The National Food Laboratory
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 Nebraska Testing Laboratories Scientific Div.
 New Jersey Laboratories
 New York Testing Laboratories, Inc.
 Northeast Laboratories, Inc.
 Northwest Laboratories, Inc.
 Palatex, Inc.

FOOD LABORATORIES/SERVICES

Professional Service Industries Inc
Analytical Services Div., Florida
Testing
Q.C. Inc. - Quality Control
Laboratory
R & D Management Systems Inc.
Regu-Tech Associates, Inc.
Richardson Research, Inc.
The Rocca Food Consultants
Arnold S. Roseman, Ph.D.
Sani-Pure Laboratories
Sci-Tek Laboratories
Walter E. Seideman, Ph.D. &
Associates
Sensory Resources, Inc.
Herbert V. Shuster, Inc.
Slitker Laboratories, Inc.
Southern Testing & Research
Laboratories, Inc.
Lawrence S. Spiegl, Ph.D.
Consultants
Stihwell & Giadding, Inc.
Strasbourg & Siegel, Inc.
Suburban Laboratories, Inc.
Tuesdale Laboratories, Inc.
Ungar Consultation & Inspection
Services
United States Testing Company, Inc.
Valley Engineers, Inc., Laboratory
Div.
Webb Foodlab, Inc.
Wells Laboratories, Inc.
J. C. Wilcox Associates
Winston Laboratories, Inc.
Wood Laboratory Ltd.
Woodson-Tenant Laboratories, Inc.

QUALITY ASSURANCE TESTING

A B C Research Corp.
ABIC Int'l. Consultants, Inc.
A & L Mid West Agricultural
Laboratories, Inc.
Allied Analytical & Research
Laboratories
American Interplex Corp.
American Standards Testing Bureau,
Inc.
Amertech Laboratories
Analytic & Biological Laboratories,
Inc.
Analytical Labs & Services, Inc.
Andy Andarmani Consulting
Services
Anresco, Inc.
Antech
Applied Microbiological Services, Inc.
Applied Research Laboratories of
Florida, Inc.
Aqualab, Inc.
Associated Analytical Laboratories,
Inc.
Bacti-Chem Labs, Inc.
Bacti-Free, Inc.
L. J. Bianco Associates
Biological Consultants
F. C. Broeman & Co., Inc.
Cardinal Biologicals Ltd.
Certified Laboratories, Inc.
Chem Bio Consultants &
Laboratories
Columbia Laboratories, Inc.
Commercial Testing Laboratory, Inc.
Commodity Labs, Inc.
Controls for Environmental Pollution
Inc.
Creative Technological Services
Curtis & Tompkins, Ltd., Good
Labs Div.
Dairy & Food Labs, Inc.
Danis Research, Inc.
Diversified Laboratories, Inc.

Diversified Research Laboratories,
Ltd.
Doty Laboratories, Inc.
Eastern Laboratory Service
Associates
Bradley Esgerman
Dr. R. H. Ellinger & Associates
Fetig Laboratories
Fritson Laboratories, Inc.
Food Evaluation Center
Food Quality Analysts, Inc.
Food Quality Lab
Food Science Associates, Inc.
Food Technology Laboratory, Inc.
Foods Research Laboratories, Inc.
Foodworks, Inc.
Friend Laboratory, Inc.
General Testing Laboratories
W. A. Golomski & Associates
Great Lakes Scientific, Inc.
Hazleton Laboratories America, Inc.,
Chemical & Biomedical Sciences
Div.
Herron Testing Laboratories, Inc.
Mid Top Research, Inc.
Industrial Testing Laboratories
Ingman Laboratories, Inc.
Ingredient Control Laboratories
Institute for Research, Inc.
Intech Biolabs, Inc.
J. H. M. Laboratories, Inc.
Kentucky Testing Laboratory Corp.
Krechter Laboratories
Krueger Food Laboratories
Laboratory Quality Systems, Ltd.
Lancaster Laboratories, Inc.
La Rocca Science Laboratories, Inc.
Leatherhead Food RA
Lebensmittel Consulting
The Leigh Valley Laboratories, Inc.
Louisville Testing Laboratory, Inc.
MacMillan Research Ltd.
Medalion Laboratories
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Med-Check, Inc.
McNerson Laboratories, Inc.
Microbac Laboratories, Inc.
Midwest Food & Water Analysts, Inc.
Minnesota Valley Testing
Laboratories
Morning Star Laboratories, Inc.
The National Food Laboratory
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Nebraska Testing Laboratories,
Scientific Div.
New Jersey Laboratories
New York Testing Laboratories, Inc.
Northeast Laboratories, Inc.
Northview Pacific Laboratories, Inc.
Northwest Laboratories, Inc.
Nutrition International, Inc.
Palater, Inc.
Pine Consultants, Inc.
Polynecon Laboratories
Professional Service Industries, Inc.,
Analytical Services Div., Florida
Testing
Q.C. Inc. - Quality Control
Laboratory
R & D Laboratory
Regu-Tech Associates, Inc.
Arnold S. Roseman, Ph.D.
Sani-Pure Laboratories
Sanitation Consultants, Inc.
R. F. Schiffmann Associates
Sci-Tek Laboratories
Scott Laboratories, Inc.
Walter E. Seideman, Ph.D. &
Associates
Herbert V. Shuster, Inc.
Slitker Laboratories, Inc.
Southern Testing & Research
Laboratories, Inc.

Stihwell & Giadding, Inc.
Strasbourg & Siegel, Inc.
Suburban Laboratories, Inc.
Trigon Corporation
Tri-Tech Laboratories, Inc.
Tuesdale Laboratories, Inc.
Ungar Consultation & Inspection
Services
United States Testing Company, Inc.
Valley Engineers, Inc., Laboratory
Div.
WW Laboratories, Inc.
Harold Wainess & Associates
Webb Foodlab, Inc.
Wells Laboratories, Inc.
J. C. Wilcox Associates
Winston Laboratories, Inc.
Wood Laboratory Ltd.
Woodson-Tenant Laboratories, Inc.

SAMPLING & INSPECTION

A B C Research Corp.
ABIC Int'l. Consultants, Inc.
American Interplex Corp.
American Standards Testing Bureau,
Inc.
Amertech Laboratories
Analytic & Biological Laboratories,
Inc.
Analytical Labs & Services, Inc.
Andy Andarmani Consulting
Services
Anresco, Inc.
Antech
Applied Microbiological Services, Inc.
Applied Research Laboratories of
Florida, Inc.
Arbuckle and Company, Inc.
Associated Analytical Laboratories,
Inc.
Associated Laboratories
Bacti-Chem Labs, Inc.
Bacti-Free, Inc.
Beckart Laboratories, Inc.
Biological Consultants
Biological Services, Inc.
F. C. Broeman & Co., Inc.
Cardinal Biologicals Ltd.
Certified Laboratories, Inc.
Chem Bio Consultants &
Laboratories
Clean Water Engineers, Inc.
Columbia Laboratories, Inc.
Commercial Testing Laboratory, Inc.
Commodity Labs, Inc.
Creative Technological Services
Curtis & Tompkins, Ltd., Good
Labs Div.
Dairy & Food Labs, Inc.
Danis Research, Inc.
Diversified Research Laboratories,
Ltd.
Eastern Laboratory Service
Associates
Ene Testing Laboratories
Fetig Laboratories
Fritson Laboratories, Inc.
Food Quality Analysts, Inc.
Food Quality Lab
Food Technology Laboratory, Inc.
Foodworks, Inc.
Friend Laboratory, Inc.
General Testing Laboratories
W. A. Golomski & Associates
Industrial Laboratories
Institute for Research, Inc.
J. H. M. Laboratories, Inc.
Kentucky Testing Laboratory Corp.
H. B. Kronn Consultants, Inc.
Laboratory Quality Systems, Ltd.

Lancaster Laboratories, Inc.
La Rocca Science Laboratories, Inc.
Leucks Testing Laboratories, Inc.
Lebensmittel Consulting
MacMillan Research Ltd.
Medalion Laboratories
See advertisement pg 54
Med-Check, Inc.
McNerson Laboratories, Inc.
Microbac Laboratories, Inc.
Microbiology Consultants
Midwest Food & Water Analysts, Inc.
Minnesota Valley Testing
Laboratories
Morning Star Laboratories, Inc.
The National Food Laboratory
See advertisement pg 55, 57, 59, 61
Nebraska Testing Laboratories,
Scientific Div.
New Jersey Laboratories
New York Testing Laboratories, Inc.
Northeast Laboratories, Inc.
Northwest Laboratories, Inc.
Pine Consultants, Inc.
Professional Service Industries, Inc.,
Analytical Services Div., Florida
Testing
Q.C. Inc. - Quality Control
Laboratory
R & D Management Services, Inc.
Arnold S. Roseman, Ph.D.
Sani-Pure Laboratories
Sanitation Consultants, Inc.
R. F. Schiffmann Associates
Sci-Tek Laboratories
Walter E. Seideman, Ph.D. &
Associates
Slitker Laboratories, Inc.
Lawrence S. Spiegl, Ph.D.
Consultants
Stihwell & Giadding, Inc.
Strasbourg & Siegel, Inc.
Suburban Laboratories, Inc.
Tri-Tech Laboratories, Inc.
Tuesdale Laboratories, Inc.
Ungar Consultation & Inspection
Services
United States Testing Company, Inc.
Valley Engineers, Inc., Laboratory
Div.
WW Laboratories, Inc.
Harold Wainess & Associates
Webb Foodlab, Inc.
Wells Laboratories, Inc.
J. C. Wilcox Associates
Winston Laboratories, Inc.
Wood Laboratory Ltd.
Woodson-Tenant Laboratories, Inc.

SENSORY EVALUATION

A B C Research Corp.
ABIC Int'l. Consultants, Inc.
American Interplex Corp.
Analytic & Biological Laboratories,
Inc.
Analytical Labs & Services, Inc.
Andy Andarmani Consulting
Services
Anresco, Inc.
Antech
Arbuckle and Company, Inc.
Bacti-Chem Labs, Inc.
Beckart Laboratories, Inc.
Biological Consultants
Borish International Ltd.
Cardinal Biologicals Ltd.
Certified Laboratories, Inc.
Chem Bio Consultants &
Laboratories
Commodity Labs, Inc.
Creative Technological Services
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201 792-2400

VALLEY ENGINEERS INC

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919 787-9177

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201 460-7022

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201 988-8060

YUEN & ASSOCIATES

3173 Pueblo Ave
Ventura CA 93003
805 642-2699

APPENDIX D

Suggested References

Textbooks

1. Academic Press
Harcourt Brace Jovanovich, Publisher
Marketing Dept.
6277 Sea Harbor Drive
Orlando, FL 32821-9989 USA

Titles:

- a. Muscle As Food (1986) #084191 Softcover \$39.95
Peter J. Bechtel 084190 Hardcover 75.00
 - b. Sensory Evaluation Practices (1985) #672480 Hardcover \$39.50
Herbert Stone, Joel L. Sidel
328 pp.
 - c. Sanitation in Food Processing (1983) #700650 Hardcover \$34.50
J.A. Troller
235 pp.
 - d. Quality Control in the Food Industry (1985 1986) Vol. 1, 2
#343001 Hardcover \$47.00
#343002 Hardcover 60.00
S.M. Herschdoefer (Ed.)
Vol. 1, 469 pp; Vol. 2, 528 pp.
 - e. Water Activity: Influence on Food Quality #591350 Hardcover \$83.00
(1981)
L.B. Rockland and G.F. Sterwart
921 pp.
 - f. Advances in Food Research Annual Volumes (Series) \$49.00
2. American Meat Institute
Communications Dept.
P.O. Box 3556
Washington, DC 20007 USA

(See order form)
 3. Association of Official Analytical Chemists

(See order form)

4. The AVI Publishing Co. Inc.
250 Post Rd. E.
P.O. Box 831
Westport, CT 06881 USA

Titles:		U.S. \$
a. Processed Meats (1984)	# 213	\$ 55.00
A.M. Pearson and F.W. Tauber 427 pp.		
b. Advances in Meat Research (1985)	# 435	57.50
Vol. 1: Electrical Stimulation		
Vol. 2: Meat and Poultry Microbiology		
A.M. Pearson and T.R. Dutson	# 498	57.50
Vol. 1, 325 pp.; Vol. 2. 410 pp.		
c. Food Products Formulary Series	# 373	78.50
Vol. 1: Meats, Poultry, Fish and Shellfish (1982)		
L. Long, S. Komarik and D.K. Tressler		
2nd Ed., 459 pp.		
Vol 2: Cereals, Baked Goods, Dairy		
and Egg Products (1975)		
D.K. Tressler and W. Sultan	# 182	55.00
437 pp.		
Vol. 3: Fruit, Vegetable and Nut Products		
(1976)		
D.K. Tressler and J.G. Woodroof	# 133	55.00
290 pp.		
Vol. 4: Fabricated Foods (1982)		
M.J. Inglett and G.E. Inglett	# 386	42.50
146. pp.		
d. Meat Handbook (1973)	# 291	26.50
Albert Leive		
354 pp.		
e. Practical Meat Cutting and Merchandising		
Vol. 1: Beef (2nd Ed., 1975)		
	# 285	17.50
Vol. 2: Pork, Lamb and Veal (1975)		
	# 029	17.50
T. Fabbriante and W.J. Sultan		
Vol. 1. 235 pp.; Vol. 2, 206 pp.		

5. The Interstate
Printers and Publishers, Inc.
19-27 North Jackson Street
Danville, IL 61832-0594

The Meat We Eat (1985) Clothbound \$ 35.00
J.R. Romans, K.W. Jones, W.C. Costello,
C.W. Carlson and P.T. Ziegler
12 Ed., 872 pp.

Journals

U.S. \$

1. Journal of Food Science \$ 50.00
Food Technology 50.00

Institute of Food Technologists
Suite 300
221 N. La Salle St.
Chicago, IL 60601 USA

2. Journal of Food Protection 50.00

IAMFES, Inc.
Earl O. Wright, Managing Editor
P.O. Box 701
Ames, IA 50010 USA

3. Journal of Agriculture and Food Chemistry 139.00

American Chemical Society
2540 Olentangy River Road
P.O. Box 3330
Columbus, OH 43210

4. Meat Science 380.00

Elsevier Applied Science Publishers LTD
Crown House
Linton Road
Barking
Essex-IG11 8JU, ENGLAND

5. Journal of Texture Studies (4 issues) 91.00

Journal of Food Quality (6 issues) 100.00

Journal of Food Biochemistry (4 issues) 80.00

Journal of Food Process Engineering (4 issues) 75.00

Journal of Food Processing and Preservation (4 issues) 80.00

Journal of Food Safety (4 issues) 75.00

Food and Nutrition Press, Inc.
155 Post Road East, Suite 6
P.O. Box 71
Westport, CT 06881 USA

Trade Journals

U.S. \$

1. The National Provision (weekly issues) 18.00/yr
15 W. Huron St.
Chicago, IL 60610 USA
2. Meat Industry (Monthly issues) 35.00/yr
Oman Publishing, Inc.
90 Throckmorton Ave.
P.O. Box 1059
Mill Valley, CA 94942 USA
3. Meat Processing (monthly issues) 70.00/yr
Davies Publishing Company
Harcourt Brace Javanovich Publications
7500 Old Oak Boulevard
Cleveland, OH 44130
4. Prepared Foods (11 issues) 80.00/yr
Gorman Publishing Co.
8750 West Bryn Mawr Ave.
Chicago, IL 60631 USA
5. Food Processing (13 issues) 60.00/yr
Putman Publishing Company
301 E. Eire St.
Chicago, IL 60611

APPENDIX E

MANUFACTURED FRESH MEAT PRODUCTS

Dr. J.T. Keeton

Associate Professor

Meats and Muscle Biology

Texas A&M University

Further processed meat products are typically known as "restructured meats" and are formed from whole muscle sections, meat trimmings, finely chopped tissues or a combination of these ingredients. Examples of these products range from sectioned and formed roasts to meat balls or nugget forms. Some of the unique characteristics of these products are that they can be:

- Portioned to a variety of specifications
- Controlled for nutrient content
- Adjusted to achieve a specific texture
- Made from various trim sources
- Precooked to be made microwave ready.

Market Potential

Trends of the Meat Industry

During the next decade, retail food costs are projected to stay steady or lower, while raw agricultural and commodity prices will decline more than wholesale, food processing, food service or retail prices. This trend will improve margin prospects for further processed and value-added consumer food products. In addition, energy costs and the cost of money are projected to be lower over the next decade causing purchases, investments and lending decisions to be based on productivity, cash flow generation and return on total investment. Major food companies will likely become more involved in marketing, positioning and advertising fresh meat, processed meats and frozen entrees.

Need for New Products

Beef supplies through 1990 are expected to decline below 38%, the present level of total meat consumption, while pork supplies will most likely stabilize at low levels of <30%. Poultry (broilers and turkeys) species are projected to increase beyond 31% of all meat consumed based on present consumer demands. The key to stabilizing or increasing red meat consumption is through the creation of:

- 1) New consumer demand and
- 2) New beef products perceived (by the public) as uniquely meeting consumer needs.

Since the "shotgun approach" of providing numerous meat products (whether wanted or not) is not working, a "rifle approach" with targeted advertising, merchandising and packaging appears to offer greater growth possibilities. New types of restructured products have the potential of:

- 1) Competing favorably with poultry
- 2) Increasing beef carcass value
- 3) Allowing convenient preparations of microwavable entrees and
- 4) Meeting consumer expectations as a healthful, lean product.

Manufacturing Methods

Particle Size Reduction

Restructured meat products are primarily classified according to the method of particle size reduction used in producing these items. These basic procedures involve:

- 1) Sectioning whole muscle pieces and recombining these to form a uniform muscle mass which duplicates the textural characteristics of intact muscles.
- 2) Chunking of large muscle pieces through a coarse plate, such as a kidney plate or mechanical dicer, also results in products with muscle-like texture. In some cases, smaller grinder plates and different configurations are used to further reduce the particle size. Sharp knives and properly tensioned plates are essential to reduce smearing.

- 3) Flaking of frozen and tempered muscle pieces (fat 36°F, lean 24°F) through an Urschel Comitrol® or similar piece of equipment produces flat uniform-sized flakes. Various cutting heads yield different size meat flakes which can be combined to alter textural and appearance characteristics of the product. Meats higher in connective tissue or fat are usually flaked finer having an emulsion like appearance when finished.
- 4) Slicing strips of tempered tissue with equipment manufactured by Bettcher Industries or Ross Equipment Company produces long slivers of meat which can be recombined into a product form. Coarse flakes or slices also result from hydroflaking tempered meat blocks. Silent cutters or choppers are frequently used to produce slices and reduce crushing of the tissue as compared to grinders, but knife sharpness is critical.
- 5) Emulsification with a bowl chopper of a small amount of ground or preblended material (usually under 15%) may be reincorporated into restricted products to give a smooth uniform appearance and act as a binding agent.

Meat Raw Materials

Raw material cost will directly reflect finished product cost, therefore, selection of these materials is critical and contributes to the economic "success" or "failure" of a product. Meat materials should be as fresh as possible, have low bacterial counts and show no signs of deterioration (off-color, off-odors, enzymatic breakdown, etc.). Beef trimmings should be used within seven days postmortem if the temperature has been kept at 29 to 36°F. Examples of the variety of raw materials available for use are:

- 1) Boneless primal cuts for sectioned and chunked products which are relatively tender and free of major tissue membranes.
- 2) Selected trimmings from larger cuts low in connective tissue and high in tenderness such as sirloin tips.
- 3) Non-selective trimmings, such as chuck meats, shanks and neck trim which vary in tenderness and connective tissue content and must be further reduced in particle size.
- 4) Mechanically Separated Meat (MSM) which can vary considerably for content of lean, connective tissue, fat, microscopic bone pieces and degree of lipid oxidation. A limit of 10% of the total formulation is often used.

- 5) Partially defatted tissue remaining after low temperature rendering (120°F) to remove fat without denaturing the protein. "Chopped" and "fatty" tissues are limited to 25 and 15%, respectively, as meat ingredients.

Recent work by Recio et al. (1985) has shown that meat trimmings from the chuck clod with a moderate amount of connective tissue removed produced chunked and formed steaks which were comparable to those processed with extensive connective tissue removal. This research indicates that removal of the major muscle membranes appears to provide adequate trimming for restructured steak raw materials. Desinewing equipment or membrane skimmers, such as the Townsend models, can be used to reduce hand labor in the removal of connective tissue sheets. Fat levels in restructured meats typically average 15-20% for flaked and formed items, but higher levels up to 30% may not be unacceptable in some product forms.

Non-Meat Ingredients

In restructured meats, low levels of salt and alkaline phosphates provide the chemical conditions for extracting salt-soluble, myofibrillar proteins which are responsible for binding meat pieces. Levels of 0.5-0.75% NaCl and 0.125-0.25% sodium tripolyphosphate (STPP) have been shown to be optimum for reducing cooking losses, enhancing sensory characteristics, preserving raw color and minimizing lipid oxidation of restructured steaks. Salt is primarily responsible for the extraction or solubilization of myosin while alkaline phosphates increase the water holding capacity (reduce cooking losses) as well as act synergistically with salt in protein extraction. When the extracted protein is heated, a heat-set coagulum or gel holds the product together.

Reducing additives in meat products and particularly sodium has been

accomplished through the substitution of NaCl with KCl. Recent research by Means and Schmidt (1985) has resulted in restructured beef steaks with no added salt or sodium (Na^+). Their process involves incorporating calcium alginate (0.8-1.2%) and CaCO_3 (0.14-0.216%) into chunked trimmings and allowing a gelation reaction to occur at 4°C for two days. This process enables the production of a restructured beef steak or roast which can be held at refrigeration temperatures without falling apart. Typically, restructured meat items must be kept frozen prior to use or precooked.

Other ingredients which may be incorporated into restructured products include non-meat protein binder/extenders, flavorings, hydrolyzed vegetable proteins and antioxidants. Examples of non-meat protein binder/extenders are:

Sodium Casinates	Soy Protein Concentrates
Whey Proteins	Soy Protein Isolates
Soy Flours	Vital Wheat Gluten

Siegel et al. (1979) reported that wheat gluten, egg white, calcium-reduced skim milk, bovine blood plasma and soy protein isolate had binding abilities in the presence of salt while sodium caseinate failed to bind. Only bovine blood plasma, wheat gluten and soy protein isolate were able to bind in the absence of added salt. Of the plant proteins, vital wheat gluten with flavorings (Hand et al., 1981) in a flaked and formed product was similar in rheological and sensory properties to steaks with flavorings only. Use levels of non-meat binder/extenders normally do not exceed 2-3% of the formula weight and all, except vital wheat gluten, may be rehydrated before blending with meat trimmings.

Flavorings such as hydrolyzed vegetable proteins, monosodium glutamate and flavor nucleotides are added to restructured meats to enhance flavor properties

of specialty items such as meat pieces for stews, loaf items or barbecue products. Antioxidants such as butylated hydroxyanisole (BHA) or butylated hydroxytoluene (BHT) can also be incorporated into restructured items to retard the development of oxidative rancidity. However, use of antioxidants is product dependent and fresh meats cannot contain more than 0.01% by weight singly or 0.02% in combination, based on the fat content of the meat. Phosphates have antioxidant properties and often eliminate the need for antioxidants in lean products (<20% fat).

Protein Extraction and Binding

Salt and alkaline phosphates can be applied directly to meat particles and blended in paddle or ribbon vane mixers for 12 to 18 minutes. In some formulations, the phosphate and then NaCl are solubilized in 3-10% water (based on the meat weight) to increase their effectiveness as protein extracting agents. Sectioned and formed muscle pieces can be blade tenderized and/or injected with a low-salt brine to increase tenderness and juiciness of beef roasts. Mixer/blenders are most often used for chunked, sliced, ground, flaked and emulsified trimmings while vacuum tumblers and/or massagers are used for sectioned and formed products. Mandigo (1985) reported higher color scores and sensory bind values for sectioned and formed steaks processed with a vacuum mixer, however, other sensory, textural and chemical values were not different. Vacuum tumblers accelerate the extraction of meat proteins by allowing the meat to free fall and some studies indicate that the meat should drop about three feet for maximum benefit. Most tumblers have internal baffles, but others have bars and needles to cause abrasion of the meat surface. Tumbling times vary from 1 to 4 hours depending upon the product and if intermittent rest intervals are used. Massagers gently agitate large chunks of meat with arms or paddles

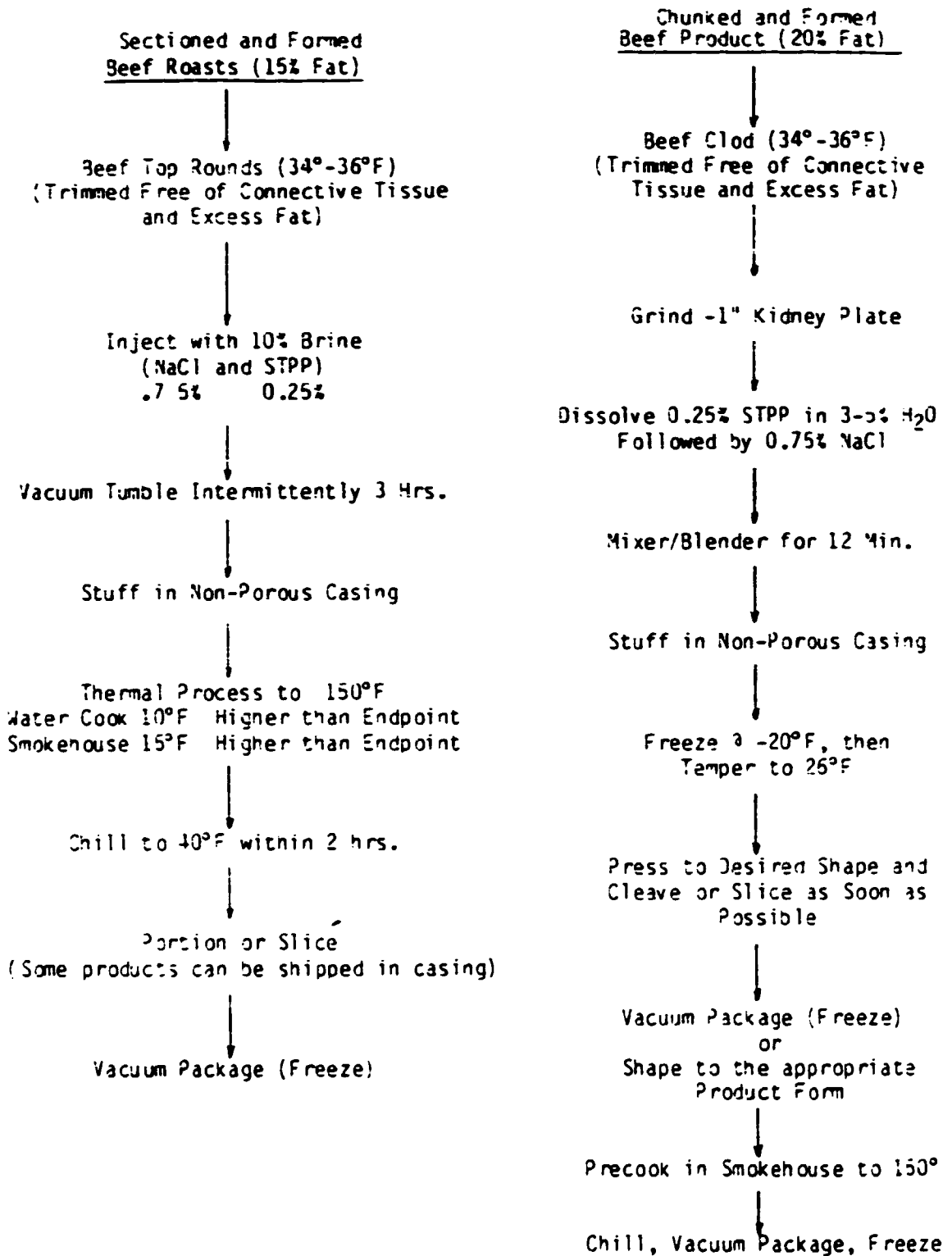
and normally require 3 or more hours for adequate protein extraction. Vacuumizing helps minimize incorporation of air pockets into the extracted exudate thus preventing weakening of the binding juncture between meat pieces.

Shaping the Product

Most restructured meat products are stuffed into a mold or casing using a piston or screw-type stuffer. Extruders may also be used to produce a shaped portion such as snack sticks, jerky, sheets, patties or slabs. Shaped products are then blast frozen at temperatures of -20°F followed by tempering at 22° to 24°F. Products can then be further molded in a hydraulic press and sliced. For precooked beef roasts, they may be heat processed immediately after stuffing or frozen for later processing.

Product Formulation and Processing

Outlined below are procedures for producing restructured beef products by sectioning, chunking (or coarse grinding) and flaking. Specialized equipment such as extruders, patty formers, and meatball/nugget formers have not been included, but are widely used for shaping special items.



Flaked and Formed
Beef Product (15%)

Beef Clod (22-24°F)
(Lean Source)

↓
Trimmed Free of Connective Tissue
and Excess Fat

↓
Coarse Flake

Chuck Trimmings (32-34°F)
Loin Tails
Beef Plate
(Fat Source)

+
Meat Trim with Connective
Tissue (22-24°F)

↓
Fine Flake

↓
Dissolve 0.25% STPP in 3-5% H₂O
Followed by 0.75% NaCl

↓
Mixer/Blender for 12-18 min.

↓
Vacuum Stuff or Extrude into
Non-Porous Casing

↓
Freeze at -10 to -20°F or below,
then Temper to 26°F
Press to Desired Shape
and Cleave or Slice
as Soon as Possible

↓
Vacuum Package and Freeze

Precooking Restructured Products

Restructured steaks are typically broiled from the soft frozen or tempered state on an open grill in a manner similar to intact steaks to an appropriate endpoint temperature of 145° to 160°F. Other products such as beef logs or roasts are processed in a smoke house or water bath with the temperature incremented in 10°F stages and held 10°-15°F above the final endpoint temperature until done. For batter-breaded products to be deep-fat fried, oil bath temperatures range from 325° to 350°F and frying times are dependent upon the size and thickness of the product. Chicken-fried steaks typically require 2-4 min. to achieve doneness, depending upon thickness.

Rapid chilling or freezing of products after cooking is essential to retain freshness and prevent "stale" flavors from developing. Roasts should be chilled to 40°F or below within 2-4 hrs. while pre-fried products can be frozen immediately using cryogenic methods or a blast freezer.

POTENTIAL PROBLEM AREAS

In order for restructured beef products to compete successfully with other muscle foods, potential product problems must be avoided. Among those that a processor is most likely to encounter are:

- 1) Color--Often frozen restructured beef products lack bright red color and may have grey, brown or green spots on the frozen surface. This discoloration can occur during processing or frozen storage. Use of fresh meat trimmings, use of minimum salt levels, proper processing conditions, and low storage temperatures improves color. Oxygen tension during processing of the product may be a primary cause of discoloration and color variation.

- 2) **Connective Tissue**--The degree of trimming affects product acceptance due to the amount and size of connective tissue pieces remaining intact. Larger muscle pieces from "middle meat" portions of the carcass must be trimmed of heavy connective tissue while combinations of grinding or flaking or emulsifying are useful for reducing connective tissue presence. Desinewing machinery and membrane skimmers are also effective in some cases.
- 3) **Texture**--Hardness, mushiness, toughness and dryness characterize some products if little attention is given to the particle size reduction process or source of the meat from the carcass. Generally, trimmings high in connective tissue must be reduced to a smaller particle size as well as the fat beef source. If a product is too lean, it can be rubbery and dry.
- 4) **Rancidity or Off-Flavor**--These conditions sometimes result from use of "old" meat (previously frozen), temperature abuse of trimmings or of the final product, improper packaging and poor manufacturing practices. Warmed-over flavor causes problems if cooked products aren't protected from atmospheric oxygen or oxidizing additives. Phosphates are most often used to reduce WOF since they possess antioxidant properties, but high levels give products a metallic off-flavor.
- 5) **Fat Incorporation and Particle Size**--Fats are most often reduced to a fine particle size since this improves overall appearance and gives a more desirable mouthfeel. Large fat pieces will allow pooling of the fat when cooked or increased shrinkage.
- 6) **Inadequate Stuffing**--Voids or gel pockets can form when products are understuffed causing a non-uniform product with poor muscle-like characteristics. Use of a vacuum stuffer can eliminate part of this problem or spring-loaded molds to shape the product.
- 7) **Product Image**--If the perceived value of restructured products is low, then consumer appeal is limited. Further processed meats require strict controls during manufacture and handling and must be marketed as meeting a consumer need. For example, leaner, precooked microwave ready products would most likely have consumer appeal, but frozen entrees have not had repeat customers because they were of poor quality or overpriced.

POTENTIAL PRODUCTS--RESTRUCTURED AND PRECOOKED

Microwave Ready--Frozen Main Items

- BBQ Brisket with or without seasoning and sauce (Whole or Presliced)
- Fajita Meats - Precooked, sliced or whole blocks and ready to sear on a grill or microwave heat.
- Chicken Fried Steaks - Microwave on slatted plastic grill to prevent soggy batter-breading.
- Beef Nuggets, Fingers, Curls, Kabobs - With or without batter-breadings.
- Seasoned Patties - Precooked with grill flavoring.

Restructured Meats as an Ingredient

Combined vegetable - beef cakes (pressed)-Reheat for a meal.
Beef Stroganoff Mix - Noodles and gravy in a retort pouch.
Beef on a Bun - Sauce packaged separately.
Beef Pot Pies or Canned Beef Stew - shaped beef pieces.
Quiche Nuggets or Flakes - Frozen in a milk carton.

TECHNICAL BULLETIN



No. L750480

LACTACEL[®] 75

A MICROLIFE[®] BROAD TEMPERATURE RANGE CULTURE
FOR THE PRODUCTION OF DRY AND SEMI-DRY SAUSAGES

LACTACEL 75 is a frozen, highly concentrated lactic acid starter culture of Pediococcus organisms. Because of its unique ability to produce lactic acid rapidly at either low or high temperatures, LACTACEL 75 is particularly useful in controlling Staphylococcus aureus in all types of fermented sausage.

APPROVAL

LACTACEL 75 is approved by the U.S.D.A. for use in fermented sausage.

DRY AND SEMI-DRY SAUSAGES

LACTACEL 75 should be used for the manufacture of pepperoni, Genoa, hard salami, salami, summer sausage, beef sticks, beef logs, thuringer, cervelat, Italian salami, and other fermented sausages.

USE RATE

LACTACEL 75 is highly concentrated. The effective use rate for LACTACEL 75 is as follows:

One - 27.6 gram container for 300 lbs. of meat
One - 46.0 gram container for 500 lbs. of meat

This recommended use rate will provide millions of viable Pediococci organisms per gram of meat insuring a proper and fast fermentation with excellent color and aromatization. The exceptional rate of lactic acid production by LACTACEL 75 will discourage the growth of unwanted bacteria.

FERMENTATION TEMPERATURE

The broad temperature range of LACTACEL 75 allows many options depending upon the type of sausage and the producer's preference.

Genoa:	80°F (pH 5.3 in 18 hrs.)	95°F (pH 5.3 in 10 hrs.)
Summer Sausage:	75°F (pH 5.0 in 17 hrs.)	110°F (pH 5.0 in 7 hrs.)
Pepperoni:	75°F (pH 5.3 in 19 hrs.)	95°F (pH 5.3 in 9 hrs.)

See temperature charts for details on page 3, 4, and 5.

STORAGE: Store cultures at -15°F or colder.

CONTROL OF STAPHYLOCOCCUS AUREUS

LACTACEL[®] 75 has been proven to be uniquely useful in controlling staph (which may be present in the meat mixture) thus preventing the formation of enterotoxin which accompanies the growth of Staphylococcus aureus. See charts on pages 5 and 7 for details. Complete information on experimental procedures available on request.

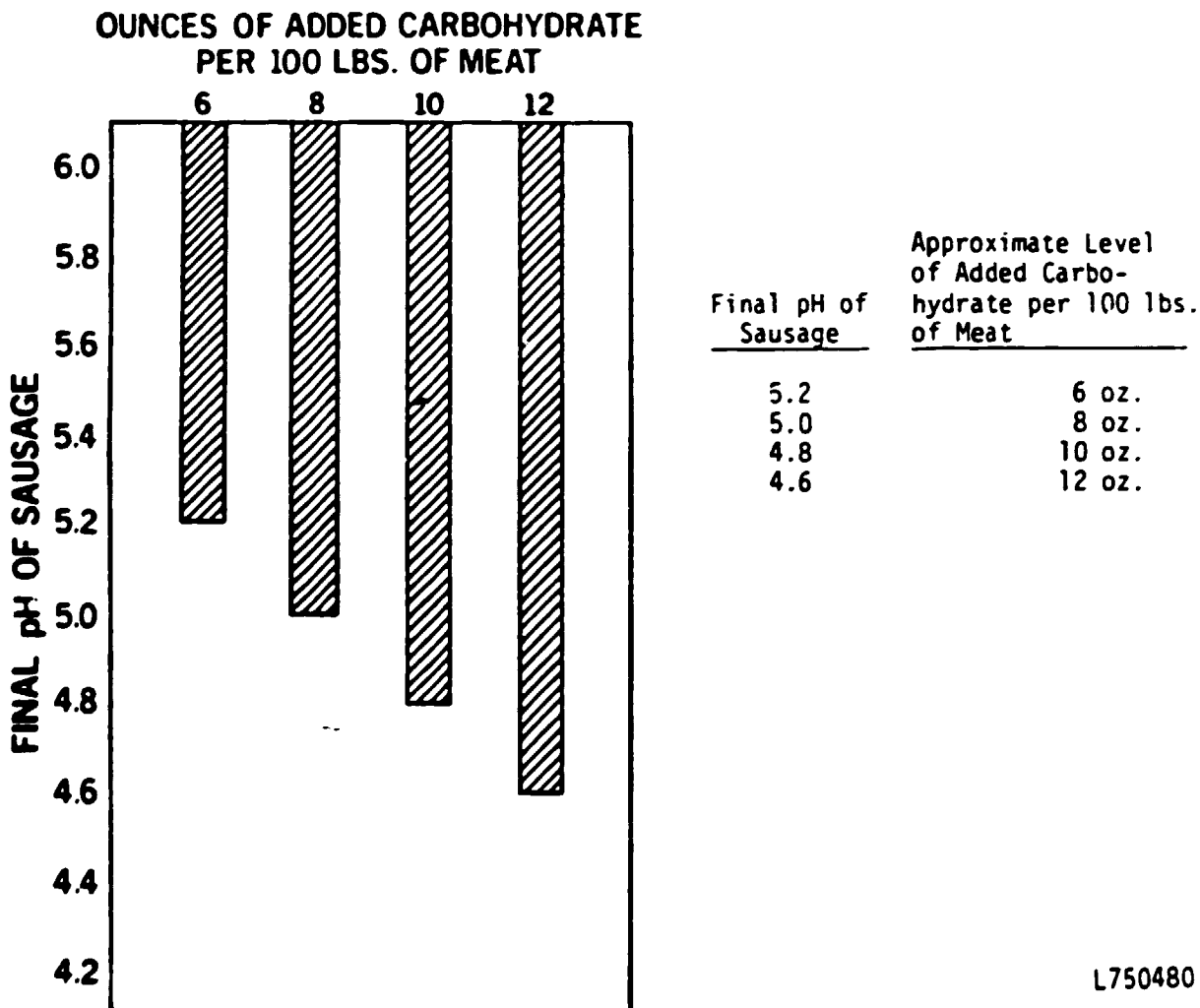
IMPORTANCE OF ADDED CARBOHYDRATE

LACTACEL 75 requires added carbohydrate as a nutrient for growth and lactic acid production. The following carbohydrates can be used: dextrose, cane sugar, fructose, high fructose corn syrup, maltose, corn syrup solids, lactose (utilizes only 50% of added amount). Be sure to calculate dextrose content when corn syrup is used.

The final pH of the sausage will depend upon the total added carbohydrate in the sausage, the temperature of fermentation, and the length of fermentation time.

The following bar graph depicts typical final pH obtained in sausage in relation to the amount of added carbohydrate per 100 lbs. of meat. Note: The graph is only an indicator, and final pH may vary ± 0.1 depending upon initial pH of meat and the ratio of pork to beef.


RELATIONSHIP OF ADDED CARBOHYDRATE (DEXTRROSE, FRUCTOSE, SUCROSE, MALTOSE) TO
FINAL pH OF SAUSAGE



RELATIONSHIP OF LACTACEL[®] 75 FERMENTATION TIME TO TEMPERATURE

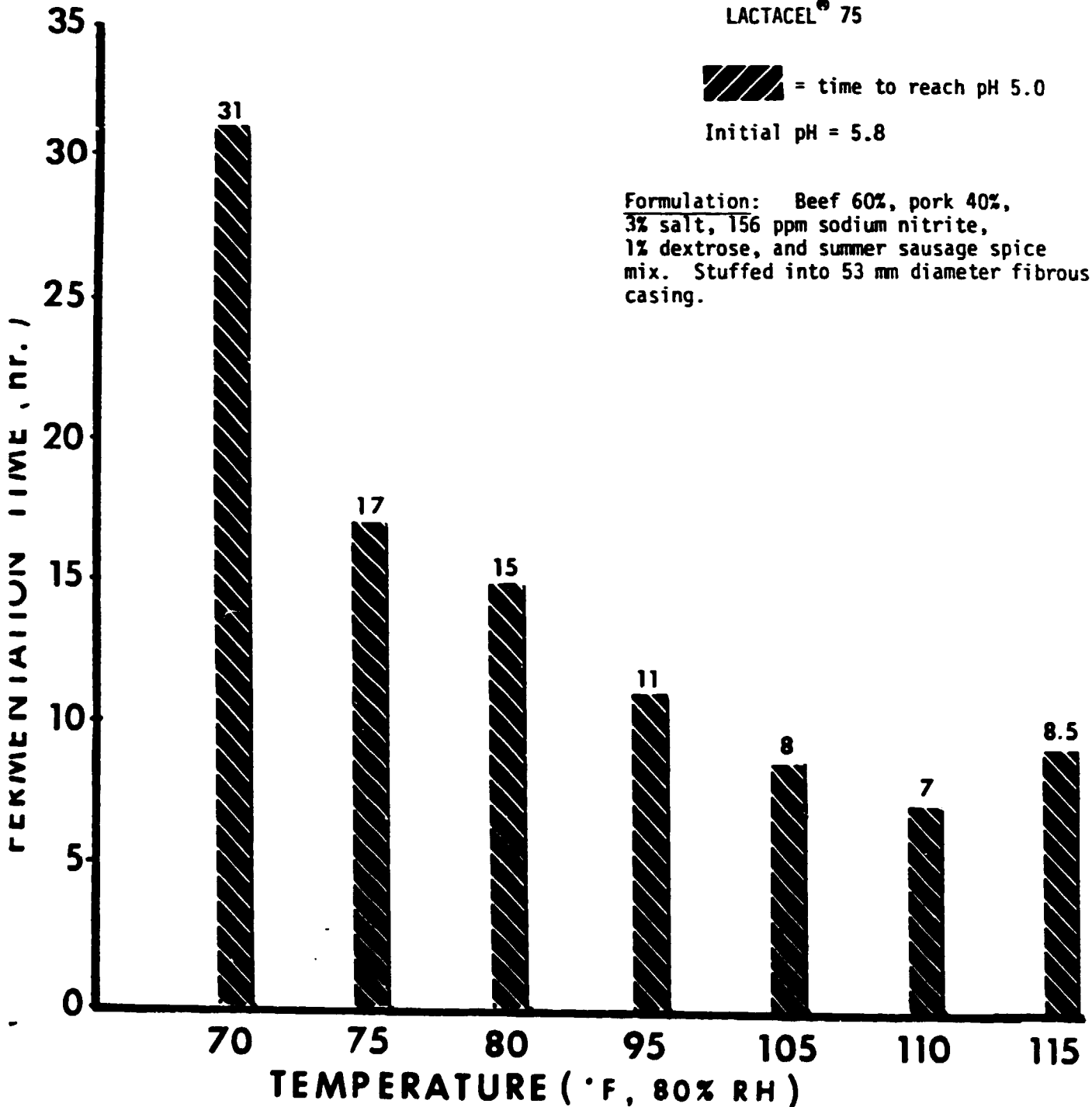
The extremely broad temperature range (75° to 110°F) in which LACTACEL 75 will produce lactic acid rapidly, allows the producer much versatility. Charts on this and the next two pages give time/temperature relationships in Summer Sausage, Genoa and Pepperoni.

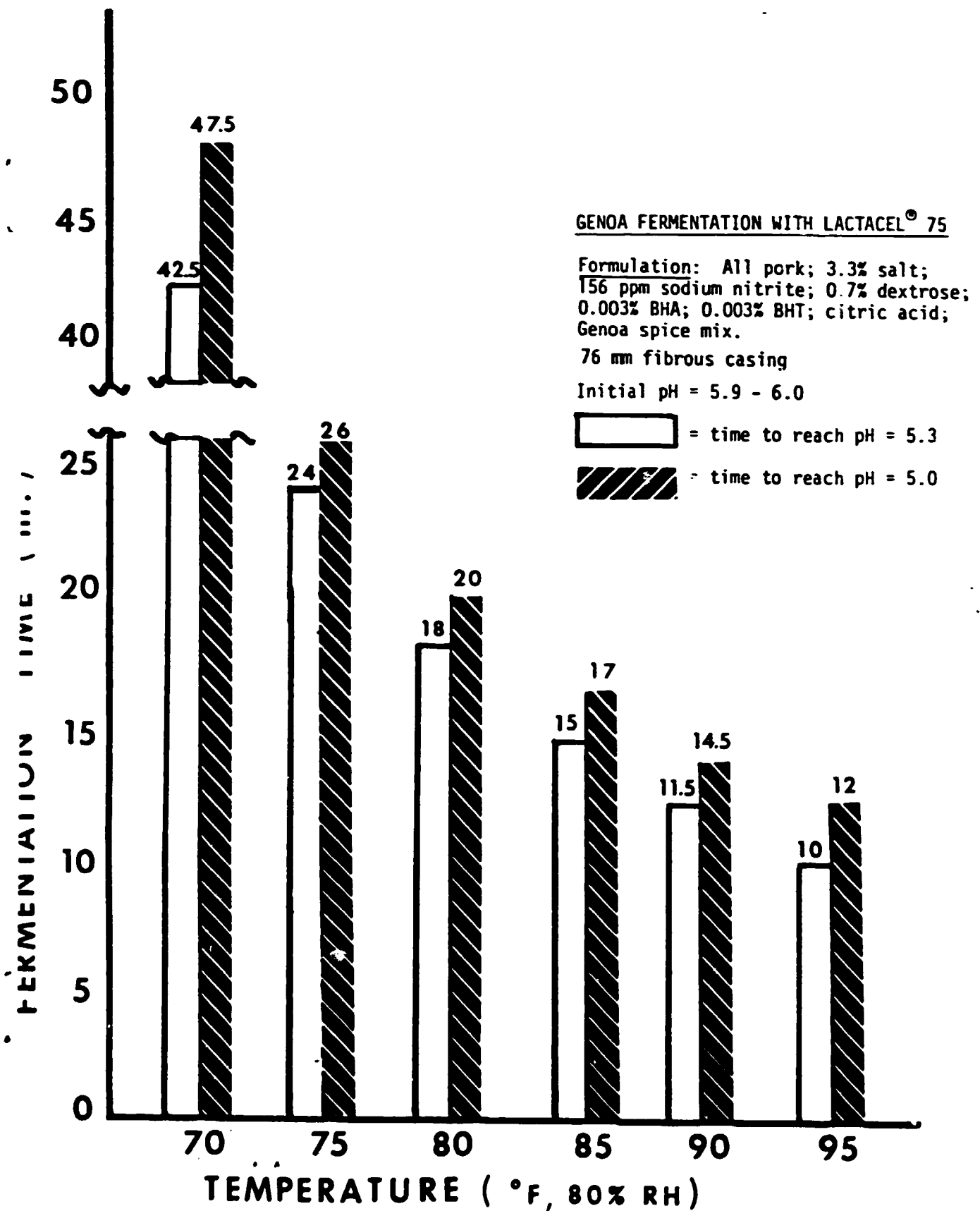
SUMMER SAUSAGE FERMENTATION WITH
LACTACEL[®] 75

 = time to reach pH 5.0

Initial pH = 5.8

Formulation: Beef 60%, pork 40%,
3% salt, 156 ppm sodium nitrite,
1% dextrose, and summer sausage spice
mix. Stuffed into 53 mm diameter fibrous
casing.







PEPPERONI FERMENTATION WITH LACTAGEL 75

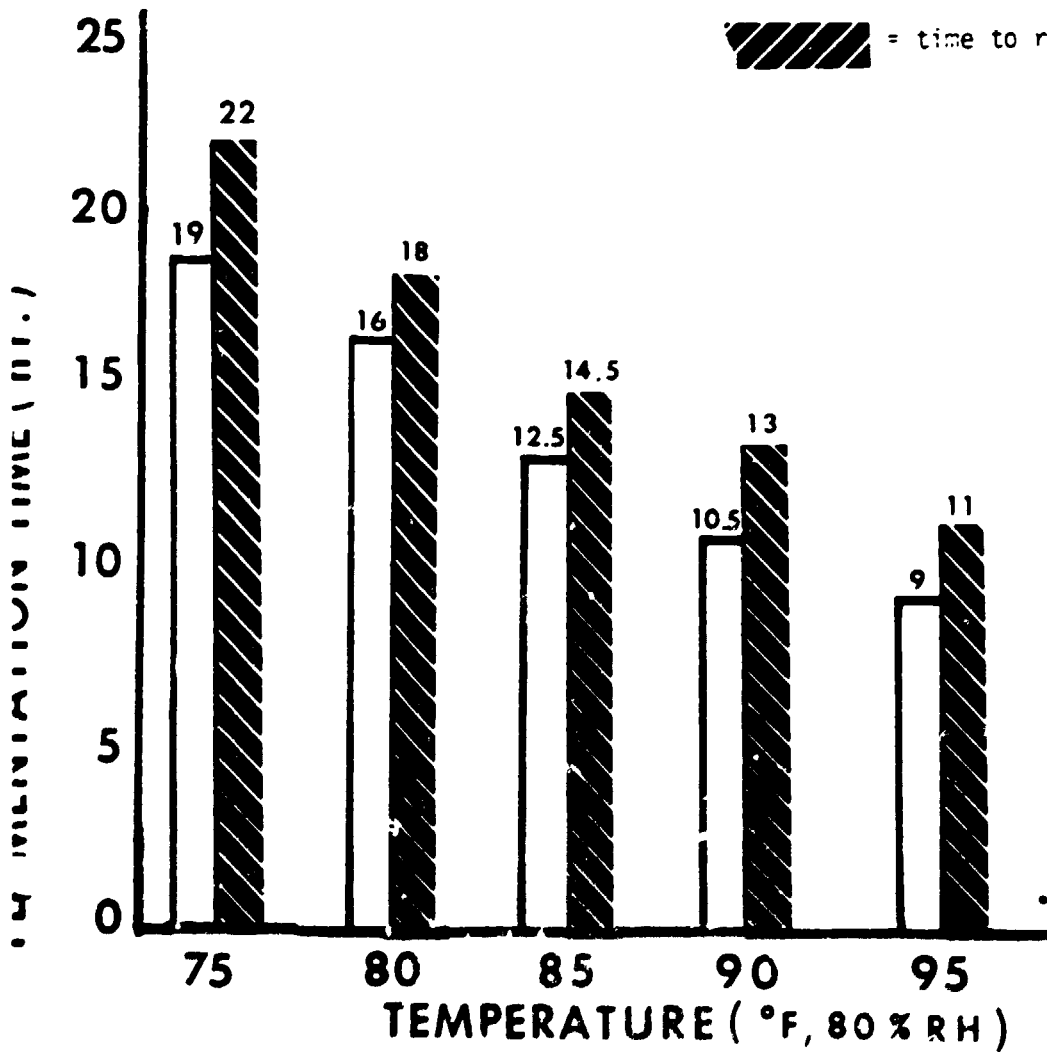
Formulation: All pork; 3.3% salt; 156 ppm sodium nitrite; 0.7% dextrose; 0.003% BHA; 0.003% BHT; citric acid, pepperoni spice mix.

40 mm fibrous casing

Initial pH = 5.9 - 6.0

 = time to reach pH = 5.3

 = time to reach pH = 5.0



STAPHYLOCOCCUS AUREUS CONTROL

The control of Staphylococcus aureus with LACTACEL[®] 75 is exceptional. The data shows the S. aureus growth is limited to about $\frac{1}{2}$ log cycle between 75-95°F in Genoa and Pepperoni when S. aureus 265-1 is added at 10,000 cfu/g of meat.

EFFECT OF LACTACEL 75 ON GROWTH OF S. AUREUS 265-1
IN PERIPHERY OF GENOA SALAMI INCUBATED AT 80°F

	CFU** of <u>S. aureus</u> /g at		Log Increase <u>S. aureus</u> count*
	0 HR (T ₀)	18 HR (T _F)	
<u>S. aureus</u> 265-1 only	15,000	41,000	0.44
<u>S. aureus</u> 265-1 & LACTACEL 75	15,000	20,000	0.12
	pH		
	0 HR	18 HR	
<u>S. aureus</u> 265-1	5.90	5.76	
<u>S. aureus</u> 265-1 & LACTACEL 75	5.92	5.00	

EFFECT OF LACTACEL 75 ON GROWTH OF S. AUREUS 265-1
IN PERIPHERY OF PEPPERONI INCUBATED AT 95°F.

	CFU** of <u>S. aureus</u> /g at		Log increase <u>S. aureus</u> count*
	0 HR (T ₀)	10 HR (T _F)	
<u>S. aureus</u> 265-1 only	11,000	200,000	1.26
<u>S. aureus</u> 265-1 & LACTACEL 75	10,000	40,000	0.60
	pH		
	0 HR	10 HR	
<u>S. aureus</u> 265-1	5.95	5.60	
<u>S. aureus</u> 265-1 & LACTACEL 75	6.01	5.00	

* Log T_F - Log T₀ = Log increased S. aureus count.
** CFU = Colony forming units (viable count)

EFFECT OF LACTACEL[®] 75 ON GROWTH OF S. AUREUS 265-1
IN PERIPHERY OF GENOA SAUSAGE INCUBATED AT 95°F

	pH After 11 hrs	CFU** of S. aureus/g at		Log increase S. aureus count*
		0 HR (T ₀)	11 HR (T _F)	
S. aureus 265-1 only	5.60	10,000	360,000	1.56
S. aureus 265-1 & LACTACEL 75	4.90	7,400	9,400	0.104

EFFECT OF LACTACEL 75 ON GROWTH OF S. AUREUS 265-1 IN
PERIPHERY OF GENOA SAUSAGE INCUBATED AT 90°F

	pH After 14 hrs	CFU** of S. aureus/g at		Log increase S. aureus count*
		0 HR (T ₀)	14 HR (T _F)	
S. aureus 265-1 only	N.D.***	14,000	300,000	1.331
S. aureus 265-1 & LACTACEL 75	5.03	11,000	14,000	0.105

*Log T_F - Log T₀ = Log increased S. aureus count.

**CFU = Colony forming units (viable count)

***N.D. - Not Determined.

NITRITE

All sausage formulations must include nitrite for proper color development and Cl. botulinum protection. LACTACEL 75 grows well in formulations with 100-155 ppm sodium nitrite.

DIRECTIONS FOR USE OF LACTACEL 75

1. Preparation of sausage mixture.

- a. Make up sausage mixture as usual being sure that salt, cure, and spices are well blended to avoid localized high concentrations. The nitrite level should be 1/8 - 1/4 oz./100 lb. of meat depending upon your label declaration and/or current U.S.D.A. regulations. CAUTION: ALL INGREDIENTS SHOULD BE THOROUGHLY MIXED WITH THE MEAT BEFORE ADDING THE LACTACEL 75. BE SURE TO ADD THE LACTACEL 75 TO THE SAUSAGE MIX WITHIN ONE HOUR AFTER TAKING THE CULTURE FROM THE FREEZER.

2. Preparation of LACTACEL 75

- a. Take container of LACTACEL 75 from freezer and hold at room temperature for 2 or 3 minutes, then remove foil lid and "pop out" contents into a clean stainless steel container.
- b. Add the following amount of cool tap water. Do not use warm or heavily chlorinated water.

*Add 23 fluid oz. of water to the 27.6 g container size of LACTACEL[®] 75 for 300 lbs. of meat.

*Add 38 fluid oz. of water to the 46.0 g container size of LACTACEL 75 for 500 lbs. of meat.

- c. Stir or mix this solution until completely thawed (no chunks or ice crystals floating on the surface).
3. Add LACTACEL 75 solution to the meat and mix thoroughly. BE SURE TO USE THE LACTACEL 75 WITHIN ONE HOUR AFTER TAKING THE CULTURE FROM THE FREEZER.
4. Stuff the sausage into the desired casings as soon as possible.
5. Transfer the stuffed sausages to your smokehouse, drip room, or fermentation chamber. For general recommendations, see semi-dry sausage or dry sausage schedules.

SEMI-DRY SAUSAGE PROCESSING SCHEDULE

- a. Bring the temperature of the smokehouse to the desired setting (between 75° - 110°F). The wet bulb temperature should be set to give 80-90% R.H. (see chart). Temperature of the product should be measured as internal temperature. Do not use temperatures above 110°F for fermentation, because culture will be inactivated. The product can be smoked to the desired level during this fermentation period.
- b. The wet bulb temperature is the true indication of the internal temperature of the sausage. With the wet bulb and dry bulb at the same temperature, the humidity is 100%. However, in meat smokehouses, this is not obtainable. Set the wet bulb temperature as close to the dry bulb temperature as possible. If smoke is applied during fermentation, the flow of air into the smokehouse will affect the humidity and internal temperature of the sausage. Often the flow of air will cause evaporation of water from the product, producing cooler temperatures in the sausage. Be sure to check internal temperatures in the sausages after the smokehouse temperatures have stabilized.
- c. When the desired pH or degree of tang is reached (7-17 hours, depending upon the product, fermentation temperature, and relative humidity) the sausage should be cooked-out as desired, withdrawn from the house, cooled at room temperature and placed in a holding cooler.
- d. Make flavor and texture evaluations after the product has been aged for 3 - 5 days (about 40°F - 50°F) and the product is ready for shipment to customers. Characteristically, the flavor will be quite sharp or harsh immediately following the fermentation process. After aging a few days, this harshness will mellow into the desirable "tangy" flavor.

DRY SAUSAGE PROCESSING SCHEDULE

- a. Bring the temperature of the smokehouse to the desired setting (between 75° - 95°F). The wet bulb temperature should be set to give 80 - 90% R.H. (see chart). Temperature of the product

should be measured as internal temperature. Do not use temperatures above 110°F for fermentation, because the culture will be inactivated. The product can be smoked to the desired level during this fermentation period.

- b. The wet bulb temperature is the true indication of the internal temperature of the sausage. With the wet bulb and the dry bulb at the same temperature, the humidity is 100%. However, in meat smokehouses, this is not obtainable. If smoke is applied during fermentation, the flow of air into the smokehouse will affect the humidity and internal temperature of the sausage. Often the flow of air will cause evaporation of water from the product, producing cooler temperatures in the sausage. Be sure to check internal temperatures in the sausages after the smokehouse temperatures have stabilized.
- c. Determine pH of sausage at regular intervals until desired pH or degree of tang is reached (9 - 26 hours, depending upon product, fermentation temperature and relative humidity).

NOTE: Method of determining pH of sausage is important. The proper method is to place a cross section cut of sausage (about 30 g) in blender jar, add three times the weight of distilled water (about 90 g) and blend at high speed until thoroughly mixed. Determine pH of mixture with pH meter that has been calibrated with 2 standard buffers, one buffer at pH 7.0 and the other buffer having a pH value near that of final sausage pH (range 4-6).

- d. If heating is the treatment of choice to destroy Trichinae, Section 318.10, Paragraphs (c), (1), (i) and (ii) of the Meat and Poultry Inspection Regulations, APHIS, USDA, should be followed to achieve an internal temperature of 137°F or higher. We recommend that the relative humidity be maintained at 70%.
- e. Remove sausage from smokehouse, cool and transfer to drying room maintained at 55° - 65°F and 65 - 70% relative humidity. Drying is completed after a 35% shrink has been achieved.

RELATIVE HUMIDITY TABLE

Humidity is important in fermented sausage production. The table below shows the relative humidity using wet bulb settings and dry bulb settings.

An 80% relative humidity is recommended.

		DRY BULB (°F)							
		68	70	75	80	85	90	95	100
WET BULB (°F)	64	80**	72	54	41	30	22		
	66		81**	62	47	35	26		
	68	100	90	70	54	41	31		
	70		100	78	61	47	36		
	71			82**	64	50			
	75			100	79**	63	50		
	80				100	82**	68	54	43
	85					100	83**	67	54
	90						100	81**	66
	95							100	83**

** Recommended Wet and Dry Bulb

To use this table, locate the dry-bulb temperature and the wet bulb temperature. The relative humidity (R.H.) is read at the intersection of these two columns.

The information herein is true and accurate to the best of our knowledge. Nothing herein shall be construed as granting a license under any patent of Microlife Technics or as a recommendation to use any method or product in violation of any patent rights.

UNITED NATIONS

Appendix G



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNIDO

August 1986

Request from the Government of Uruguay

for Special Industrial Services

JOB DESCRIPTION

SI/URU/85/801/11-02/J13103

Post title Meat Industry Engineer

Duration 16 days

Date required As soon as possible

Duty station Montevideo and home base

Purpose of project To identify the potential varieties of processed meat products (non-apathousic - free from foot and mouth virus) to be developed for export during the forthcoming years, based on the availability of raw materials and the demand of the foreign markets, to determine the technology to be applied and to design meat product samples for the meat processing lines.

Duties
In close co-operation with the Ministry of Agriculture and the Administration of the slaughterhouses concerned, the expert will be expected to carry out the following duties:

- To study the availability of raw material resources;
- To identify new meat products for which there would be a big demand on the foreign markets;
- To identify the proper processing and packaging technology for the meat products;
- To elaborate standard instructions for the processing of the meat products;
- To introduce and apply the know-how in the pilot production;
- To evaluate technically the possibilities of the new meat processing technology at an industrial level and provide recommendations thereof;

The expert will also be expected to prepare a final report, setting out the findings of his mission and his recommendations to the Government on further action which might be taken.

..../..

Applications and communications regarding this Job Description should be sent to:

Project Personnel Recruitment Section, Industrial Operations Division
UNIDO, VIENNA INTERNATIONAL CENTRE, P.O. Box 300, Vienna, Austria

Qualifications

Highly qualified expert in the field of meat industry with extensive multidisciplinary practical experience in exploitation of machinery and equipment for animal slaughtering, meat processing, utilization of animal by-products, testing and quality control of meat products.

Language

Spanish, English.

Background information

The present situation and the short-term perspectives for Uruguay to sell its meat on international markets are very critical. The differences existing nowadays between the prices achieved for apthousic and non-apthousic meat have lately increased considerably. This means that - while the countries producing meat free of apthous obtain US\$ 1,780 FOB for the meat manufactured without bones, Uruguay is having problems in getting US\$ 600 FOB for similar merchandise. Taking the average of the last five years, the Uruguayan meat exports show that only 2 % of what has been embarked on has been commercialized to countries free of apthous, under the form of processed meat. At the same time, throughout the years, meat without bones of up to 60 % of the total of the system of draw-back exports has been sold to Brazil to be industrialized there and re-exported by Brazil to non-apthousic markets, with a corresponding loss of the value added.

Facing this situation and foreseeing that in future years the EEC will continue its policy of subsidizing and intervening actively in the exports of this product to markets which were traditionally supplied by Uruguay, an imaginative and aggressive strategy must be adopted in order that the exports of Uruguayan meat to apthous-free markets be increased.

Presently the Uruguayan cold-storage industry is suffering a considerable deficit in the industrialization of processed meats. Only two of the already working 35 plants have the proper installations for the processing of corned beef and only one for cooked/frozen meat. This limits the possibilities of obtaining access to the countries of the non-apthousic circuit, which apply the theory of "zero-risk" (USA, Canada, Japan, Scandinavian countries, Korea, etc.) to a volume of only 2 - 4 % of the total of the meat exports of the country.

In the short run the Uruguayan Government has decided to give an impulse to the construction of centres for processed meat where technology is applied which guarantees the destruction of the apthousic virus and which would allow Uruguay to compete in the non-apthousic markets with a minor cost of industrial reconversion and avoiding idle capacities of the plants by an adequate planning strategy. For this reason it is necessary to clearly determine which varieties of products will have to be industrialized in the forthcoming years according to the market demand, taking into consideration products such as cooked and frozen veal, sterilized meat products in the different kinds of packaging, oriented towards retail sale or the industrial processing market, dehydrated meat, ready-cooked dishes, etc.

In this sense, the Government estimates to reach within a three year period a minimal structure of 50 % of processed meat with the consequent benefit of a major employment of the value added to the products, a diversification of the offers and with the possibility of obtaining better prices abroad.

To this effect the central plants for processed meat will have the flexibility which will allow the production of varieties of products which will be better suited for the requirements of the market.