
**COMBAT RATION
ADVANCED MANUFACTURING
TECHNOLOGY DEMONSTRATION
(CRAMTD)**

"Civilian Products from Dual-Use HFFS Equipment"
Short Term Project (STP) #33

FINAL TECHNICAL REPORT
Results and Accomplishments (October 1994 through March 1995)
Report No. CRAMTD STP #33 - FTR12.0
CDRL Sequence A004
February 1996

CRAMTD CONTRACT NO. DLA900-88-D-0383
CLIN 0003

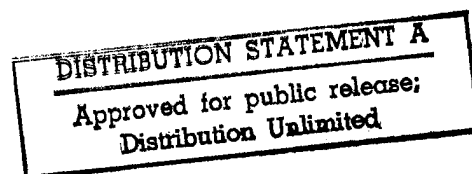
Sponsored by:
DEFENSE LOGISTICS AGENCY
8725 John J. Kingman Road
Ft. Belvoir, VA 22060-6221

Contractor:
Rutgers, The State University of New Jersey
THE CENTER FOR ADVANCED FOOD TECHNOLOGY*
Cook College
N.J. Agricultural Experiment Station
New Brunswick, New Jersey 08903

Principal Investigator: S.C. Cajigas

Dr. John F. Coburn
Program Director

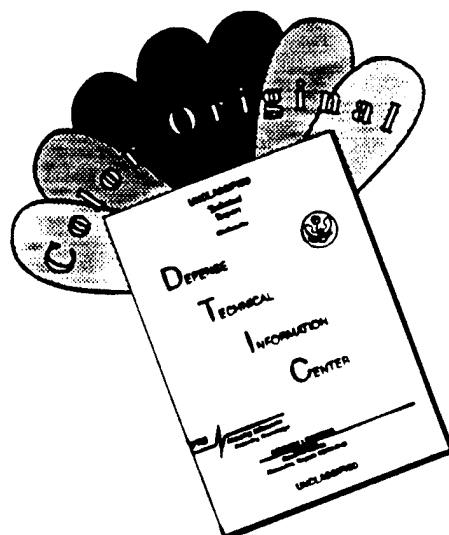
TEL: 908-445-6132
FAX: 908-445-6145



19960313 063

*A New Jersey Commission on Science and Technology Center

DISCLAIMER NOTICE



THIS DOCUMENT IS BEST QUALITY AVAILABLE. THE COPY FURNISHED TO DTIC CONTAINED A SIGNIFICANT NUMBER OF COLOR PAGES WHICH DO NOT REPRODUCE LEGIBLY ON BLACK AND WHITE MICROFICHE.

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE February 1996	3. REPORT TYPE AND DATES COVERED Final Oct. 1994 - Mar. 1995	
4. TITLE AND SUBTITLE Civilian Products from Dual-Use HFFS Equipment (Short Term Project - STP#33)			5. FUNDING NUMBERS C-DLA900-88D-0383 PE-7811s PR-88003	
6. AUTHOR(S) S. C. Cajigas				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Rutgers, The State University of New Jersey The Center for Advanced Food Technology Cook College, NJ Agricultural Experiment Station New Brunswick, NJ 08903			8. PERFORMING ORGANIZATION REPORT NUMBER FTR 12.0	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Defense Logistics Agency 8725 John J. Kingman Road Ft. Belvoir, VA 22060-6221			10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES				
12a. DISTRIBUTION / AVAILABILITY STATEMENT <i>A per Russell Eggers DLA/MMPRT</i>			12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) In support of current combat ration producers expanding into civilian sector markets, thereby reducing their dependence on DOD procurement, this project has the objective of demonstrating the design and production of civilian packaged-food products. Four Workshops (Market Opportunities, Product Design, Market Development, and Production) were held at which the combat ration producer attendees were brought together with 15 representatives of the commercial, civilian food industry including elements devoted to design, distribution and retail sectors. Two model food products were developed and served as Case Studies and Model Demonstration (Macaroni & Cheese with Chicken and Ziti with Ground Turkey). Following market testing and reformulations, the two candidates were served as the entrees at the CRAMTD Annual Contract Briefing. Following the formal, funded portion of the Project, a Macaroni & Cheese product, reformulated to meet the specific needs of a New Jersey Supermarket chain, was commercialized and production began on January 28, 1996 in the CRAMTD Demonstration Site.				
14. SUBJECT TERMS			15. NUMBER OF PAGES 193	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT UL	

Contents

1.0 CRAMTD STP #33	1
1.1 Introduction and Background	1
1.2 Results and Conclusions	1
1.3 Recommendations	1
2.0 Program Management	2
2.1 Summary of STP Accomplishments	2
3.0 Short Term Project Activities	3
3.1 STP Phase I Task	3
3.1.1 Market Needs Definition (Task 4.3.1.1)	3
3.1.2 Product Design (Task 4.3.1.2)	4
3.1.3 Market Development (4.3.1.3)	4
3.2 STP Phase II Task	5
3.2.1 Production (Task 4.3.2.1)	5
3.2.3 Coordination (4.3.2.2)	6
3.2.4 Technical Guidance (4.3.2.3)	6
3.3 Post-Contract Results	7
3.3.1 Product Development	7
3.3.2 Developmental Production	7
3.3.3 Enterprise Demonstration	8
4.0 Appendix	9
4.1 Figure 1 CRAMTD STP #33 Time and Events Milestones	10
4.2 Agenda, "Market Opportunities Workshop", December 15, 1994	11
4.3 "Major Trends Affecting the Food Industry", H. Goldman, Abridged	12
4.4 Agenda, "Product Design Workshop", January 23, 1995	54
4.5 "Design Lab", H. Moskowitz	55
4.6 "Chilled Foods", G. Moore	75
4.7 "Food Service", R.E. Mohel	77
4.8 STP #33 Buffet Items Candidate List	90
4.9 Agenda, "Market Development Workshop", February 15, 1995	91
4.10 "Reaching Your Market", B. Sherman	92
4.11 "University Expectations from Vendors", D. Stern	93
4.12 "Purchasing for the Food Service Industry", B. Williams	94
4.13 "Market Development Plan", S. Cajigas	95
4.14 "Market Research" Results for STP #33 Candidate Products	103
4.15 Agenda, "Production Workshop", March 23, 1995	107
4.16 "Food Process Engineering", G. Gimson	108
4.17 "Thermal Processing", J. Van Ness	131
4.18 "Food Packaging", N. Davis	146
4.19 "Production Planning", B. Rex	163
4.20 "Quality Control", D. Moore	170
4.21 "Cost to Sell", J. Paolini	179
4.22 Model Products: Ingredients, Serving Information, Cost/Serving	189

1.0 CRAMTD STP #33

Results and Accomplishments

1.1 Introduction and Background

STP#33 started October 1, 1994 based on technical and cost proposals dated September 8, 1994 that were submitted to the DLA on September 12, 1994. Final approval for the project was received on September 30, 1994. The broad objective of the project is to demonstrate the design and production of civilian packaged-food products. A series of workshops was to be held to transfer the methodology to participating combat ration producers. The workshops proposed consisted of: Market Opportunities, Product Design, Market Development, and Production. A non-proprietary product, selected by a Steering Committee, was to be used as a CRAMTD model for the project.

1.2 Results and Conclusions

Four Workshops were held at which the Combat Ration producer attendees were brought together with 15 representatives of the commercial, civilian food industry including elements devoted to design, distribution and retail sectors.

Two model food products were developed and served as case studies: Macaroni & Cheese with Chicken, and Ziti with Ground Turkey. The market and product focus was developed by the Ration producers as being closest to their capabilities. Following market testing and reformulations, the two candidates were served as the entrees at the Annual Contract Briefing.

Following the formal, funded portion of STP #33, a Macaroni & Cheese product, reformulated to meet the specific needs of a New Jersey Supermarket chain, was commercialized and production began on January 28, 1996 in the FMT Facility.

As an outgrowth of this project, ration producers requested technical guidance on five different occasions, including one case of a contract to reformulate an existing product (conducted under confidentiality agreement).

1.3 Recommendations

The Workshops were attended by four of the MRE producers as well as personnel from the DLA. It is recommended that the workshop series be repeated. The target would be those who did not attend the STP #33 series, the Tray-Pack producers who were not included, and those producers who wish to repeat with different employees in attendance. The first sessions were in some cases attended by those associated, within the company organization, with CRAMTD rather than the marketing personnel for whom the workshop was intended.

The commercialization and Enterprise experience gained following the completion of STP #33 should be incorporated into a workshop either added to the repeated series or, as a minimum, the subject of a stand-alone workshop. The approach and further details can be obtained by

contacting the CAFT Food Manufacturing Technology Facility, Rutgers University.

2.0 Program Management

STP #33 was a two-phase work activity. The two phases had the following general objectives:

- Phase I** Establish market needs and opportunities consulting with coalition members and then design and produce new products to exploit the opportunities.
- Phase II** Produce new products for commercial customers in sufficient quantities to demonstrate the processing and early market introduction.

Detailed objectives as described in the Technical Proposal for STP#33, dated September 8, 1994, consisted of developing and conducting a series of four Workshops: "Market Opportunities", "Product Design", "Market Development", and "Production". Each Workshop consisted of expert presentations by practitioners and an ongoing active Case Study and Model Demonstration. The work activity and status are illustrated on the attached figure 1, CRAMTD STP#33 "Civilian Products from Dual-Use HFFS Equipment", Time and Event Milestones (Appendix 4.1).

2.1 Summary of STP Accomplishments

- The "Market Opportunities Workshop" was held on December 15, 1994 at the 120 New England Avenue CAFT Food Manufacturing Technology Facility.
- The "Product Design Workshop" was held on January 23, 1995 at the Moskowitz Jacobs Design Lab in White Plains, New York.
- The "Market Development Workshop" was held on February 15, 1995 at the CAFT FMT Facility.
- The "Production Workshop" was held on March 23, 1995 at the CAFT FMT Facility.
- Two candidate Commercial products, Ziti with Ground Turkey and Macaroni & Cheese with Chicken were developed, market tested, and served at the March 8, 1995 CRAMTD Annual Contract Briefing.
- Technical guidance was provided to four of the MRE producers (in one case on two separate projects).
- Following completion of the formal STP #33 Contract, a reformulated Macaroni & Cheese product was accepted for sale through a New Jersey based Supermarket chain.

- CAFT/CRAMTD received its first purchase orders on January 31, 1996 for CAFT SKU #001, Macaroni & Cheese, 6 lb, traypack. First production was on February 28, 1996 and delivery on February 29, 1996.

3.0 Short Term Project Activities

3.1 STP Phase I Task

3.1.1 Market Needs Definition (Task 4.3.1.1)

3.1.1.1 Market Opportunities Workshop

The "Market Opportunities Workshop" was held on December 15, 1994 at the 120 New England Avenue CAFT Food Manufacturing Technology Facility. The Workshop Agenda is attached as Appendix 4.2. There were 16 participants in addition to CAFT personnel. Four of the MRE Producers attended. Both Tetra Laval Food (Tiromat) and Multivac were present and served as resources in describing the range of packaging options available on the Horizontal Form/Fill/Seal machines.

The objective of the workshop was to establish market needs and opportunities consulting with Coalition Members, members of industry, other faculty, and other institutions. The principles and methodology introduced by the speakers was then used to define the market to be pursued by a model CRAMTD product.

The outside speakers during the workshop were Hilly Goldman of HLG Associates, Farmington Hills Michigan and John Fourney, Prepared Foods Buyer/Merchandiser, Wakefern Corp. (ShopRite Supermarkets).

Mr. Goldman spoke on: Major Trends Affecting Food Industry Growth, Resources Commitments, Product Development Planning, Market Opportunities Analysis. An abridged version of the extensive handouts used by Mr. Goldman are attached as Appendix 4.3.

Mr. Fourney reviewed the Deli operations at the ShopRite supermarkets. Opportunities exist there for new products without the costs associated with shelf space, advertising, etc. Pricing by the supplier does have to be aggressive, however, since the store will seek a 50% mark-up to retail price yet must remain competitive with outside deli's and fast food outlets.

3.1.1.2 Case Study and Model Demonstration

During the final portion of the Workshop, the Producers agreed that their strengths are in meat/pasta products and that they would more likely be successful in pursuing institutional rather than retail markets. Since that market needs refrigerated or frozen products, rather than thermostabilized, retorts would be used to cook the model product but not to sterilize. The product would therefore be a refrigerated/frozen product.

At the December 21, 1994 Program Manager/COTR Review Meeting, the STP Steering Committee agreed to the approach of an institutional product which could have both retail (family or large group size) and institutional (institutional and deli) market potential. Specific institutional products will be defined using the resources of Chef Bruce Williams and the CAFT Extension Program staff who will do several items for buffet or deli and club store sales.

3.1.2 Product Design (Task 4.3.1.2)

3.1.2.1 Product Design Workshop

The "Product Design Workshop" was held on January 23, 1995 at the Moskowitz Jacobs Design Lab in White Plains, New York. The Workshop Agenda is attached as Appendix 4.4. There were 12 participants in addition to CAFT personnel.

Howard Moskowitz, of Moskowitz Jacobs, Inc., along with staff members of the Design Lab provided a tour of the facilities including the focus-group interview rooms used in concept/product evaluation. Attendees participated as panelists in evaluating cold breakfast cereal mixtures. Using computer stations on a LAN for product rating, results were available before the lunch break. Also demonstrated was product labelling (positioning). Copies of handouts from Moskowitz Jacobs are attached as Appendix 4.5.

Gary Moore, Kings Super Markets, Inc., described the relationships between Kings, 19 stores in central NJ but now part of England's Marks & Spencer which is the largest retailer in the U.K. and its suppliers. These suppliers are within 6 - 8 hours by truck. He targeted his presentation (outline attached as Appendix 4.6) to Chilled Foods.

Robert Mohel, Consultant, presented information on the Food Service Industry based on his past affiliations with Hotels, Restaurants, and Supermarkets. His presentation (Appendix 4.7) covered Opportunities, Food Trends, Quality, and Specific Technologies.

3.1.2.2 Case Study and Model Demonstration

Bruce Williams, an Atlantic City chef with whom the CAFT Technology Extension Program has been working, supplied a list of 8 buffet items described as most popular buffet items. This list appears as Appendix 4.8. These items were proposed as a model institutional product. Two of the items were selected for "costing": Ziti with Ground Turkey and the Macaroni and Cheese w/ Chicken.

3.1.3 Market Development (4.3.1.3)

3.1.3.1 Market Development Workshop

The "Market Development Workshop" was held on February 15, 1995 at the CAFT FMT Facility, Piscataway, NJ. There were 11 participants in addition to CAFT personnel. The Workshop Agenda is attached as Appendix 4.9.

Bernard Sherman, Independent Consultant, presented "Reaching Your Market/Assessing The Market" an outline of which is attached (Appendix 4.10). His model was illustrated as a target of

which the bullseye was the Target Market, surrounded by a first ring of Controllable Variables consisting of Price, Product, Promotion, and Place(when and where). The outer ring was made up of the Uncontrollable Variables: Cultural and Social Environment, Economy, Existing Business and Competition, Corporate Resources and Objectives, and Political and Legal Environment.

David Stern, Rutgers Dining Services, provided input to the workshop attendees on Institutional Food Purchasing and what a University expects from its vendors (Appendix 4.11). Rutgers is the 2nd largest operation among U.S. universities with \$8.5 million per year of food purchases. Rutgers differs significantly from the rest of the university feeding plans in that it does not charge students based on what they consume (neither quantity or selection). Students are driven by healthful foods selection for their everyday meals and “fat-out” as a change of pace. During the week they select flavored chicken nuggets without breading or fish without breading or frying. Large companies are driven by the retail market rather than institutional and the current generation of buyers rather than the next generation.

Bruce Williams, Chef and Owner of Latitude 39 Foods, discussed Purchasing for the Food Service Industry (Appendix 4.12). His list of what the buyer is seeking was: Quality, Applications (multi-use), Taste, Health Aspects/Nutrition, Cost, Fit (operational and labor), Packaging, Communications (product tailored selling), Availability (delivery cycle), and Trends.

3.1.3.2 Case Study and Model Development

A three-stage Market Development Plan was presented by Stan Cajigas (Appendix 4.13). During Stage One, free samples are given to 300 test subjects with questions that require simple answers. In Stage Two, the price is established in relation to the product requiring sales of 1000 or more. Stage Three includes development of marketing plans, production plans, pricing and cash flow. Preliminary cost data was presented for Ziti with Ground Turkey, and Macaroni & Cheese with Chicken.

Market Research results were presented on 2 candidate products: Ziti with Ground Turkey, and Macaroni and Cheese with Chicken (Appendix 4.14). Taste testing was conducted at the Rutgers Busch Campus Student Center with 91 students for the Ziti survey and 87 students with Mac & Cheese. 63% reported they would choose the Ziti in the Dining Hall, 61% would choose the Mac & Cheese (a significant group were undecided: 29% and 27% respectively) and very few said no (8% and 12%). The students suggested more flavor, more chicken or sauce for both products and included in their suggestions low fat, fewer calories, healthy.

3.2 STP Phase II Task

3.2.1 Production (Task 4.3.2.1)

3.2.1.1 Production Workshop

The “Production Workshop” was held on March 23, 1995 at the CAFT FMT Facility, Piscataway, NJ. There were 13 participants in addition to CAFT personnel. The Agenda is attached (Appendix 4.15).

Guy Gimson, Consultant, a chemical engineer whose experience includes Nabisco, Allen-Bradley, and Air Products, presented a session on Food Process Engineering which takes a product concept through preliminary engineering to final design and includes economic analyses in successively greater detail (Appendix 4.16).

John Van Ness, Van Ness & Associates, discussed thermal processing including using the retort to cook a raw product. HACCP becomes more important in a sous vide or refrigerated product than in a canned/thermostabilized product. He ended with discussion of flash cooling as an aid to better quality products (Appendix 4.17).

Norman Davis's, Top Inc., presentation on packaging emphasized form/fill/seal (both vertical and horizontal, with and without thermostabilization), Appendix 4.18. Shrouding the filling and sealing areas and the ability to use clean untouched trays brings F/F/S near to aseptic packaging. In general, Norman Davis was bullish of the role of F/F/S in food packaging.

The outline of the Bruce Rex (former President of Ontario Foods) presentation is attached as Appendix 4.19. In addition to discussing the production planning process, Bruce Rex also presented an example of Material Requirements Planning (MRP) using a software package "Fourth Shift" applied to hypothetical Macaroni & Cheese with Chicken production.

David Moore, Director Quality Assurance for Papetti's Hygrade Egg Products, discussed Quality Control. As can be seen in his handout (Appendix 4.20), this included: Quality Involvement, Quality Programs, Customer Inspections, Kosher Production, School Lunch Program and FDA Continuing Community Guarantee. Papetti's Recall program is geared to a 10-15 minute response - must identify every lot within 30 minutes! This response necessitates the Crisis Flow Chart, Periodic Practice Drills, and Pre-Prepared Recall Statement.

"Cost to Sell" was the title of the presentation (Appendix 4.21) given by John Paolini, President of Paolini Food Brokers. Of the money spent on food, 35% is at food service. "Trade Related Costs" additions made to producer costs in moving an item to store average 35% with the following breakdown: Leaker allowance - 2%, Advertising & Promotions - 15%, Incentives/Accruals - 5-10%, Slotting Fees - 5%. The rule of thumb for Sales Expense is 5%.

3.2.1.2 Case Study and Model Demonstration

The recipes, serving information (nutrition), and cost data were distributed (Appendix 4.22) for the two candidate products: Ziti with Ground Turkey and Macaroni & Cheese with Chicken.

3.2.3 Coordination (4.3.2.2)

At the March 8, 1995 CRAMTD Annual Contract Briefing, Lunch included the two Candidate Products: Ziti with Ground Turkey, and Macaroni & Cheese with Chicken. Chef Bruce Williams prepared the entrees in the FMT Facility and they were served in the Buffet Line. The product was well received; including by the Caterer who expressed interest in obtaining the items for his business.

3.2.4 Technical Guidance (4.3.2.3)

3.2.4.1 Product Reformulation

The reformulation of a product recently introduced by one of the Combat Ration producers was requested of CAFT's Technology Extension Program/CRAMTD. This R&D was conducted for a fee and under a confidentiality agreement. The work was completed and recommendations given to the producer.

3.2.4.2 Foil Laminate Forming

One of the MRE producers requested a run of an experimental foil laminate on the horizontal form/fill/seal machine filled with smokey franks. Both franks and film were supplied by the producer, the run was conducted during a visit by their technical staff and the production was retorted and shipped to them.

3.2.4.3 Customer Contacts

Following the Workshops, CAFT/CRAMTD made introductions for a combat ration producer to a number of potential customers (distributors and supermarket buyers).

3.2.4.4 Resources Assessment Visit

One of the Combat Ration Producers separately visited the FMT facility and met with staff to discuss the capabilities of CAFT/CRAMTD to serve as a resource for the future. To-date, this producer has yet to make a formal request or submit a purchase order, however.

3.2.4.5 Resources Assessment Consulting

On behalf of one of the Combat Ration producers, a Consultant visited the FMT facility and met with the staff to discuss participation of CAFT/CRAMTD in future market and product line expansion. To-date, the producer has yet to request a follow-up meeting.

3.3 Post-Contract Results

3.3.1 Product Development

A New Jersey-based supermarket chain became interested in the ability of the Food Manufacturing Technology Facility (FMT) to develop and produce a Macaroni and Cheese product for sale, initially, in the Deli sections of their stores (150 stores). Broadly, the product was to be packaged in a 6 pound polymeric tray-pack with heat seal lid. The polymeric tray-pack developed for STP #10 had been awarded the EDDA "Best New Product -General" 1995 award and the next step was to generate a suitable commercial use. This product application could meet that objective.

The supermarket found the recipe used for STP #33 "Macaroni & Cheese with Chicken" to be too strongly flavored for their product. It would not be what the customer expected on purchasing macaroni and cheese but was rather a specialty product probably well suited for the buffet line. It was necessary, therefore, to reformulate.

A shelf life of 21 days, refrigerated, was required. The first accepted product lost flavor over

this storage time and had to be reformulated again for flavor retention. The formulation/reformulation including customer acceptances took about 3 months.

3.3.2 Developmental Production

During October, Process Development including Quality Control developed the "Preparation Production Procedures", the "Hazard Analysis of Critical Control Points (HACCP) Plan", and the "Process and Quality Control Points Plan". They follow the form of those reported in STP #3, "Generic Inspection - Statistical Process Control System for a Combat Ration Manufacturing Facility (see CRAMTD Final Technical Report (FTR) 11.0). These documents were shared with the customer and the customer visited the plant to review the proposed operations.

The first experimental batches of CAFT SKU #001X were 65 trays (390 lbs) on November 7, 1995 and 72 trays (430 lbs) on December 21, 1995. Microbiological and taste testing were conducted at 1, 14, and 21 days with product stored in the refrigerator (taste testing was also conducted after 7 days). Control sample trays were also placed into the freezer.

CAFT/CRAMTD received the first 3 purchase orders from the customer on January 31, 1996 for CAFT SKU #001, Macaroni & Cheese, 6 lb, traypack. The purchase orders are one per week delivery each of 600 trays (3,600 lbs). First order delivery was on February 29, 1996 and then subsequently each week. Other SKUs will be added as soon as possible.

Detailed production data (times for each stage, temperatures, and checkweigher weights) were collected for the December 21st run. Such data will be routinely collected to chart the production "learning curve". Major changes were made between the experimental runs and are scheduled for the first full-scale production.

3.3.3 Enterprise Demonstration

Changes to formulations and to packaging materials changed costs and impacted the price at which product could be delivered to the customer. Pricing was developed based on: raw material, packaging material, space utilization charges, labor requirements, and overhead and profit. Delivery charges, outer cartoning, and labels are provided by the customer but cost for these items was taken into account in negotiating the price the customer was "willing" to pay.

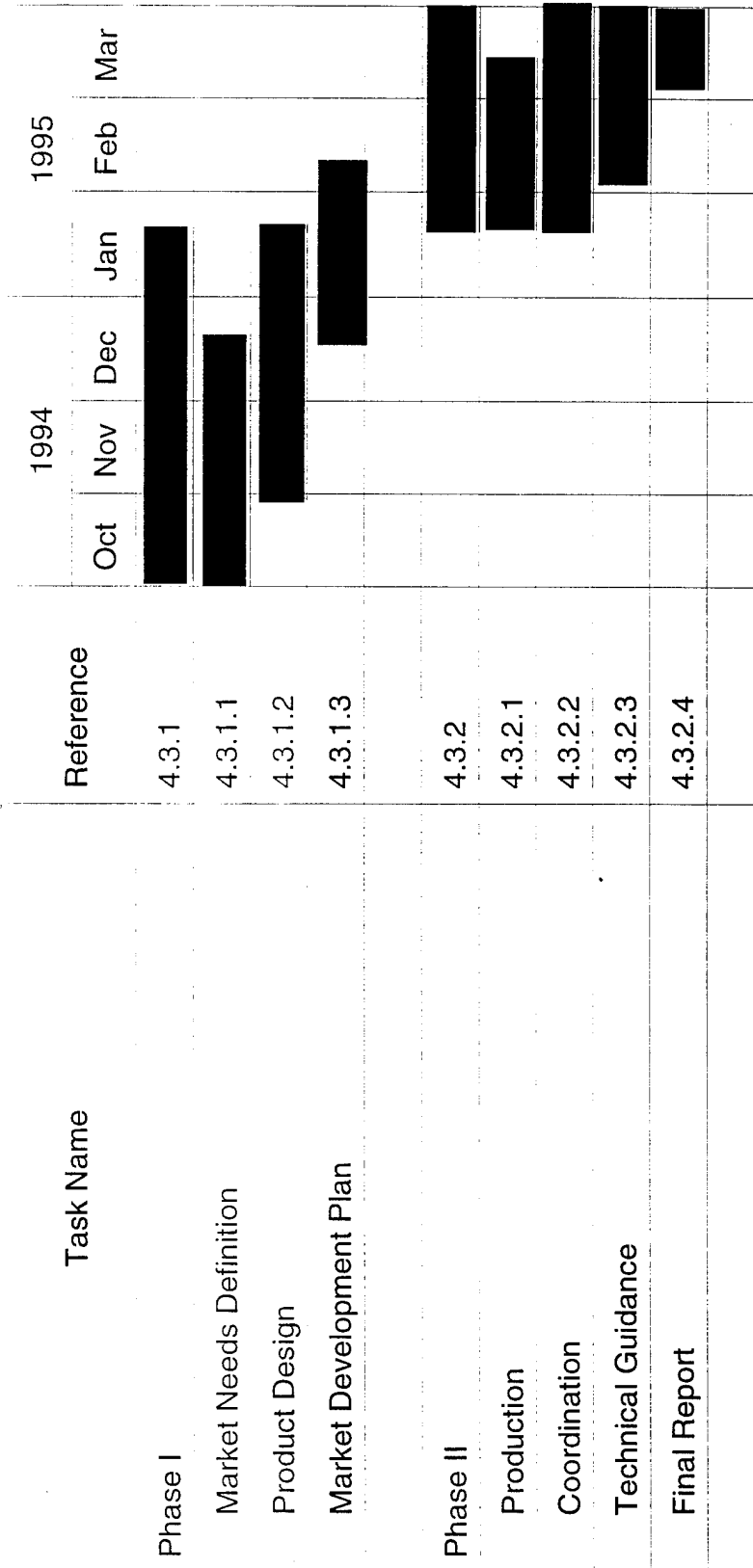
Labor and space utilization charges were based on a target productivity which leads to considerable incentives for continuous production improvements.

At present, the bottlenecks to target production rate are mostly in the cooking area. Capital investments in equipment will have to be recovered from product sales and therefore cost/benefits analyses model those required by a full-fledged commercial enterprise.

4.0 Appendix

- 4.1 Figure 1 CRAMTD STP #33 Time and Events Milestones
- 4.2 Agenda, "Market Opportunities Workshop", December 15, 1994
- 4.3 "Major Trends Affecting the Food Industry", H. Goldman, Abridged
- 4.4 Agenda, "Product Design Workshop", January 23, 1995
- 4.5 "Design Lab", H. Moskowitz
- 4.6 "Chilled Foods", G. Moore
- 4.7 "Food Service", R.E. Mohel
- 4.8 STP #33 Buffet Items Candidate List
- 4.9 Agenda, "Market Development Workshop", February 15, 1995
- 4.10 "Reaching Your Market", B. Sherman
- 4.11 "University Expectations from Vendors", D. Stern
- 4.12 "Purchasing for the Food Service Industry", B. Williams
- 4.13 "Market Development Plan", S. Cajigas
- 4.14 "Market Research" Results for STP #33 Candidate Products
- 4.15 Agenda, "Production Workshop", March 23, 1995
- 4.16 "Food Process Engineering", G. Gimson
- 4.17 "Thermal Processing", J. Van Ness
- 4.18 "Food Packaging", N. Davis
- 4.19 "Production Planning", B. Rex
- 4.20 "Quality Control", D. Moore
- 4.21 "Cost to Sell", J. Paolini
- 4.22 Model Products: Ingredients, Serving Information, Cost/Serving

**Figure 1 - CRAMTD Short Term Project #33
Civilian Products from Dual-Use HFFS Equipment
Projected Time & Events and Milestones**



Printed: 02/09/96

"Market Opportunities Workshop"

At CAFT FMT Facility, Piscataway, NJ

December 15th, 1994

Objectives: Establish market needs and opportunities consulting with coalition members. members of industry, HLG Associates, Wakefern Corp., and Stan Cajigas & John Coburn, CAFT. Introduce principles and methodology.

Resources: H. Goldman, President HLG Associates
 John Fourney, Prepared Foods Buyer/Merchandiser, Wakefern Corp.
 Peter Sherman, NRDEC
 John Coburn, Associate Director CAFT, Director CRAMTD
 Stanley Cajigas, Manager CAFT Technology Extension Program
 Joseph Martin, Multivac Packaging Machines
 Ron Merrill, Tetra Laval Food

AGENDA

- | | | |
|-----------|--|--------------------------------|
| 9:00 A.M. | - Welcome by John Coburn, Director CRAMTD | |
| 9:15 | - "Course" Outline | (Stanley Cajigas) |
| 10:00 | - MRE Qualification Status | (Peter Sherman, NRDEC) |
| 10:30 | - Topics: Major Trends Affecting Food Industry Growth | |
| | Resources Commitments | |
| | Product Development Planning | |
| | Market Opportunities Analysis | (H. Goldman, HLG Assoc.) |
| 12:00 | - Lunch | |
| 1:00 P.M. | - Topic: Product Trends | (John Fourney, Wakefern Corp.) |
| 1:45 | - Workshop: Market Opportunities | (Stan Cajigas & John Coburn) |
| 3:30 | - Workshop Reports | |
| 3:50 | - Fill out evaluation forms | |
| 4:00 | - Adjourn | |

HLG MARKETING AND SALES ASSOCIATES

Marketing Implementation • Sales Execution • Customer Development

PRESENTATION to CENTER FOR ADVANCED FOOD TECHNOLOGY CRAMTD MARKET OPPORTUNITIES WORKSHOP

**CAFT FMT FACILITY
Piscataway, NJ
December 15, 1994**

Appendix 4.3

MAJOR TRENDS AFFECTING FOOD INDUSTRY GROWTH

- The significant shift in the balance of marketing power from suppliers to retailers
- Sustained growth of private label/store brand marketing
 - decline in "brand health"
- Pervasive shifts in consumer shopping patterns and behavior
- Transition to changes/modifications in consumer life styles

- **Balance of power has swung dramatically to the customer side across all classes of trade - brought on in large part by:**
 - Trade concentration as a result of acquisitions
 - Explosive growth of non-traditional channels
 - as evidenced by the exponential growth of warehouse clubs and "supercenter" operations
 - Adjusted for inflation, supermarket sales have been basically flat.
 - although food prices are now rising at a 1.5-2.0% annual rate
 - A focus on store brand marketing as a strategic approach to
 - enhance profitability
 - differentiate store formats
 - emphasize/build corporate image

- **Strategic Assessment - Supermarket sales (and the Grocery Industry in general) have been growing, but at declining rates since 1980.**

Year	Dollars (billions)	% Rate of Growth vs. Previous Year
1993	\$292.0	2.0%
1990	\$271.7	5.7%
1980	\$157.0	11.7%

- Grocery Volume

Because the total universe of grocery volume extends across all classes of trade in the Grocery Industry, market potentials should be measured across all industry sectors. Approximately 25% of grocery store sales are not measured by InfoScan databases (which cover supermarkets of \$2 million or more.)

- The following is based on 1993 estimated sales from total grocery stores, as reported by Progressive Grocer.*

1993 Grocery Industry Sales

	No. of stores	% of total	Dollars in billions	% of total
All Grocery Stores	136,000	100.0	\$390.0	100.0
Supermarkets (> \$2 million)	29,800	21.9	292.0	74.9
Convenience Stores	58,000	42.7	27.0	6.9
Wholesale Club Stores	690	0.5	19.0	4.9
Other Stores	45,510	34.9	52.0	13.3

*Source: Progressive Grocer; April 1994 - 61st Annual Report on the Grocery Industry



How \$100 is spent

PERISHABLES \$49.51
NON-EDIBLE GROCERY \$10.73
MISCELLANEOUS GROCERY \$9.36
BEVERAGES \$9.09
SNACK FOODS \$5.77
MAIN COURSES & ENTREES - \$5.39
GENERAL MERCHANDISE \$4.05
HEALTH & BEAUTY CARE - \$3.97
OTHER - \$2.13

PERISHABLES - \$49.51

Bakery foods, packaged	2.95
Dairy products	8.20
Deli	3.07
Florals	0.19
Frozen foods	5.34
Ice cream	1.52
In-store bakery	1.78
Meat & seafood	16.37
Produce	10.09

NON-EDIBLE GROCERY - \$10.73

Household supplies	2.94
Paper, plastic, film & foil	3.22
Pet foods	1.76
Tobacco products	2.81

MISCELLANEOUS GROCERY - \$9.36

Baby foods	0.88
Baking needs	1.82
Canned fruit	0.44
Canned vegetables	1.01
Desserts & toppings	0.26
Pickles & olives	0.41
Rice & dried vegetables	0.45
Sauces & dressings	2.07

Soup	0.93
Spices & extracts	0.41
Spreads & syrups	0.68

BEVERAGES - \$9.09

Beer & wine	2.31
Coffee & tea	1.45
Juice (grocery)	1.31
Soft drinks & mixes	4.02

SNACK FOODS - \$5.77

Candy & gum	1.08
Cookies & crackers	2.10
Nuts & dried fruit	0.55
Snacks	2.04

MAIN COURSES & ENTREES - \$5.39

Breakfast foods	3.32
Canned fish	0.55
Pasta	0.77
Prepared foods	0.75

GENERAL MERCHANDISE - \$4.05

HEALTH & BEAUTY CARE - \$3.97

OTHER - \$2.13

At a quick glance it appears that share of sales for different sections in the supermarket has not shifted much. That's true for most departments. A closer look, though, points out some small, but significant, changes. Non-edibles' share has been inching downward for many years, a result of increased competition. Snack foods' share, on the other hand, has increased slightly for several years in a row, largely due to the growth of health-oriented products such as pretzels. Likewise, there have been small share gains for main courses and entrees, with most of the increase coming from breakfast foods.

- **Other significant food retailing trends are:**

- Depressed operating profits (supermarket segment) generated from
 - flat tonnage growth
 - deflationary price structures
 - "penny pinching" by consumers
- Centralized procurement management
 - emphasis on category management
 - renewed efforts to develop supplier/customer alliances
- Pricing issues - "every day low pricing" (EDLP) versus "high/low" strategies
- Focus of emphasis on cash flow management driven in part by several Industry-wide initiatives
 - Efficient Consumer Response (ECR) - cost reduction programs through "replenishment logistics" - joint customer/supplier cooperation to improve operational productivity
 - Electronic Data Interchange (EDI) - "paperless transactions" - between suppliers and customers - computer to computer ordering, invoicing, inventory management
 - Activity Based Costing (ABC) - more accurate sourcing of profit contributions

MAJOR TRENDS AFFECTING FOOD INDUSTRY GROWTH

- The significant shift in the balance of marketing power from suppliers to retailers
- Sustained growth of private label/store brand marketing
- decline in "brand health"
- Pervasive shifts in consumer shopping patterns and behavior
- Transition to changes/modifications in consumer life styles

- **As trade power grows, customers are focusing on "store branding" strategies.**
 - Retailers consider private label a brand
 - Store brands offer respective retailers a banner
 - under which they can effectively market their corporate image to consumers
- **Influence by European firms with a strong private label orientation who have acquired major U.S. supermarket chains...**
 - Ahold, Sainsbury, Delhaize, Tengelmann Group, Marks and Spencer, Aldi, etc.
- **There is significant price competition among many brands - producing a squeeze on retailers' margins.**
- **Emphasis is being placed on category management strategies.**
 - spotlights high margin contributions from many P/L categories
 - sustains P/L in category merchandising mix

- Influences driving trends in food manufacturing are both product marketing and customer related.

- Product Related Influences

- a decline in "brand health" that is being driven in part by price competition and "commoditization" among brands, i.e. the deterioration in margins of branded products
- decline in "new" product innovation by many major brand marketers
- generic effect of advertising and promotion on product usage
- the impact on brands brought on by the acquisition and consolidation of food companies

- Customer Related Influences

- emphasis on category management instead of brand promotion
- transfer of consumer loyalty from brands to retailers
- introduction by retailers of upscale, high quality, higher priced store brand lines with premium product positionings
- marketing strategies that "contemporize" store brands to national brand equivalent levels of product quality, packaging and merchandising support

RETAIL PRIVATE LABEL MARKET ENVIRONMENT TRENDS

Retail Private Label Grocery Category growth trends

- Supermarket sales velocity has been affected by price deflation in food sales
- 1993 was the lowest rate of growth ever recorded for the Supermarket Industry
- Overall, private label growth trends continue to be positive

	1993	1992	1991	1990	1989
Supermarkets (over \$2 M) \$ sales in billions ± % growth vs. YA	\$292,000 + 2.0%	\$286,000 + 2.1%	\$280,400 +3.2%	\$271,700 +5.5%	\$257,600 +7.2%
Private Label Category (spmks over \$2M)– \$ sales in billions ± % growth vs. YA	\$29,939 +2.4%	\$26,400 +2.3%	\$25,800 +2.0%	\$25,400 +17.5%	\$21,613 n/a

- Total Private Label segment growth is significantly impacted by flat sales trends of high volume, mature commodity oriented categories i.e. milk, bread, cheese etc.
- Private Label marketing opportunities should be assessed on a category by category basis

Sources: Progressive Grocer, issues of April 1994, 1993 and 1992.
PLMA Private Label Yearbooks for 1992 and 1993. (Sales do not include Generics)
IRI Supermarket Review data 52 weeks ending 1/04/94 (1993 P/L sales)

RETAIL PRIVATE LABEL MARKET ENVIRONMENT TRENDS

RANK OF TOP 50 PRIVATE LABEL CATEGORIES

Rank by \$ (out of 238)	IRI Private Label Category	52 week P/L Dollar Sales	+/- % vs. YA	P/L % Share of Product Category	% Cum. of Total P/L \$
	All Categories	29,939 MM	2.41	100.00%	100.00%
1	Milk	5,666 MM	-0.48	64.75	18.43
2	Fresh Bread & Rolls	1,741 MM	1.62	29.18	24.79
3	Cheese	1,528 MM	1.05	26.74	24.83
4	Fresh Eggs	1,279 MM	-5.14	27.11	34.11
5	Ice Cream	959,364 M	-3.46	27.90	37.31
6	Carbonated Beverage	762,780 M	14.50	7.90	39.86
7	Fz Plain Vegetables	758,738 M	-0.80	44.20	42.41
8	Sugar	639,389 M	0.10	52.91	44.53
9	Vegetables - SS	603,327 M	-0.41	30.56	46.54
10	Juice - Rfg	578,869 M	-0.38	19.08	41.45
11	Juices - SS	566,077 M	0.14	13.47	48.34
12	Fz Juices	516,851 M	-10.17	31.96	50.07
13	Fruit - SS	485,418 M	-1.62	31.75	51.03
14	Cold Cereal	438,730 M	11.63	5.53	53.09
15	Deli Luncheon Meats	406,884 M	-0.28	14.19	54.45
16	Diapers	403,558 M	12.31	17.47	55.80
17	Cookies	367,805 M	16.67	10.72	57.03
18	Chips & Snacks	353,287 M	-1.27	6.66	58.21
19	Food & Trash Bags	339,229 M	-0.53	21.76	59.34
20	Cigarettes	298,473 M	50.02	4.19	60.33
21	Pickles/Relish/Olives	297,491 M	-1.39	24.05	61.33
22	Cottage Cheese	282,719 M	-1.03	40.43	62.28
23	Cups and Plates	259,513 M	1.74	28.91	63.15
24	Spices/Seasonings	257,326 M	-1.87	78.35	64.00
25	Breakfast Meats	252,323 M	-5.84	14.57	64.85
26	Shortening & Oil	233,983 M	0.48	17.70	65.62
27	Bottled Water	231,070 M	15.60	17.55	66.40
28	Tomato Products	227,482 M	-0.19	26.56	67.15
29	Butter	223,916 M	-0.16	40.95	67.90
30	Pastry/Doughnuts	220,950 M	8.84	18.87	68.63
31	Crackers	217,942 M	6.08	7.64	69.37
32	Yogurt	217,591 M	6.42	15.14	70.09
33	Fz Novelties	216,208 M	9.92	14.03	70.82
34	Toilet Tissue	205,744 M	9.25	9.43	71.51
35	Creams	181,406 M	4.58	32.90	72.11
36	Jellies and Jams	175,724 M	0.70	21.38	72.70
37	Internal Analgaesics	174,906 M	15.44	16.59	73.28
38	Fz Fry/Brown/Onion	173,087 M	1.40	23.70	73.86
39	Pasta	172,507 M	4.81	14.74	74.44
40	Foil & Wraps	171,076 M	-0.98	31.00	75.01
41	Paper Towels	169,815 M	5.38	12.02	75.58
42	Soup	169,723 M	2.52	5.59	76.14
43	Coffee	184,295 M	-0.04	6.18	76.69
44	Peanut Butter	160,782 M	-9.61	19.48	77.23
45	Dog Food	160,576 M	6.92	5.69	77.77
46	Seafood - SS	157,763 M	-1.48	6.72	78.29
47	Dinners	148,508 M	8.39	6.45	78.79
48	Vitamins	148,479 M	13.18	33.45	79.29
49	Sour Cream	139,419 M	-4.70	32.69	79.26
50	Pies and Cakes	139,121 M	13.13	32.71	79.72

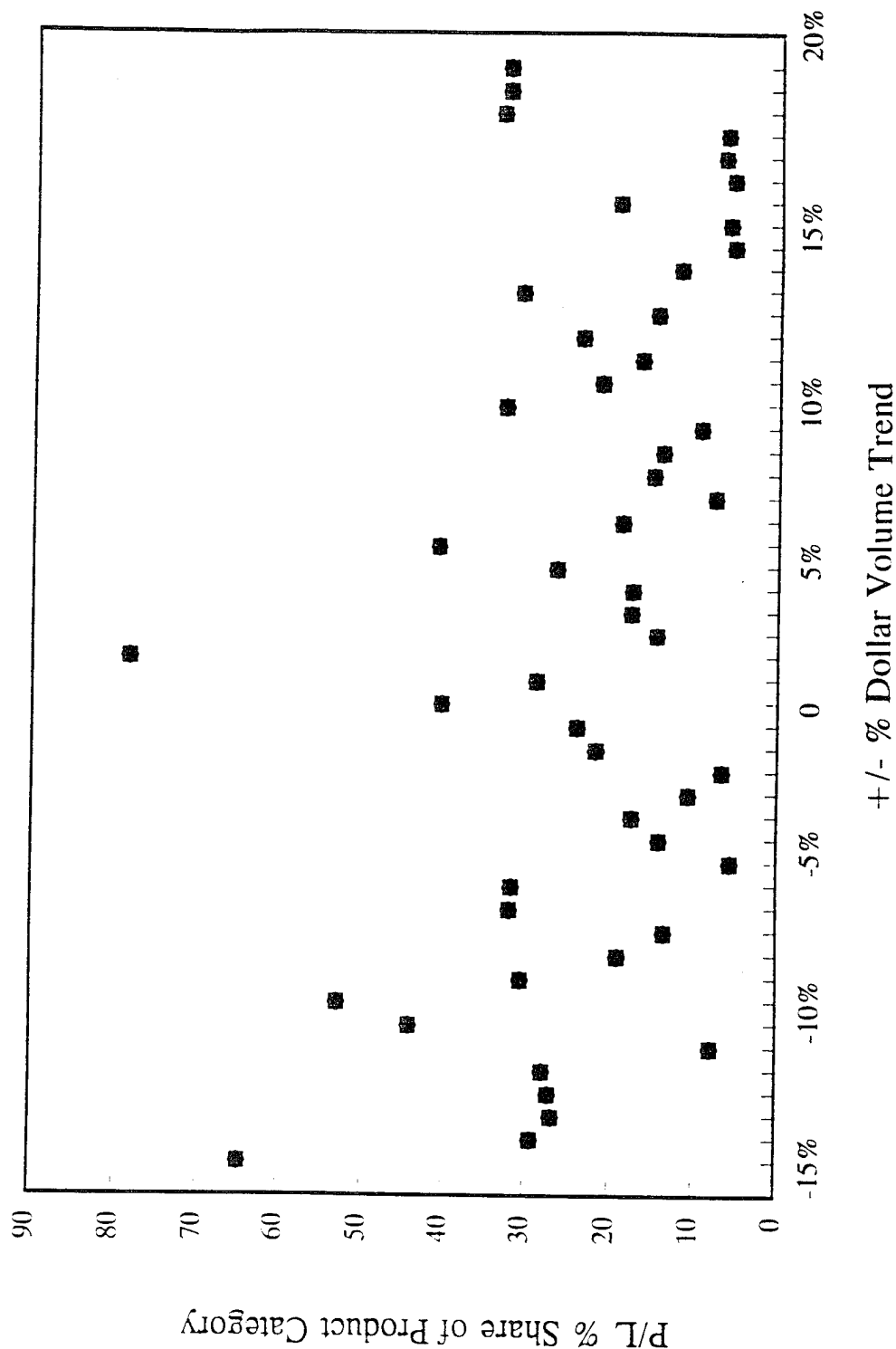
Source: InfoScan Supermarket Review database 52 weeks ending 11/7/93 - Published in March-April 1994
issue of Private Label Magazine

HLG MARKETING AND SALES ASSOCIATES

Top 50 Private Label Categories Dollar Volume

52 week period ending November 7, 1993

Volume trends - and % share of product category - can vary widely for the respective P/L category. Opportunities should be evaluated on a category-by-category basis.



- National warehouse clubs and mass merchandiser operators are deploying assets to build an infrastructure of "supercenter retail stores" - with 40- 45% of square footage dedicated to grocery merchandising.

- These growth patterns position their private label lines as "nationally distributed" brands. Private label growth with mass merchandisers (including warehouse clubs) has significantly outpaced supermarkets, but from a much smaller base.

Private Label Dollar Sales Growth
Total Grocery Sales (billions)

	Total Dollars	% Change	P/L Share
Supermarkets	\$26.4	+ 2.3%	14.3%
Mass Merchandisers	\$ 1.2	+45.8%	8.2%

Source: PLMA 1993 Yearbook and InfoScan Multi Outlet Review
Database (Q2 1993)

- Through January 4, 1994, private label supermarket sales sustained a trend of growth that has reached

14.5% of dollar sales (approximately \$30.5 billion)

19.7% of unit sales (estimated at 25.5 billion)

Major Food Industry Trends

Development of Kmart and Wal-Mart "Supercenters"

Kmart and Wal-Mart are "turning up the heat" as they move towards becoming "national food chains"

	Kmart	Wal-Mart
<i>number of stores</i>	1993 - opened.....19 1994 - projected.....70 by 1995 - projected.....110	1993 - opened.....70 1994 - estimated.....150 by 1995 - projected.....210
<i>supply source</i>	Flemming Companies, Inc. Foodland Distributors	Flemming Companies, Inc. (temporary) - building DCs in Clarksville, AK and Temple, TX to self-distribute
<i>approximate average store size</i>	150-195,000 square feet, with average of 165,000 square feet	97-211,000 square feet, with average of 160,000 square feet
<i>estimated % space for food and non-food consumables</i>	30-40%	about 40%
<i>average annual sales</i>	\$50,000,000	\$56,000,000
<i>average annual food sales (40-50% of total volume)</i>	\$20-22,500,000	\$22.4-22,500,000
<i>private label brands</i>	Natures Classics, Dazzle, Prevail, Softress, Kmart	Sam's American Choice, Equate (HBC)

Source: "Supercenters," *A Supplement to Fairchild Publications*, August 1, 1994 - estimates adapted from database contributed by Management Horizons, Columbus, OH.
Private Label, November-December 1994: "Industry Outlook," page 108.

MAJOR TRENDS AFFECTING FOOD INDUSTRY GROWTH

- The significant shift in the balance of marketing power from suppliers to retailers
- Sustained growth of private label/store brand marketing
 - decline in "brand health"
- Pervasive shifts in consumer shopping patterns and behavior
- Transition to changes/modifications in consumer life styles

- **Store Brands - "the rising tide of consumer demand" - has generated the unparalleled growth of consumer confidence in store brand products.**

- Consumers have developed new and positive perceptions about "value" relationships with price, quality and selection

- Projectable consumer research was conducted by the Gallup Organization

- Some key indicators from this research are:

86 % of shoppers had purchased store brands

33 % reported buying more store brand items than they did one year ago

- Other important findings from the Gallup Research include:

- High quality levels of store brands and consumer perceptions about their quality

"75 % said quality was very important in influencing the first buy"

"88 % mentioned quality as the most important factor in deciding to repurchase"

- Private label opportunities should be evaluated on a category-by-category basis.

- "Real" velocity growth in the P/L grocery segment is being driven by many value added product lines...for example, 52 week P/L dollar sales advanced in the following categories

RTE Cereals	+11.6%	Bottled Water	+15.6%
Cookies	+16.7%	Frozen Novelties	+9.9%
Crackers	+6.1%	Frozen Pastry/Baked Goods	+29.2%
Carbonated Beverages	+14.5%	Frozen Pasta	+37.1%

- Of 238 private label categories reported by IRI's InfoScan database for the 52 week period ending 11/07/94

90 categories have +10% P/L segment share

42 categories have +20% P/L segment share

26 categories have +30% P/L segment share

12 categories have +40% P/L segment share

- purchase frequency of "every time or most of the time" among these respondents was:
 - 43 % with income levels of \$25K-\$45K
 - 87 % with income levels of over \$45K
- changing consumer perceptions about "value" were:
 - "67 % of shoppers mentioned price as a very important factor in the first buying decision"
 - "73 % rated price as very important in deciding to repurchase"
 - "57 % were strongly influenced by label information (to try a store brand)"
- quality was the factor rated most highly by the following respondents in deciding to repurchase a store brand item
 - 86 % of those with some college and a high school graduate
 - 83 % by those with a college degree
 - 86 % by those 50 +
 - 84 % by those 35-49

Source: statements were excerpted from Gallup Organization research commissioned by the Private Label Manufacturers Association -
 Gallup: Store Brands in the 1990s

- **These Gallup findings suggest:**

- Consumers are demanding new alternatives to "value" and quality.
 - emphasis can be placed on "contemporizing" store brand lines - particularly in underdeveloped categories.
- This trend is generating new demand for premium and/or gourmet type store brand lines with high perceived value.
 - consumers have a willingness to pay for better quality at what is still a value price
 - and retailers are offered better price points and higher margin contribution.
- The consumer environment is one of strong demand for both national brand equivalent (NBE) and more upscale private label products. This trend is conducive to opportunities for developing new and differentiated offerings to satisfy customer demands for store brand product lines.

- **The exponential growth and support by consumers of non-traditional supermarket channels**

- Consumers have given sustained, growing support to nationally located, discount retail combination store operations i.e. mass merchandisers, warehouse club stores and "supercenter" outlets
- Key influences include
- emergence of price as a motivator in the "90's"
- national name recognition; comfort zone and trust
- one stop shopping - especially in more rural oriented areas
- reasonable selection and satisfaction of quality expectations
 - choice is no longer thought to be a primary value
- excitement - ego satisfaction; "sniffing out bargains, deals, etc.
- concern for personal security - convenience stores, malls, etc.
- shifts in apparel market - clothes don't mean as much to American women as they did five years ago

sources: Michael Wellman, Vice President Marketing, Kmart Corporation; *Private Label* - November/December 1994 "Kmart Perspective" Pg. 108
Progressive Grocer, various issues, 1994

Major Food Industry Trends

Expansion of Supercenter Growth, 1990-2000

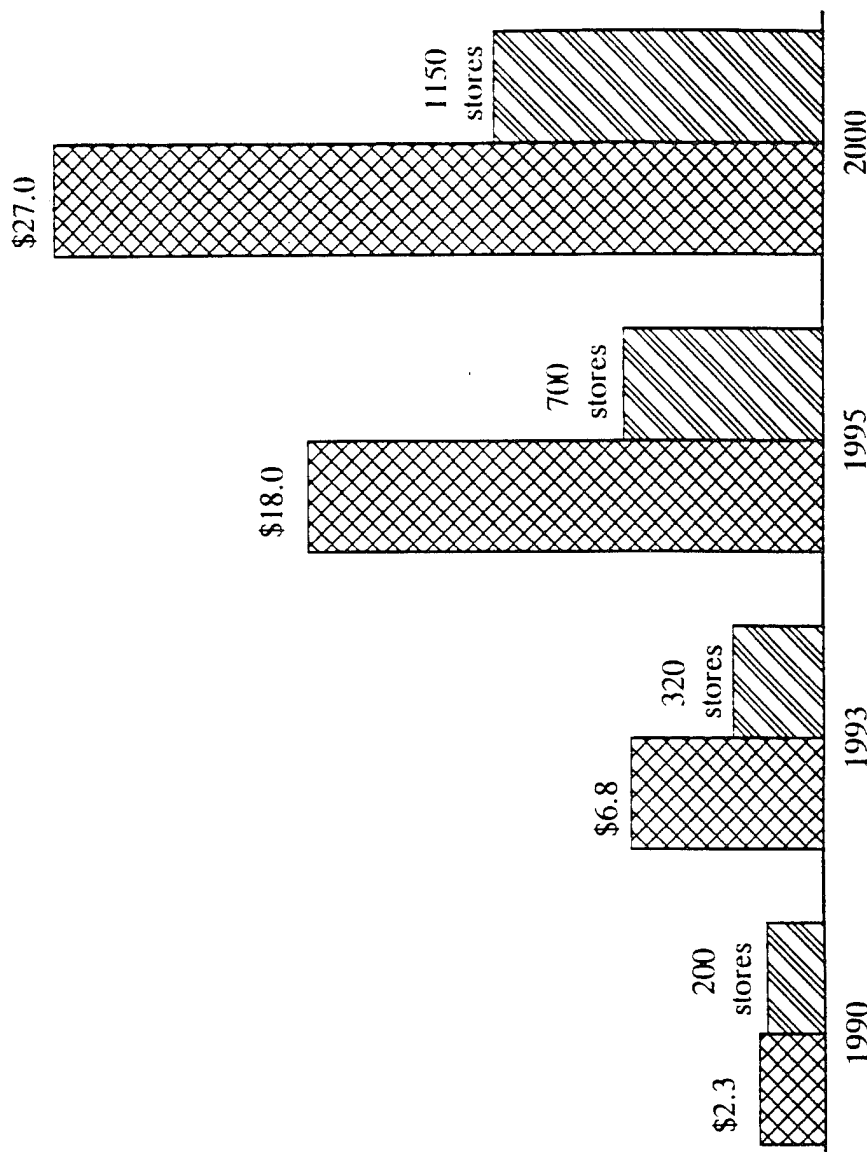
The exponential growth of supercenters and other combination stores has contributed significantly to a pervasive shift in consumer grocery shopping patterns

Sales Forecast and Store Growth
(Sales in billions of dollars)

1990 - 2000

Estimates

- ° from 200 to 1150 stores
- ° from \$2.3 to \$27.0 billion in grocery sales
- ° average annual 10 year growth rate of 11.0% vs. 3.0% for food store sales
- ° sales per unit estimated at \$56 million annually
- ° four leading companies account for approx. 77% of total U.S. supercenter sales, i.e., Fred Meyer, Meijer, WalMart Supercenter and Super K-Mart Center



Source: "Supercenters": A Supplement to Fairchild Publications, August 1, 1994. Estimates adapted from database contributed by Management Horizons, Columbus, OH

HLG Marketing & Sales Associates

- **"The demographic profile of regular shoppers of Warehouse Clubs reveals where they exceed the norm ... they are considerably more upscale than would be expected ... one reason is that one - third of the members operate businesses."**

- highlights of demographic survey

<u>Criteria</u>	<u>% index to average (100)</u>
• Married	139
• Age	
35 - 44	154
45 - 54	136
• 1 - 3 years of college	115
• Annual Household Income	
\$30 - 39,999	116
\$40 - 49,999	132
\$50 - 74,999	151
• Ethnic Classification	
White	97
Hispanic	148
Asian	144
Afro American	N/A

• Occupation	
Professional	120
Manager of a business	128
Homemaker	130
Factory worker	115
• People in Household	
Three	108
Four	142
Five	179
Six	219
Average of 3.4	126
• Own home	119

source: Michael Sansolo, "Meeting the Club Threat," *Progressive Grocer*, May 1992; from database used by MA & RI Consumer Intelligence System, Impact Resources, Inc. (interviews from 266,000 shoppers), Pg. 58

- **Food product consumption is being affected by trends towards living healthier life styles.**

- a growing national consciousness about the nutritional value of foods
- food industry programs generating awareness for healthier eating habits
 - Food Pyramid - recommended daily servings from 5 basic food groups
 - 5 a Day Program - recommended daily consumption of fresh fruit and vegetables
- National Label Education Act (NLEA) - "has really made for a dividing line in food marketing"
 - "basically depicts products as nutritious on one side of the line - and those that aren't on the other"

Source: Dale D. Buss, "NLEA opens up new marketing strategies," *Food Business*, June, 1994, p. 27

- **There is more awareness about nutrition and eating better.**

- a new emphasis is now communicated via nutritional labeling requirements on packaged foods.
- this awareness has translated into new marketing opportunities for food manufacturing companies.
- nutritional claims afford firms varied approaches in designing new product concepts.

total calories	total sodium
total fat	total carbohydrates
total cholesterol	total protein

READ YOUR LUNCH



Nutrition Facts	
Serving Size 1 cup (236g)	
Servings Per Container about 5	
Amount Per Serving	
Calories 230	Calories from Fat 120
Total Fat 13g	
	% Daily Value*
Saturated Fat 5g	22%
Cholesterol 30mg	35%
Sodium 118mg	13%
Total Carbohydrate 31g	5%
Dietary Fiber 2g	8%
Sugars 3g	
Protein 11g	
Vitamin A 20%	Vitamin C 0%
Calcium 2%	Iron 6%
* Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:	
Calories: 2,000	
Total Fat	Less than 65g
Sat Fat	Less than 20g
Cholesterol	Less than 300mg
Sodium	Less than 2,400mg
Total Carbohydrate	300g
Dietary Fiber	25g
Calories per gram:	
Fat 9 • Carbohydrate 4 • Protein 4	

• The "Nutrition Facts" box enables you to tally quickly how much of your daily nutrient requirements will be met by eating a food. Here's what to consider:

• "Serving sizes" are now more consistent among similar foods and closer to the real amount people tend to eat. All the information that follows is based on these amounts. If you eat more or less, adjust the calories and nutrient amounts.

• "Calories from fat" will help you get no more than 30 percent of your daily calories from fat, as is currently recommended for good health.

• "% Daily Value" tells you how much of a nutrient the product provides. Here, one serving supplies 2 grams of dietary fiber which is 8 percent of the recommended daily consumption for a 2,000-calorie-per-day diet. The goal is to eat an average of close to 100% of each nutrient per day. The listings of saturated fat, cholesterol, sodium and sugars reflect the need for consumers to limit these items. The inclusion of dietary fiber, calcium, iron and vitamins A and C reflect the need to get adequate amounts of these. Since deficiencies of the B vitamins are now rare in this country, they have been left off the new labels.

• This section is included on larger packages. It shows the daily amounts of certain nutrients required for good health based on both a 2,000-calorie-per-day and a 2,500-calorie-per-day diet. Consumers can use it to adapt the information above to their individual needs.

MAJOR TRENDS AFFECTING FOOD INDUSTRY GROWTH

- The significant shift in the balance of marketing power from suppliers to retailers
- Sustained growth of private label/store brand marketing
 - decline in "brand health"
- Pervasive shifts in consumer shopping patterns and behavior
- Transition to changes/modifications in consumer life styles

- **Major consumer trends of the "90's" are shaping a vision of the future - from year 2000 and beyond.**

- The dynamics (trends) being played out in today's marketplace offer a basis to more clearly predict and assess future market opportunity.
- Larger cultural swings include shifts in food consumption trends.
- A defining portrait of these cultural trends of the "90's", and the path they are taking into the next century, was made by Faith Popcorn, in her 1992 published book, *The Popcorn Report*.

- **Popcorn identifies 10 trends as having significant impact on the way people will live and work in the future i.e. the "BrainReserve Trends" (after the name of her company).**

- certain food manufacturing and retailing trends may be related to the "BrainReserve Trends"

Source: BrainReserve Trends and quotations taken from *The Popcorn Report*, Faith Popcorn, HarperCollins Publishers, Inc., New York, NY, 1992, Pages 29-92, 225-227

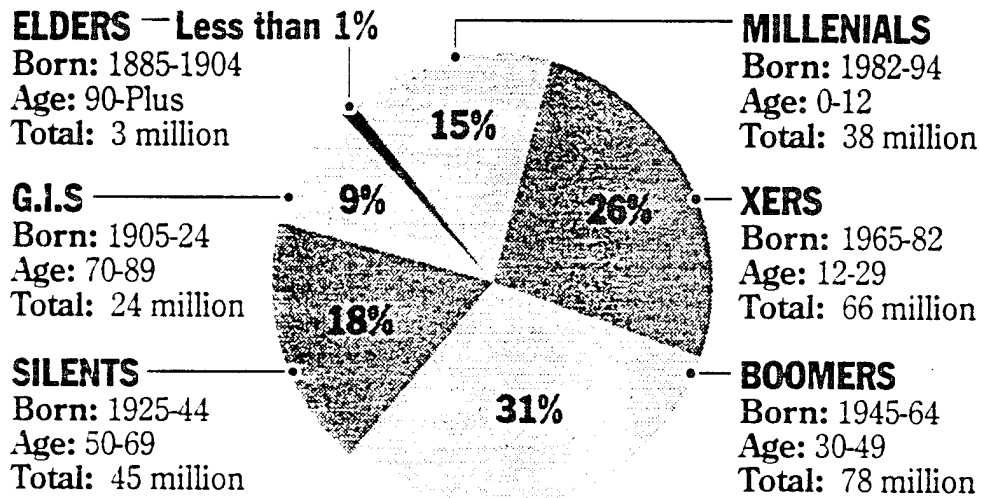
HILG MARKETING AND SALES ASSOCIATES

- 1. "Cocooning in a New Decade Trend" - staying at home (more), fear of the environment, self presentation, "... protecting oneself from the harsh, unpredictable realities of the outside world."
 food related - increase in more at home eating occasions, revival of home delivery grocery services, trend towards smaller, neighborhood restaurant eating out
- 2. "Fantasy Adventure Trend" - momentary or brief retreats from the real world - travel, doing something different!
 food related - growth in exotic foods, especially produce, specialty imported foods, ethnic foods
- 3. "Small Indulgences Trend" - emotional fix for "stressed out" consumers, affordable luxuries to reward oneself
 food related - the "Dove Bar" super premium concept, upscale product quality differentiation through branding i.e. Super Premium, President Choice, Excellence, World Classics, etc.
- 4. "Egonomics Trend" - customizing, personalizing, individualizing - "to make a statement in the sterile computer era ..."
 food related - custom meat cuts, special order baked goods for parties, catering services, etc.
- 5. "Cashing Out Trend" - "opting for a simpler" living style, changing the pace of our lives, "questioning our personal, career goals ..."
 food related - in-store service boutiques to provide varieties of prepared, ready-to-serve meals i.e. deli meats
- 6. "Down-aging Trend" - redefining traditional age limitations, finding a connection with goods and services from earlier years (or youth), nostalgia
 food related - making food a "fun experience" i.e. brand and image advertising that reaches out to a cross section of demographic profiles - ready-to-eat cereals, soup, snacks, beverages, etc.

- Also, shifts in cultural trends can be influenced by the impact of generational groups which share certain general characteristics

THE AMERICAN PIE: WHAT'S YOUR SLICE?

Americans don't like being lumped together and stereotyped, but some sociologists divide the population by generations, which seem to share some characteristics. People born at the ends or beginnings of a generation are less likely to fit the mold.



Elders: Largest immigrant generation. Scarred by the Depression, a murderous flu epidemic and too many children lost to wars.



G.I.s: Have a can-do spirit; builders of enduring civic, educational and corporate entities. Raised standards of American dream.



Silents: Less into teamwork, more divorces; gave us more teachers, doctors, lawyers, ministers and the leaders of the civil rights movement; expanded government bureaucracy.



Boomers: Idealists, aided by advances in medicine, hurt by rising rates of accidental death, suicide, drug use and crime. Embraced sexual revolution, questioned government.



Xers: Children raised amid record number of divorces and working mothers; caught by fading support for education; self-reliant, conservative, crime-conscious.



Millennials: Lowest child-to-parent ratios in U.S. history; idealist boomers raising them to explore, excel, build. Will they succeed?

Source: Economics and Statistics Administration, U.S. Department of Commerce, and "Generations: The History of America's Future," by William Strauss and Neil Howe, William Morrow & Co., New York, 1991.

- 7. "Staying Alive Trend" - quest for a more healthful existence, living longer, awareness about our "natural" selves.

 food related - personal control of one's own nutrition intake(National Label Education Act), pesticide and pollution issues (interest in organically grown foods, fish farming, genetic engineering of animals, etc.)
- 8. "The Vigilante Consumer Trend" - the power of consumer protest to create change in the marketplace - consumer "policing" to confront marketers about their (mistakes) responsibilities to the public.

 food related - Save the Dolphin issue with tunafish packers, fluorocarbons in packaging issue with MacDonalds, New Coke fiasco versus Classic Coke tradition, etc.
- 9. "99 Lives Trend" - accelerating pace of living, sustained time constraints, forcing of multiple roles - creates sense of urgency to adapt easily, make life easier, streamline tasks

 food related - Convenience foods that emphasize multiple usage, have multiple meal serving benefits i.e. breakfast and lunch - products that have ingredient usage as well - in-store prepared food services
- 10. "S.O.S. (Save Our Society) Trend" - Capturing a social conscious for supporting the "critical E's - Environment, Education and Ethics" - the "Decency Decade" of the "90's" Cause marketing - tying business in with the concerns of society, the community, the nation

 food related - "support of environmentally "safe" product programs, consumer education programs about environmental claims, package resizing and replacement; community and nationally based involvement: Junior Olympics program, Muscular Dystrophy; more emphasis on inner city store development, etc.

- The growth trend in specialty foods is reflecting consumer desires to stray from the mundane, the "tried and true".

- This environment is roughly analogous to the growing share of premium private labels in supermarkets.
- "Gourmet" specialty foods are projected to grow at a 6-7% rate over the next four years - current sales have reached \$30 billion.

Gourmet Specialty Food Market
Current and Projected Retail Sales
(Billions)

	1993	1994	1995	1996	1997	1998
	\$29.4	\$31.2	\$33.4	\$35.7	\$38.2	\$40.8
	6.0%	6.0%	7.0%	7.0%	7.0%	7.0%

Source: *Private Label*, November-December 1994, Page 36; database source from *Packaging Foods*

- This market is being driven by increased demand for "new and different" ethnic specialty foods - from one product to entire cuisines.
 - Mediterranean
 - Mexican
 - Thai
 - Chinese
 - Italian
 - U.S. regional (i.e., Tex/Mex, Cajun)
- Primary consumers of ethnic foods are 28-44 years old.
- This group was formerly 18-34 years. Now they are reaching their prime earning years.

- **A trend towards consumer spending on affordable "small" luxury type items instead of more expensive high priced goods...has influenced food retailing.**

- high end, gourmet, upscale food product profiles
"lobster at home"
- premium, super-premium product offers
"decadent chocolate chip cookies", premium pasta lines, super premium ice cream
- "you deserve it" reward where value means a smaller expenditure to obtain ego satisfaction
"discounting luxury"

- **Other trends reflecting changing consumption patterns are:**

- growing interest in ethnic foods
- in-store service boutiques

bakeries	cheese kiosks	prepared foods
deli's	salad bars	wine and spirits

- **Food retailing businesses are investing in assets and implementing merchandising tactics that reflect in the trends by consumers towards more healthy eating habits ... some specific areas of focus reported on by Supermarket News in 1994 include.**

<u>Retail store area</u>	<u>Products</u>	<u>Influence/Trend</u>
In - store bakery	European-style specialty breads	Consumer demand for nutrition
Grocery	Chinese - ethnic foods	leveraging ethnic promotional events
Grocery	Salsas popularity	Mex/Tex explosion of ethnic foods
Baked goods aisle	diet bread products	no fat/low fat concern
Frozen foods	"Healthy frozen" - lowfat, low cholesterol frozen desserts, dinners, entres	health conscious; +54% growth rate proj. to \$12.8 billion market by 1997*
Produce	prepackaged, precut offers - salad mixes, fruits, vegetables (esp.carrots)	convenience, nutrition conscious, substitute for salty snacks
Beverages	Ice beer	new product excitement
New - Age Beverages	fruit flavor drinks	excitement, more healthful alternatives to carbonated drinks
Snacks	"the pretzel logic"	healthier, more sensible alternative to salty snacks
Grocery	"lighter" shelf stable salad dressings	healthier eating, packaged salad trend
Beverages	sports drinks	national emphasis on exercise, leisure time
Grocery, refrigerated	tortillas	growing interest in ethnic foods

• "Strong Gains Predicted for 'Healthy' Frozen," *Frozen Food Age*, December 1994 - excerpted from "The Market for Healthy Prepared Foods by FND/SVP, Inc., Pg. 50

HLG MARKETING AND SALES ASSOCIATES

Marketing Implementation • Sales Execution • Customer Development

RESOURCE COMMITMENTS

- **Assumptions about Company capabilities**
 - Organizational and operational
- **Evaluating sales potential of the opportunity**
- **Variables of the Marketing Mix**
 - Influencing success in the target market(s)

- **Does the company have the requirements needed for success with a particular opportunity?**
 - Level of production, processing capabilities to succeed in the industry
 - Level of relationships with suppliers of key raw materials
 - Level of distribution and logistical capability
 - Company enjoys relationships with a diverse customer base
 - geographical areas of dominance
- **Assessing operational resources that are needed to support product expansion.**
 - manufacturing capacity
 - technological competence/advantages
 - inventory management systems
 - centralized order entry
 - consistent quality control
 - logistical management proficiency
- **Assessing organizational resources needed to support product expansion.**
 - quality of customer relationships
 - experienced sales/marketing staff
 - broker/distributor network in place
 - customer service support
 - brand equities to leverage
 - information systems in place

RESOURCE COMMITMENTS

- Assumptions about Company capabilities
 - Organizational and operational

- Evaluating sales potential of the opportunity

- Variables of the Marketing Mix

- Influencing success in the target market(s)

- From a marketing standpoint, a key area of attention is to evaluate the sales potential of each opportunity.

- Areas of investigation can be
 - Distinctiveness from competitive offers?
 - Category volume - trends?
 - Optimal price - affordability?
 - Market share potential?
 - Volume potential (tonnage, units, dollars)?
 - Where are the best markets located?
 - Intensity of competitive activity?
 - How will the product be distributed?
 - What are the costs (product, distribution, marketing)?

STRATEGIC FOCUS

Corporate Brand Marketing Strategy Alternatives

Illustrative

COMPANY STRATEGY ALTERNATIVES

- Support only core business
- Protect current market share
- Utilize technology advantages
- Create high value added perception
- Quick response to major changes in the marketplace
- Seek profit ahead of growth
- Generate market share growth
- Seek growth ahead of short term profit
- Target well defined niche(s)
- Steal share
- Utilize product sourcing advantages
- Avoid head to head confrontation
- Use of financial advantage
- Offer customized products
- Use advantages of short production cycles, small orders

STRATEGIC APPROACH

Competitive Selling Strategies

Best Selling Opportunities

Niche Selling Opportunities

High Volume, High Margin - Brand recognition - Product differentiation - Consumer support - Low price sensitivity - Exploit geographical advantage - Quality and service out-perform competition	Low Volume, High Margin - Protect status with valued customer - Sell customized, seasonal products - Introduce upscale products with high price perception
High Volume, Low Margin - Gain entry with high profile customers - Economies of scale - for manufacturing and logistical handling - High price sensitivity driven products	Low Volume, Low Margin - Necessary to protect valued customer relationship - Special request from major customer - Move low quality or dated inventory

Premium Oriented
Product Status

Commodity
Oriented Product
Status

RESOURCE COMMITMENTS

- Assumptions about Company capabilities
 - Organizational and operational
- Evaluating sales potential of the opportunity
- Variables of the Marketing Mix
 - Influencing success in the target market(s)

- The marketing mix is a set of variables the company uses to influence, drive and support its businesses in the marketplace.

- A critical element is determining the level of marketing resources that will be allocated among a company's products, customer segments and sales areas.
- Decisions about allocating marketing mix should be based on estimates for generating incremental revenue (and profit).

- **Chart classifying variables of a marketing mix**

Product	Price	Service	Distribution	Promotion
Features	List price	Consumer	Markets	Consumer
Benefits	Discounts	Customer	Classes of Trade	Trade
Brand Name	Allowances	Inventory	Sales Coverage	Advertising
Quality	Payment Terms	Logistical		Public Relations
Packaging		Transportation		
Sizes				
Guarantees				

Strategic Selling Approach

Customer Selection Criteria

I. Customer Type

- warehouse club
- multi-divisional corporate chain
- market dominant corporate chain
- multi-divisional wholesaler (voluntary or cooperative)
- market dominant wholesaler (voluntary or cooperative)
- P/L buying cooperatives

II. Geography of Retailers Served

- national
- multi-regional
- multi-market
- one market-primarily rural
- one market-primarily urban

III. Warehouse Locations and Configuration

- single warehouse
- multi-divisional regional
- multi-divisional national
- indirect (no warehouse)
- self manufacturing operations

IV. Store Brand Labels Supplied

- premium, upscale
- National Brand Equivalent
- value, economy, packer
- number of SKU's of each

V. Category Procurement Strategies

- full line distributor
- "block" buyer (price opportunities only)
- spot buy (seasonal, thematic events)
- seeks technology advantages

VI. Procurement Organizational Structure

- centralized corporate buying functions
- divisional buying functions
- category management staffing
- dedicated P/L staff
- dual buying responsibilities - brand and private label
- in-house broker procurement services

VII. Current Competitive Supplier Base

- full line supplier preferred
- selected items only
- length of time as vendor

VIII. Retail Pricing Strategies

- EDLP
- high/low
- combination of both
- average retail gross margins on brand and P/L
- average retail price variance between brand and comparable P/L items

IX. Estimated Range of Annual Volume

- \$500m-\$5mm
- \$15mm-\$25mm
- \$5mm-\$10mm
- \$25mm-\$50mm
- \$10mm-\$15mm
- over \$50mm



"PRODUCT DESIGN WORKSHOP"

Held At Moskowitz Jacobs, Inc. Design Lab

January 23, 1995

Objective: Assess product designs and develop recommendations to include costs, ease of marketing and other criteria to be defined. Principles derived from "Dual-Use and Manufacturability" will be included in the assessment.

Resources: Howard Moskowitz. Moskowitz Jacobs, Inc.
Gary Moore. Kings Super Markets, Inc.
Robert Mohel. Independent Consultant
John Coburn. Associate Director CAFT. Director CRAMTD
Stanley Cajigas. Manager CAFT Technology Extension Program

AGENDA

- | | | |
|---------|---|----------------------|
| 9:00 AM | - Welcome by John Coburn | |
| 9:15 | - Session Outline | Stan Cajigas |
| 9:50 | - Welcome by Howard Moskowitz | |
| 10:00 | - Tour of Design Lab | Carolyn |
| 10:30 | - Cereal Demonstration | Kelly, Heidi, Ashish |
| 11:15 | - Demonstration Results Completed | Ashish |
| 11:30 | - Discussion of Results | Howard Moskowitz |
| 12:00 | - Lunch | |
| 1:00 PM | - Topic
The need for product development in the hi-end
deli/appetizer department (chilled foods) | Gary Moore |
| 2:00 | - Topic
The need for product development in the hi-end,
hi-tech food servicing industry and growth trends
in the food servicing industry | Robert Mohel |
| 3:00 | - Workshop: "Product Design"
To include discussion of label/package
design and modification | Stan Cajigas |
| 4:00 | - Adjourn | |



MOSKOWITZ JACOBS INC.

Introducing:
DesignLabtm Omnibus
 From Moskowitz Jacobs Inc.

■ **Who needs this service ?**

- *Research professionals who want to test 1-15 products or concepts, at low cost, under supervision, in DesignLab - MJJ's testing facility for the 21st century.*

■ **What happens during testing ?**

- *Each product or concept is rated on 8 attributes*
- *Extensive attitude & usage questionnaire (25 questions)*
- *Full session - base of 90-100, Half session - base of 45-50*

■ **Where ?**

- *Location - Mid-Westchester, N.Y.*
- *DesignLab makes controlled sample preparation "a snap" for you*

■ **Who Participates ?**

- *General adult population sample to keep costs down*
- *Kid Panel (7-12) , Teen Panel (13-17) available bi-monthly*

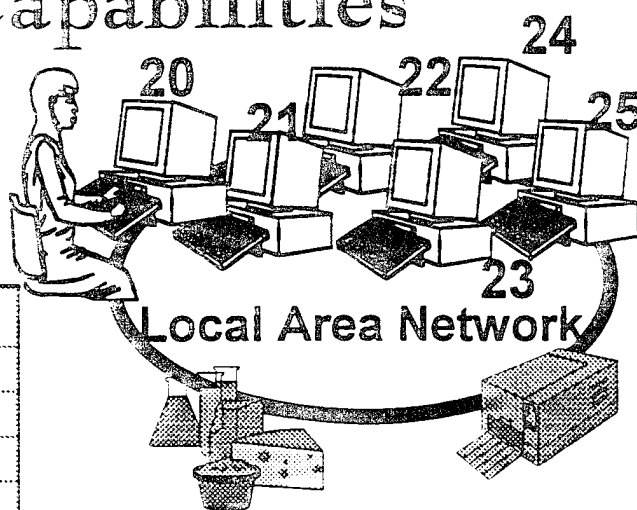
■ **What do you get ?**

- *Output: Summary tables + raw data file on disk (IBM)*
- *Available: Follow-up data analysis, diagnostic focus groups*
- *Weekend testing, 4 day turnaround (faster available!!)*

■ **Next Step:**

- *Call Carolyn Cappello, 914-421-7400 to schedule a test or to visit DesignLab and inspect our facilities*
- *See reverse side for facilities, technologies & cost sheet (effective October 1, 1994)*

Omnibus Pricing & DesignLab Capabilities



Stimulus Presentation Capabilities

Concept Presentation Capabilities

Concepts on a computer	Yes
Concepts containing videoclips	Yes
Videoclips on a computer (commercial)	Yes

Product Test Questionnaires

Multiple attributes	Yes
Concepts as questions for "fit"	Yes

Package Presentation Capabilities

Video for person-product interaction	Yes
Compatible with AutoCad	Yes
Use the computer as a T-Scope	Yes

Pricing (Effective Oct. 1, 1994)

	Half	Full
Respondent Panel Size	45-50	90-100
To Enter	\$800	\$1,400
Per Sample - 8 Questions	\$800	\$1,400
Each additional question	\$200	\$200
Attitude/Usage - 25 Questions	\$800	\$1,400
Each additional question	\$100	\$100
Preparation/per sample - min.	\$200	\$300
Preparation/per sample - max.	\$300	\$500
Turnaround Time	4 days	4 days
Fast turnaround (2 days)	\$1,000	\$1,000
Superfast turnaround (1 day)	\$2,000	\$2,000
Followup Services Available		
Focus Groups	Yes	Yes
Additional data analysis	Yes	Yes

MJI's DesignLab Facility (NY)

DesignLab Kitchen

Size	2,000 Sq. Ft
Toasters	25
Microwaves	18
Gas burners	16
Oven	6
UDISCO System for fast food equipment	Yes
Number of UDISCO hook-ups available	4
Walk in freezer	Yes
Walk in refrigerator	Yes
Storage - dry goods	Yes
Storage - fast food prep. equipment	Yes

Main Data Acquisition Room

Size	2,000 Sq. Ft
Computers On A LAN	Yes
Number of panelists on the LAN	25-50

Other Testing Facilities In DesignLab

Focus Group Suites	2
Fragrance Testing Room/ Exhaust Fans	Yes
Virtual Reality Environment Room	Coming
Satiety/Drinking/Eating Monitoring Room	Coming



MOSKOWITZ JACOBS INC.

DEVELOPING PRODUCT & POSITIONING
CONCEPTS FOR CONSUMERS:
USING IDEAMAP (TM) A CASE HISTORY
WITH EXERCISE BEVERAGES

DEVELOPING PRODUCT & POSITIONING CONCEPTS FOR CONSUMERS:
USING IDEAMAP (TM) -- A CASE HISTORY
WITH EXERCISE BEVERAGES

Howard R. Moskowitz
Moskowitz Jacobs Inc.
Valhalla, New York 10595 U.S.A.

ABSTRACT

This paper presents a new approach to the development of concepts, based upon the consumer's input. The approach is designed to assess a wide variety of potential elements (up to 300+), combined in small scale mixtures (test concepts), using different types of stimuli (multimedia, including words, pictures and music). The approach enables the researcher to segment consumers, and to create new combinations of elements (viz., concepts), based upon the data. The approach is independent of the researcher's state of knowledge at the start of the study, and provides a global view of what are the "hot buttons" that excite consumer interest. The results are illustrated by a case history involving an exercise beverage. The data is shown for total panel, for key subgroups, and for segments based upon the pattern of responses to the concept elements.

INTRODUCTION

Product development in the food industry generally proceeds in a systematic fashion, first with concept development to plan the product characteristics, and then with prototype creation to actually implement what the product looks, smells, feels and tastes like. In product development concepts are critical, for they are the defining statements of the product, and dictate the direction for both R&D and marketing.

Traditional concept development proceeds in a sequence of two steps. Step 1, *promise testing or content creation*, identifies the characteristics of a product (e.g., words, phrases and pictures of what the product should taste like, what the product benefits should be, etc.). Step 2, *concept testing*, obtains consumer ratings of different concepts for the product. The consumer rates these concepts on a number of scales, including expected acceptance, frequency of use, perceived appropriateness for occasions, and different benefits that will be obtained (e.g., nutrition, good taste, good value, etc.).

Traditional approaches for concept testing, hallowed by years of practice and standardized methods, leave much to be desired. There are 4 major deficiencies of the traditional methods:

- 1) *Limited number of concepts tested*. The researcher typically tests 1-5 different concepts in a test. A large scale concept screen may entail as many as 10-15 concepts. It is rare to test more than 15 concepts, even in the largest of tests. [Indeed, a study of 15 concepts is often considered as a landmark piece of research].
- 2) *Hard to identify what specific elements or features of the concept drive acceptance*. Concepts are "gestalts" or finished entities. The consumer reads the full concept and rates that concept on attributes. It is difficult to identify the drivers of that concept. The researcher can, of course, get some insight by asking the consumers to identify the "hot buttons" or key phrases in each concept, but often the consumer is not consciously aware of the actual stimuli that provoke such interest.
- 3) *Hard to reconstruct new concepts (viz., by replacing losing elements with more winning elements)*. Since conventional concept testing relies upon the assessment of complete combinations, the researcher does not have a rule by which to configure or surgically reconstruct a concept to improve its acceptance or communication of benefits. Conventional concept testing does not generate these rules.
- 4) *Hard to work with multimedia (e.g., pictures, music, even video)*. Conventional concept research works with combinations of words and pictures. But -- the conventional researcher does not know how to recombine pictures and words into new combinations, nor how to work with other forms of communication (e.g., voice-overs, music, video). Typically these other ways to communicate are left to the "creative" person at the advertising agency, and the topic of multimedia is left to the domain of "execution", rather than strategy.

In order to remedy these difficulties researchers have resorted to statistical design and to new methods of stimulus presentation.

1. STATISTICAL DESIGN

The aim of statistical design is to create combinations of independent variables, and estimate the contribution of these independent variables to consumer reactions.

The experimental design approach differs dramatically from the traditional approach of testing full concepts, or even single elements. In concept development the researcher could, in fact, test each element singly (viz., alone), instructing the consumer to rate interest in that concept element. In reality, however, consumers do not react to single elements. Consumers react to full messages or advertisements about a product. Thus the statistical design is better. The design creates many different combinations (with these combinations better representing "real" stimuli, rather than disconnected elements). Furthermore, the design enables the researcher to estimate how the component elements interact to generate the consumer reaction.

Statistical design has a long and hallowed history in research. Most designed studies work with a limited number of continuous variables (e.g., 2-6), with each variable present at a number of quantitatively different levels. The mathematics for laying out these designs is well accepted (see Box, Hunter & Hunter, 1978).

For concept research the issue of design is significantly more complicated. Typically concepts deal with the nuances of language. There are dozens of ways to express the same idea. These different ways are not quantitatively related to each other on a single scale. When we expand the scope from one idea (or variable) to many ideas (or variables) in the same concept, we find that there may be dozens, if not hundreds of different elements that express the same set of ideas. Conventional experimental designs, as laid out by the statistician, simply do not work.

2. MODES OF STIMULUS PRESENTATION

Conventional concept research uses paper and pencil methods, or in some cases simplistic computer-based interviews. The researcher presents the consumer with the stimuli (e.g., concept statements), and the consumer rates these statements on attributes. The concepts comprise pictures and words. Computer-based interviews do essentially the same task, only the stimuli are presented on the screen rather than on paper.

What is presented in a concept limited to pictures and words may differ from the actual concept, more fully executed, either as a product (for product-based concepts) or as an ad (for advertising-based concepts). The product has aspects to it that are hard to capture in static words and pictures. The advertising concept has aspects that are more executional in nature, and also which cannot be captured by words and pictures.

Fortunately, current multimedia-based computers offer alternative methods for presenting stimulus information. The picture on a concept can be replaced by a short video, showing how the product is constructed and used. For some cases an action video provides a more realistic representation of the product than any static picture could ever provide. In other cases, music or voice-overs can be added to the visual representation to add information about the sound of the product, or to create a "mood" suggesting the appropriate use of the product.

3. PUTTING CONCEPT DESIGN & MULTIMEDIA PRESENTATION INTO USE

The best way to understand designed studies with multimedia presentation is by means of a case history. The case history reported here deals with a sports beverage. The issue behind the study was to identify the specific phrases, pictures, and music elements that would promote consumer acceptance of the product.

The sports beverage study can be divided into the following logical sections:

- 1) Creation of the appropriate stimulus elements to be tested
- 2) Selection of the appropriate statistical design
- 3) Creation of test concepts by the design, including pairwise restrictions
- 4) Concept evaluation by the consumers
- 5) Modeling the panelist data
- 6) Analysis of key trends
- 7) Creation of winning new product and positioning concepts, based upon the data

3.1 STIMULUS ELEMENTS

There are many ways of talking about a sports beverage. These include functional aspects (e.g., flavor, nutrition), performance aspects (e.g., what it does to the body), psychological aspects (e.g., how does the user feel after using the product), etc. Furthermore, there are different ways of communicating these benefits, such as phrases, pictures, etc. Table 1 shows some of the elements developed for the project. Note that there are various "themes" in the elements, and that the same theme may recur several times, in different "executions" (viz., variations in the way the message is stated).

It is important at this point to contrast the current approach of testing many elements with the conventional research approach that tests only a few elements and a limited number of "executions". Conventional research rarely looks beyond a few elements. Nor does it usually consider the power of "execution", above and beyond the basic idea implicit in the element. In contrast, the approach presented here recognizes that the execution or specific phrasing may be as important to consumer acceptance as the intrinsic quality of the message being conveyed, and that there may not be a true test of intrinsic message quality unclouded by execution.

TABLE 1A. CATEGORIES SELECTED FOR THE EXERCISE BEVERAGE

<u>Category Name</u>	<u>Elements In Category</u>
Pictures	A1-A10
Health Benefits	B1-B9
Emotional Benefits	C1-C3
Flavor-Character	D1-D11
Flavors	E1-E9
Target Users	F1-F12
Packaging	G1-G6
Music	M1-M8

Semantic Differential Scales On Which The Elements Were Rated

	<u>Negative (Lower part of the scale)</u>	<u>Positive (upper part of the scale)</u>
Q	For men	For women
R	For younger people	For older people
S	For non-serious exercisers	For serious exercisers
T	For mild exercisers	For hard exercisers
U	For those who exercise alone	For those who exercise in a group
V	For those "in shape"	For those "out of shape"
W	For overweight consumers	For non-overweight consumers

TABLE 1B. ELEMENTS AND "DIMENSIONS"(ON SEMANTIC DIFFERENTIAL SCALES)
FOR THREE CATEGORIES

	<u>Concept Element</u>	<u>Q</u>	<u>R</u>	<u>S</u>	<u>T</u>	<u>U</u>	<u>V</u>	<u>W</u>
A1	Man swimming	-2	-5	-3	-3	-6	1	5
A2	Man playing volleyball	-1	-6	1	4	5	5	5
A3	Man golfing	-1	0	5	-2	-3	0	-2
A4	Men running	-3	-3	7	5	-3	6	7
A5	Woman biking	1	-5	4	6	-4	7	8
A6	Woman playing volleyball	0	-3	2	5	6	6	5
A7	Woman running	4	-3	4	4	-4	6	6
A8	Woman holding glass to face	6	-2	-2	6	0	-2	2
A9	Couple sitting	-1	-2	3	0	3	2	2
A10	Group running	-1	2	3	3	4	6	5
B1	Replenishes body fluids lost through exercise	-1	-2	3	3	0	3	4
B2	Replenishes your body's minerals--naturally	0	-2	4	5	-2	5	4
B3	Re-energizes your body	2	1	5	6	-1	6	4
B4	Vitamin-enriched	-1	3	3	3	-2	-1	0
B5	Low in calories	7	0	3	1	-2	0	1
B6	Not too filling	4	3	2	-1	0	-1	2
B7	Good for you	2	0	2	1	-1	1	-1
B8	Replaces salt and potassium lost through exercise	0	-3	4	5	3	4	3
B9	Can be a meal replacement when you're rushed	-1	0	2	-1	3	-1	0

The stimulus elements are analyzed at this early stage by means of a process called "dimensionalization". After the elements have been selected to appear in the study they are rated on a series of semantic differential scales relevant to the category. The semantic differential scales appear in Table 1 as well, along with the semantic profiles of a few representative elements. A small panel of consumers, matched to the target group, is used to rate the elements on the semantic scale. The semantic profile will be used to estimate the response of a consumer to elements not tried, and will be used to direct the concept optimization. [Both of those topics are discussed below].

3.2 STATISTICAL DESIGN OF THE TEST CONCEPTS

In this study there were 73 different elements. It is vital to test these elements in small, easy to understand combinations. Those combinations are the test concepts. Test concepts are designed according to precise layouts known as fractional factorial designs. These designs combine the elements in different sets, with the property that the elements appear equally often, against different backgrounds. Thus a specific flavor might appear four times, each time against different combinations of other elements.

Statistical designs come in many different types. For concept optimization, where there are many elements, it is vital to use a statistical design that can test many elements in relatively few combinations. Furthermore, the combinations of elements (viz., the test concepts) must themselves be fairly short to simplify the consumer's task. [It is much more difficult to evaluate a long, complicated page talking about a sports beverage than it is to evaluate a short set of elements combined into a test concept].

Table 2 shows the statistical design, known as a Plackett Burman screening design (Plackett & Burman, 1946). Screening designs recommend themselves because they can handle many independent variables in relatively few combinations. Of course the researcher must recognize that such designs are relatively "sparse" in terms of the total number of combinations. It is an ongoing battle to balance the number of elements tested versus the number of combinations in which each element is present. Given limited time and resources the best compromise is the screening design.

3.3 CREATING RESTRICTIONS AND DEVELOPING TEST CONCEPTS

When creating concepts, the researcher has to be sure that the elements make sense when grouped together. In traditional concept research this is no problem because the researcher writes a coherent concept. In concept optimization, problems may arise, however, because the elements are combined according to a statistical design that does not know whether pairs of elements are logical or illogical. It is therefore necessary to develop a list of incompatibilities between pairs of elements, so that these elements never appear together in a concept. The elements can appear in separate concepts, however. Table 3 shows a partial list of some incompatible pairs.

TABLE 2. EXPERIMENTAL DESIGN (5 LEVEL PLACKETT BURMAN SCREENING DESIGN)

Concept	Category A	Category B	Category C	Category D	Category E
1	4	1	3	1	1
2	0	4	1	3	1
3	3	0	4	1	3
4	3	3	0	4	1
5	2	3	3	0	4
6	3	2	3	3	0
7	4	3	2	3	3
8	1	4	3	2	3
9	2	1	4	3	2
10	2	2	1	4	3
11	0	2	2	1	4
12	2	0	2	2	1
13	4	2	0	2	2
14	3	4	2	0	2
15	0	3	4	2	0
16	0	0	3	4	2
17	1	0	0	3	4
18	0	1	0	0	3
19	4	0	1	0	0
20	2	4	0	1	0
21	1	2	4	0	1
22	1	1	2	4	0
23	3	1	1	2	4
24	1	3	1	1	2
25	4	4	4	4	4

Once the researcher has identified the restrictions it becomes straightforward to create combinations of elements that both follow the experimental design (see Table 1), as well as logically go together (or better - which do not "go" together).

The experimental design shown in Table 1 is general. That is, the design calls for 5 categories (whichever these may be), and 4 elements per category. The only constraints in the system are that the categories appear in a pre-specified order all the time (no matter which subset of categories is selected for the specific design), and that there be no pairs of mutually incompatible elements.

TABLE 3. EXAMPLES OF RESTRICTIONS BETWEEN PAIRS OF ELEMENTS FOR THE EXERCISE BEVERAGE

If A1 appears then F12 M1 M2 M3 M4 M5 M6 M7 M8 cannot appear.
 If A2 appears then M1 M2 M3 M4 M5 M6 M7 M8 cannot appear.

As a consequence of the design, the IdeaMap system is *independent* of the researcher's state of knowledge at the time of the inception of the study. That is, the design takes over, and combines elements in a specific fashion. The researcher's state of knowledge as to what goes together and what does not can only affect the creation of the pairwise restrictions for incompatibilities.

Table 4 shows 4 test combinations that were created from one run of 25 concepts from the experimental design, as well as the ratings assigned to the concepts (more of that below). As Table 4 shows, the concepts comprise different elements and different numbers of elements. For another run of 25 concepts from the experimental design (viz., for the same consumer panelist or another consumer panelist), the categories would differ, as would the elements. This means that if a single consumer evaluates 4 runs (or 100 concepts) in a session, and if there are 100 consumers participating, then there are a total of 10,000 combinations tested. The nature of the test design reduces the odds to almost 0 that any 2 of these combinations would be identical. Thus the experimental design also truly is independent of the researcher's state of knowledge and belief prior to the study. The researcher is afforded a greater opportunity to assess each element against many different backgrounds of other elements.

3.4 TESTING THE CONCEPTS AMONG CONSUMERS

The ingoing premise of the approach is that it is vital to test the response of consumers to more "real-world" stimuli, which in this case means testing combinations of elements, not just single elements alone. To this end, the computer is used as a device to combine elements, present these combinations to the consumer, and record the data.

Each consumer tests a total of 100 combinations, although this number can be changed by a different experimental design. Each consumer goes through 4 sets of 25 concepts each. Each set comprises a set of 5 categories. For each set, the computer program selects the 5 categories, and the 4 (mutually compatible) elements within those categories. It creates a file for each set of concepts. Finally, it randomizes the order of concepts within the file, in order to create a randomized list of 100 combinations. In this way the consumer is unaware that he or she is testing combinations from 4 different experimental designs. The randomization is such that each consumer tests a unique set of 100 combinations, with very low probability that a combination would be repeated, either with that consumer or with any other consumer. Furthermore, by creating the set of experimental combinations (or at least a list of what these combinations should be) ahead of the field work, it is possible to precisely balance the number of times each category and element appears in the full set.

The actual interview is conducted by means of a computer, equipped with multimedia (sound, video). The computer program has the elements in a set of files, as well as the file that dictates what combinations will be developed, and in what

TABLE 4. RATINGS OF THE FIRST 4 CONCEPTS FOR EXERCISE BEVERAGE - 1 PANELIST

RUN # 1 CONCEPT # 1

A5 Woman biking

B4 Vitamin-enriched

E8 Light mocha flavor

F11 If you exercise regularly

M5 ENYA 'ORINOCO'

RATING = 66 SPEED = 47.6 Binary Interest ---> 0

RUN # 1 CONCEPT # 2

E3 Light berry flavor

F8 For the whole family

M6 ALAN PARSONS SOFT 'SIRIUS'

RATING = 55 SPEED = 38.2 Binary Interest----> 0

RUN # 1 CONCEPT # 3

A6 Woman playing volleyball

B5 Low in calories

F11 If you exercise regularly

M6 ALAN PARSONS SOFT 'SIRIUS'

RATING = 77 SPEED = 52.3 Binary Interest ---> 100

RUN # 1 CONCEPT # 4

B8 Replaces salt and potassium lost through exercise

E1 Light citrus flavor

F11 If you exercise regularly

RATING = 88 SPEED = 30.7 Binary Interest ---> 100

Rating = 1-9 rating multiplied by 11

Speed = 10ths of seconds from the time the stimulus finishes appearing
to the time the panelist assigns a rating

particular order they will be shown. The consumer goes through the following straightforward task:

- a. Orientation exercise with short concepts to introduce the method
- b. Evaluation of 25 concepts, rating the concept on interest using
a scale (e.g., 1-9, 1=not interested ---> 9=interested)
- c. Short wait/rest
- d. Continuation with the next 25 concepts, etc.
- e. Completion of the task by a short attitude and usage questionnaire
(also on the computer)

The computer acquires the consumer's rating, including ratings of overall interest, and other attribute ratings (if the researcher is interested in attributes beyond overall interest). The computer also measures the "speed" of reaction in milliseconds. The speed statistic is a measure of latency or quickness of reaction, from the time that the concept is fully exposed on the screen to the time that the consumer reacts.

3.5 MODELING THE PANELIST'S DATA

Each individual responds to a set of combinations whose elements have been arrayed in an experimental design. The elements are statistically independent of each other, enabling the researcher to create a model relating the presence/absence of the elements (independent variables) to the individual consumer's reaction. The model is known as a "dummy variable model", because the independent variables (dummy variables) take on only one of two values - 0 if absent from the concept, or 1 if present in the concept. The dependent variable is either treated as being more or less continuous (viz., the 9 point scale), or is converted to a binary number (0 if the rating assigned is 6 or less on a 9 point scale; 100 if the rating is 7 or more).

The regression analysis generates a model for each consumer, showing how the presence of every element drives the consumer's interest, as well as the speed of reaction.

No one individual can test all elements in a large scale study, where there may be as many as 300+ elements. This would call for an unduly long session. Furthermore, the scope of the project may change and require 600 or more elements. Thus the approach must allow the researcher to estimate the likely reaction to elements not directly tested, and must be workable with many elements (of large but unknown number). That is, the approach must be generalizable.

The method used by the present approach is a variant of the mathematics of finite element analysis. The procedure is outlined below:

a) For every element, locate that element on a series of non-evaluative semantic differential scales.

b) Develop the model for a given consumer panelist, empirically estimating the part-worth contributions of every element to consumer interest (or speed, etc.).

c) Array the elements in a single order (e.g., by category, and element within category). If an element was not tested by the consumer, assign it an arbitrary high number (e.g., 1000).

c) Begin with the first element in the set. If the element was tested, do not change it. If the element was not tested, then replace its number by the average of the 8 closest elements. [Close is defined in terms of geometrical distance, based upon the semantic differential scale].

d) Continue with all elements, until the full set of elements has been changed (if not tested) or skipped (if actually tested).

e) Repeat steps c-d, again and again, until there is no change in the value achieved by untested elements, following replacement by the 8 nearest neighbors. The "smoothing" is complete, and we now have an estimate of how this particular consumer would have responded to all of the elements - those tested, and those not tested.

Once the researcher has developed the individual models for each consumer, it is straightforward to aggregate the data across different subgroups, or even to cluster consumers on the basis of common patterns of responses to the elements in the category. [This clustering to yield segments in the population is substantially better for a category than the division of the consumer population into subgroups, based upon external criteria, such as "values and lifestyles". Clustering consumers by responses to relevant items in the category cuts right through any theory, and deals with the category itself, rather than invoking intervening variables and hypothetical constructs].

Table 5 shows a few elements, ranked in order of degree to which the elements promote purchase intent. Table 5 shows the best and worst elements from the set (ranked by total panel) as well as how these elements performed among key subgroups. Although the number of consumers is relatively small (viz., 40), the results clearly show differentiation among the elements, and meaningful differences among key consumer subgroups.

TABLE 5. BEST AND WORST ELEMENTS IN THE SET FOR EXERCISE BEVERAGE
(RATINGS RANKED BY TOTAL PANEL, BUT SHOWN FOR SUBGROUPS AS WELL)

<u>Element</u>	<u>Tot</u>	<u>Male</u>	<u>Fem</u>	<u>Seq1</u>	<u>Seq2</u>
A8 Woman holding glass to face*	14	17	12	13	15
A1 Man swimming*	13	16	12	14	13
A9 Couple sitting*	13	19	9	10	15
A2 Man playing volleyball*	12	11	12	6	16
C3 No preparation - ready when you are	11	16	9	15	9
A6 Woman playing volleyball*	11	14	10	9	13
A7 Woman running*	9	18	4	0	16
C2 Satisfies without a lot of calories	9	11	8	1	16
C4 Be good to yourself after work-out	8	11	6	7	9
C1 Boosts your energy level	7	15	2	2	12
E5 Mint Julep	-11	-7	-13	-6	-14
E7 Light Cola	-11	-13	-10	-6	-15
E8 Light Mocha	-16	-17	-16	-14	-18

3.6 IDENTIFYING KEY TRENDS IN THE DATA

The results from a set of panelists generate a large data base, comprising many elements by many consumers. This data base can be analyzed in a variety of different ways, such as by market, user type (viz., brand usage), or even by segment as identified from the preference segmentation in Step 4 above.

Table 6 lists a few of the major trends, which can be obtained simply by looking at the specific elements which "float" to the top or "sink" to the bottom, standing back from the data, and then drawing qualitative trends from this quantitative data. With a larger, more exhaustive set of elements the task becomes significantly more challenging and rewarding, because the researcher has available to him the entire array of brand names, pricing, product features, and end benefits. The more exhaustive set of elements truly provides a grand overview of the product category.

TABLE 6. SOME KEY QUALITATIVE TRENDS FROM THESE RESULTS

-
- 1) Wide range of discrimination (from +14 at the top to -16 at the bottom)
 - 2) Flavors are quite polarizing. Light berry flavor is positive (+4) whereas mint julep, light cola and light mocha are quite negative.
 - 3) Most categories of elements (including visuals) have both positive and negative weights, suggesting that it is the specific execution, and not the category alone that generates acceptance.
 - 4) Men and women are qualitatively similar, though not identical.
 - 5) There are 2 segments, based upon the pattern of responses. Segment 1 is more convenience oriented. Segment 2 is more health/fitness oriented.
-

3.7 CREATING NEW PRODUCT AND POSITIONING CONCEPTS, USING THE DATA

Until now the focus of the research has been on the performance of the elements, in the concept, as deduced by an additive model. This focus is *analytic* in nature. The data can be used to create new and better combinations. This new focus is *synthetic* in nature. The objective is to use the parts to create new wholes, gestalts, or concepts that have defined properties.

To synthesize new concepts requires data and a palette with which to combine these elements into the new gestalts. The data is already available, shown in part in Table 5. The palette is a computer program known as the "Concept Optimizer". At the simplest conceptual level the concept optimizer is a sorting program which:

* Accepts a set of attribute levels to be satisfied (goals). These attribute levels may be purchase intent from different consumer groups, or purchase intent levels as well as communication levels (from the semantic differential profile)

* Determines what categories of elements are allowed (viz., are all categories allowed, or just some categories allowed; are all elements permitted, or just some elements permitted; are some elements definitely contra-indicated)

* Determines what pairs of elements are not allowed (from the file containing the pairwise restrictions). Step 3 and Table 2 discussed the restrictions in more detail.

* Determines the number of allowable elements in the concept

* Creates viable concepts comprising combinations of elements that deliver the goal specified as closely as possible, subject to constraints on the allowable number of elements, pairwise restrictions, and selection of allowable elements and categories that could be included in the final concept.

Table 7 shows a variety of different concepts. The elements in the concept will change as a function of the allowable categories of elements in the concept, and the goals. The goals can modify a concept dramatically. By using "tonality" or "communication" as a goal, not just overall interest, the researcher can "move" the concept in a variety of directions.

AN OVERVIEW

The approach to concept development presented in this paper differs dramatically in scope and potential from the more traditional methods currently in use. The approach is comprehensive, analytic and synthetic, as well as multimedia:

a) *Comprehensive* - since the researcher can test 300 elements the possibility now exists for a truly comprehensive analysis of a category. Whereas the traditional research procedures used approximately 30 elements (and required knowledge ahead of time as to what would probably work and what would not), the current procedure uses 10x as many elements, and requires very little culling.

b) *Analytic* - since the researcher obtains data on the persuasiveness of (and latency of reaction to) many elements embedded in concepts, the data enables the researcher to identify key trends. For instance, the researcher can identify what specific elements drive consumer acceptance, or what particular groups of consumers exist in the population with different points of view towards a specific category. Furthermore, if the study is repeated over time, with different groups of consumers (e.g., on a yearly tracking basis) then the procedure can identify changes in the reactivity of consumers to product/positioning ideas, brand names, new technologies, etc.

TABLE 7A. OPTIMAL CONCEPTS CREATED FOR TOTAL PANEL & SUBGROUPS -
WITHOUT FORCING IN ANY CATEGORIES OR ELEMENTS

Total Panel

- A8 Woman holding glass to face
- C3 No preparation--it's ready when you are
- D2 Refreshing taste
- G3 In 8-ounce recyclable cans

Males

- A9 Couple sitting
- C2 Satisfies without a lot of calories
- F9 For those who play seriously
- G3 In 8-ounce recyclable cans

Females

- A2 Man playing volleyball
- C3 No preparation--it's ready when you are
- D3 Great tasting
- M5 ENYA, 'ORINOCO'

Segment 1 - Convenience Oriented

- A1 Man swimming
- C3 No preparation--it's ready when you are
- D2 Refreshing taste
- M5 ENYA, 'ORINOCO'

Segment 2 - Health Oriented

- A2 Man playing volleyball
 - B2 Replenishes your body's minerals--naturally
 - C2 Satisfies without a lot of calories
 - G6 In light-weight 16-ounce plastic porta-bottles
-

c) *Synthetic* - since the data is set up as input to an "optimization" system, the approach can synthesize new combinations of elements that generate high consumer interest (viz., by maximizing purchase intent), as well as combinations that push communication in a specific direction (viz., by maximizing the degree to which these highly persuasive elements also deliver a specific degree of a "dimension". These dimensions are obtained from the semantic differential scale).

TABLE TB. OPTIMAL CONCEPTS CREATED FOR TOTAL PANEL & SUBGROUPS -
FORCING IN FUNCTIONAL ASPECTS AND HEALTH BENEFITS

Total Panel

- B2 Replenishes your body's minerals--naturally
- C3 No preparation--it's ready when you are
- F11 If you exercise regularly
- G3 In 8-ounce recyclable cans

Males

- B2 Replenishes your body's minerals--naturally
- C2 Satisfies without a lot of calories
- F9 For those who play seriously
- G3 In 8-ounce recyclable cans

Females

- B2 Replenishes your body's minerals--naturally
- C3 No preparation--it's ready when you are
- F11 If you exercise regularly
- G6 In light-weight 16-ounce plastic containers

Segment 1 - Convenience Oriented

- B7 Good for you
- C3 No preparation--it's ready when you are
- F11 If you exercise regularly
- G3 In 8-ounce recyclable cans

Segment 2 - Health/Fitness Oriented

- B2 Replenishes your body's minerals--naturally
 - C2 Satisfies without a lot of calories
 - F4 If you care how you look
 - G6 In light-weight 16-ounce plastic porta-bottles
-

REFERENCES & ADDITIONAL READING

- Cattin, P., & D.R. Wittink, 1982: Commercial use of conjoint analysis: A survey, *Journal Of Marketing*, 46, 44-53.
- Fern, E.F., 1982: The use of focus groups for idea generation: The effects of groups, size, acquaintanceships, and moderator on response quantity and quality, *Journal Of Marketing Research*, 19, 1-13.
- Green, P.E., 1984: Hybrid models for conjoint analysis: An expository review, *Journal Of Marketing Research*, 21, 55-169.
- Green, P.E., & K. Helsen, 1989: Cross validation assessment of alternatives to individual-level conjoint analysis: A case study, *Journal Of Marketing Research*, 26, 346-350.
- Green, P.E., & A.M. Krieger, 1991: Segmenting markets with conjoint analysis, *Journal Of Marketing*, 55, 20-31.
- Green, P.E., & Srinivasan, 1990: Conjoint analysis in consumer research: Issues and outlook, *Journal Of Consumer Research*, 5, 103-123.
- Green, P.E., & V. Srinivasan, 1978: (A.) A general approach to product design optimization via conjoint analysis, *Journal Of Marketing*, 45, 17-37.
- Green, P.E., & S. Srinivasan, 1978: (B.) Conjoint analysis in consumer research: Issues and outlook, *Journal Of Consumer Research*, 5, 103-124.
- Johnson, R.M., 1974: Trade-off analysis of consumer values, *Journal Of Marketing Research*, 11, 121-127.
- Luce, D.R., & A. Tukey, 1964: Conjoint analysis: A new form of fundamental measurement, *Journal Of Mathematical Psychology*, 1, 1-36.
- Moskowitz, H.R., 1986: Sensory segmentation of fragrance preferences, *Journal Of The Society Of Cosmetic Chemists*, 37, 233-247.
- Moskowitz, H.R., 1989: Sensory segmentation and the simultaneous optimization products and concepts for development and marketing of new foods. In *Food Acceptability*, D.M.H. Thomson (Ed.), Elsevier, London, 311-326.
- Moskowitz, H.R., B.E. Jacobs & N. Lazar, 1985: Product response segmentation and the analysis of individual differences in liking, *Journal Of Food Quality*, 8, 168-191.

- Moskowitz, H.R., & D.E. Martin, 1993: How computer design and presentation of concepts speeds up the product development process. *46th European Society Of Market Research Proceedings*, Copenhagen, Denmark, 405-420.
- Moskowitz, H.R., & S. Rabino, 1983: The trading of purchase interest for concept believability, *International Journal Of Advertising*, 2, 265-274.
- Wittink, D. R., & P. Cattin, 1989: Commercial use of conjoint analysis: An update, *Journal Of Marketing*, 53, 91-96.

CHILLED FOODS DEVELOPMENT

Manufacturer to Customer

Product Development Objective

Provide customers with a wide variety of exceptional quality chilled foods.

- I. **Suppliers**
 - A. Progressive
 - B. Partner
- II. **Product Development and Research**
 - A. Recipes
 - B. Ingredients
- III. **Quality Control & Food Safety**
 - A. Specifications
 - 1. Production methods
 - 2. Temperature controls
 - B. Plant Visitations
 - C. Training
 - D. Labeling
- IV. **Product Inventory**
 - A. Ordering
 - B. Sales History
 - C. Waste Control
- V. **Cold Chain Distribution**
 - A. Transportation to Distribution Center
 - 1. Temperature Control
 - 2. Sanitation Inspection

Page 2

Re: Chilled Foods Development - Manufacturer to Customer

B. Transportation from Distribution Center to Retail Stores

1. Temperature Controls
2. Sanitation Inspection

VI. Store Handling of Chilled Product

1. Handling
2. Temperature
3. Sanitation

Isprdddev
Dir:GMmemo

**PRODUCT DESIGN WORKSHOP
PRODUCT DEVELOPMENT PLANNING
FOOD SERVICE**

JANUARY 23, 1995

ROBERT E. MOHEL
FOOD AND...
(201) 444-1968

PRODUCT DESIGN WORKSHOP
CAFT/MOSKOWITZ JACOBS

- I. OPPORTUNITIES IN THE FOOD SERVICE INDUSTRY
 - A. MENU
- II. MARRIAGE OF CHEF AND TECHNOLOGIST
- III. FOOD TRENDS
- IV. QUALITY
 - A. FRESH
 - B. FROZEN
 - C. PACKAGED - LONG/SHORT SHELF LIFE
 - D. DEHYDRATED
 - E. IRRADIATED
- V. COOK/CHILL
- VI. SOUS VIDE
- VII. TIME/TEMPERATURE LABELS

FOOD AND...
ROBERT E. MOHEL
JANUARY 23, 1995

PRODUCT DESIGN WORKSHOP
JANUARY 23, 1995
FOOD SERVICE INDUSTRY

Opportunities in the food manufacturing industry can be found on restaurant menus and in the prepared food section of retailers and caterers. The recipes need to create these product have been adapted by multi-national food manufacturers and are offered for sale in:

- | |
|--|
| <ol style="list-style-type: none">1. The supermarket shelf2. The refrigerated case (self service)3. The deli/meat case (by the pound)4. The freezer case (packaged) <hr/> <ol style="list-style-type: none">5. A gourmet store6. A fast food restaurant7. A white tablecloth restaurant menu8. Cafeteria/schools/airlines9. Institutions10. Vending machines |
|--|

What makes these items so readily available can be traced to the advances developed by food technologists and chefs. Jacques Peppin, noted chef, promoted "la technique". Various French chefs promoted sous vide. Companies like Crovac (Grace) and Groen Kettles promoted cook/chill.

I feel that the future food offerings will come from the marriage of the chef and the food technologist.

Opportunities In Manufacturing for Food Service Operators

Restaurant/Hotels

Created the need and the market for small food manufacturers because of two major factors in the business.

Space

Labor

Schools/Hospitals/Institutions/Fast Food operators looked to technology to produce wholesome meals at low labor costs.

As my personal experience has been in “white tablecloth” operations, I will talk directly to opportunities in this industry and my experiences.

Culinary professionals use a menu driven approach in creating a food product. The menu leads to a recipe, the recipe requires preparations of ingredients. The task of preparing food products, leads to an opportunity for a food technologist to demonstrate how they can assist the chef in achieving their goals.

Many chefs feel that their methods and ingredients can not be duplicated or enhanced by the introduction of technology and I, for one, am hard pressed to convince the chef that if he is cooking for a few that technology can help him. But when he is cooking for hundreds or even thousands, technology must play a role.

HISTORY

To me, living in the Northeast, the first example of technology in food service was Howard Johnson.

In the 1950's, before Ray Kroc, HOJO was the restaurant that met the needs of a typical family. I didn't know how all this food was prepared, how this large menu could be offered with only a few cooks in the kitchen. The answer was

- a. a commissary
- b. food technology

In the 1950's "white tablecloth" operations had a chef and a battery of cooks preparing the foods. With increased labor costs, many food service operators looked to technology.

OPPORTUNITIES - FRESH

I have been asked, by many restaurant companies and food manufacturers to identify the next food fad or trend. What I will try to do today is identify where food service/restaurant opportunities exist.

fresh
frozen
canned/packaged (shelf stable)
dehydrated
irradiated

Opportunities in fresh

The fresh product industry is **now**. We are seeing a fantastic growth in precut packaged produce.

A large hotel in NYC is using over \$5,000 daily in precut vegetables.

Reasons for an operator using precut:

Overall saving in labor cost
Reducing waste
Reduced cost of final product
Ease in food preparation

Fresh meat and seafood are also being processed centrally using advanced packaging to obtain the needed shelf life.

OPPORTUNITIES - FRESH

FRESH

The demands for fresh ingredients have opened up many opportunities to a small entrepreneur.

Centralized Food Preparation

Taking a raw product item, cleaning (sanitizing), cutting to meet the needs of the recipe.

Packaging to extend shelf life.

Now even the chef in a expensive gourmet restaurant is using technology to assist him in food prep. The justification is:

Reduction in labor costs

Reduction in waste, storage

Better yields

Reduced cost

Have the ingredients readily available

Reduction in overall costs

On the retail side, look at the recent activities of RLB and Andy Boy.

OPPORTUNITIES

If it is a given that the food service operator and culinarian thinks that life begins as a menu, we should look at a restaurant menu to provide opportunities for the food manufacturer and the type of technology that can be applied.

Appetizer
Soup
Salad
Entree
Desert
Beverage
with Bread
Liquor
Wine

Since real estate is so expensive, many new restaurants have designed very small kitchens with large dining areas. Thus eliminating the kitchen staff and increasing the potential sales.

The Hard Rock Cafe
Planet Hollywood
The Harley Davidson Cafe

OPPORTUNITIES - COOKED

Food technology goes beyond handling fresh items that have made it easier for the chef to create a dish. Since we have found food products to be somewhat trendy, we also need to look how food trends has helped identify the challenges facing the food industry.

One item comes into mind, just look to the simple chicken wing.

Here is a product that has taken an inexpensive by product and has created not only a growing market for the popular chicken but a number of companies were created to market this product.

If you know the history, at a small restaurant in Buffalo, NY (in fact, a bar) the mother of the owner was trying to prepare something for the bar patrons. All she had to work with were the wings from the chickens.

Buffalo Chicken Wings

This one item is now found:

- on menus in white table cloth restaurants
 - banquets
 - family restaurants
 - fast food restaurants
 - cafeterias
- supermarket meat cases
 - deli cases
 - packaged frozen
- vending machines (using microwave ovens)
 - on the supermarket shelf - spice section
 - condiment section

OPPORTUNITIES - COOKED

I feel that this one item may pass the all American hamburger in popularity.

This one item probably has used every from of food preparation and food technology.

fried
baked
microwaved

TECHNOLOGY - COOK/CHILL

Cook/Chill has been used for over twenty years but the real growth can probably be noted over the last five years.

Cook/Chill is probably being used by most institutions because of

the investment needed
the cost savings as opposed to traditional cooking
the quality of the products produced
the skill level needed by the production staff
the food safety issue.

Going back to the menu - **Cook/Chill** can produce a full menu for most operators.

You should also note that many institutions that have a facility to manufacture products, using this technology, have production time available to customize a recipe.

I opened a Cook/Chill facility in Newbury, NY for the Grand Union Company for -

Soups
Salad Dressing
Meat - Roast, Gravy, Stews, Etc.

TECHNOLOGY SOUS VIDE

Sous Vide is a new technology where the quality of the finished product is (in my opinion) higher then using Cook/Chill.

A number of sophisticated chef's have developed menu items for white tablecloth restaurants use Sous Vide.

I have a video tape on how the Marriott Corporation uses Sous Vide in their hotels.

They have developed programs where they use outside suppliers to manufacture menu items for them.

They have also required the use of another technology to differentiate products and maintain product quality and integrity. They use a Time Temperature Indicator Label.

This technology seems to be received by food service operators like

Marriott Hotels and Food Service
Friendly Restaurants
Outback Steak Houses

While in Europe, I found this technology being used mostly by retailers, i.e., Monoprix.

Soon a large egg producer will introduce this technology on over 10 million boxes of eggs.

Even the World Health Organization (W.H.O.) will be requiring a TTI.

SUMMARY

In summary, the food service industry will be looking at the food manufacturers to help them successfully meet the demands of the public.

It is only with the marriage of the chef and the food technologist, with the entrepreneur serving as best man, will we be ready for the future.

RATATOUILLE

eggplant
green peppers
tomatoes
onions
zucchini (green and yellow)
chicken broth
thyme
basil
parsley
salt/pepper

ZITI WITH GROUND TURKEY

ziti
garlic
onions
oregano
ground turkey
tomato product (Sofrito)
parsley
basil
salt/pepper

CARIBBEAN RICE WITH PEAS

peas
rice
carrots
celery
garlic
small shrimp
clam juice
onions
Jamaican marinade

ROASTED PEPPER PESTO

garlic
roasted peppers
basil
roasted pumpkin seeds
canola oil
Parmesan cheese
salt/pepper

HAM AND CABBAGE

cabbage
onions
garlic
chicken broth
ham (diced)
parsley
salt/pepper

PASTA SHELLS FLORENTINE

pasta shells
garlic
onions
spinach
bacon bits
fennel
rosemary
chicken broth
mushrooms
salt/pepper

MACARONI AND CHEESE W/ CHICKEN

macaroni
chicken (diced)
cheese sauce
milk
onions
parsley
rosemary
salt/pepper

SPAGHETTI WHITE CLAMS

garlic
onions
basil
clam juice
chopped clams
spaghetti
oregano
vegetable oil
salt/pepper



"MARKET DEVELOPMENT WORKSHOP"

120 New England Avenue, Piscataway, NJ 08854

February 15, 1995

Objective: Assess preliminary business plan for CRAMTD model product. Initial test marketing methods and strategies.

Resources: John Coburn, Associate Director CAFT, Director CRAMTD
Stanley Cajigas, Manager CAFT Technology Extension Program
Bernard Sherman, Independent Consultant
David Stern, Rutgers Dining Services, Purchasing
Bruce Williams, President & CEO, Latitude 39⁰

AGENDA

- | | | |
|----------|--|-----------------|
| 9:00 AM | - Welcome by John Coburn | |
| 9:15 | - Session Outline | Stan Cajigas |
| 9:30 | - Presentation
<i>Reaching Your Market</i> | Bernard Sherman |
| 10:30 | - Presentation
<i>Institutional Food Purchasing</i> | David Stern |
| 12:00 PM | - LUNCH | |
| 1:00 | - Presentation
<i>Purchasing for Food Service Industry and
Related Aspects</i> | Bruce Williams |
| 2:30 | - Workshop
<i>Results of Market Research
Cost Projection and Analysis on Two
Demonstration Products</i> | Stan Cajigas |
| 3:45 | - Complete Evaluation Forms | |
| 4:00 | - Adjourn | |

ASSESSING THE MARKET

Bernard Sherman, Consultant

- I. Situation Analysis
 - A. Uncontrollable Variables / External Environments
 - 1. Social and Cultural Environment
 - 2. Political and Legal Environment
 - 3. Economy
 - 4. Competitors' Position
 - 5. Resources Available and Objectives
 - B. Controllable Variables / Marketing Mix
 - 1. Product
 - 2. Price
 - a. Cost-oriented
 - b. Demand-oriented
 - c. Prestige pricing
 - 3. Place
 - 4. Promotion
 - a. Selling
 - b. Advertising
 - c. Sales Promotion
 - d. Public Relations
- II. Target Market
 - A. Demographics
 - 1. Age
 - 2. Family size
 - 3. Education
 - 4. Sex
 - 5. Income
 - 6. Occupation
 - B. Geographics
 - C. Psychographics (why people buy)
 - 1. Economical Reasons
 - 2. Emotional Reasons

WHAT A UNIVERSITY EXPECTS FROM ITS VENDORS

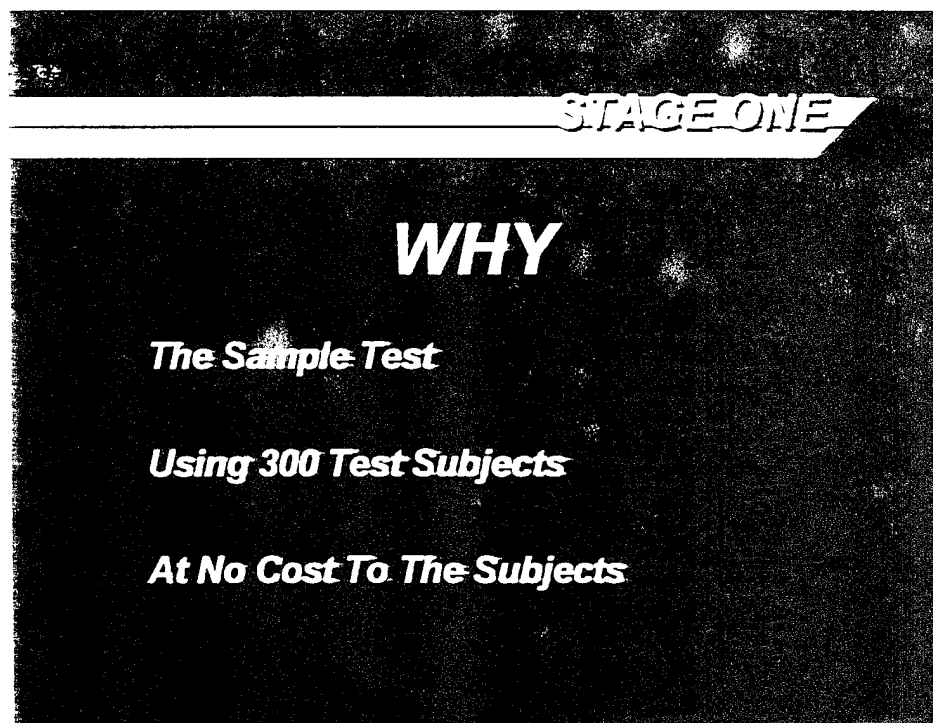
David Stern, Rutgers Dining Services Purchaser

- I. Have a communication system that is conducive to ordering:
 - A. Avoid the push button nightmare.
 - B. Respond to messages left, promptly.
 - C. Affirm order when placed.
- II. Notify the University as to what can not be delivered.
 - A. Just say no!
(Do not substitute or short)
 - B. Give the other guy a chance.
(Let the University get what it needs elsewhere)
- III. Deliver on time in a professional manner.
 - A. Vehicle must be clean, properly functioning, and safely operated.
 - B. Refrigerated foods should be refrigerated.
 - C. Frozen foods should be frozen.
 - D. Integrity of product maintained.
- IV. Make sure prices and extensions are correct, according to pre-specified price quotes.
 - A. Avoid the accounting hassle.
- V. Have a no hassle customer service policy.
 - A. Remember Sear's.

MARKET DEVELOPMENT

Bruce Williams. Owner Latitude 39° Foods

- I. Establish where product fits into food service industry
 - A. Surveys: Taste test
 - B. Research
 - C. Competitor's position
- II. Select segments of industry to market to
 - A. Demographics
 - B. Geographics
- III. Establish product in a "good light"
 - A. Quality
 - B. Applications
 - C. Taste
 - D. Health aspects
 - E. Cost
 - F. Labor intensiveness
- IV. Communicate how product is tailored to each particular customer
- V. Note market trends
 - A. Health niche
 - B. Ethnic niche



STAGE ONE

WHERE

Malls

Sites Specific To The Target Market

Sites With Various Age Groups

***Examples include Hospitals, Schools,
Nursing Homes, Fast Food and
Restaurants, Etc.***

STAGE ONE

HOW

***Questions That Require Simple
Answers***

Questions With Specific Ideas In Mind

STAGE ONE

Please circle your preferred response.

- 1) Do you like the taste? 
- 2) Do you like the appearance? 
- 3) Do you like the aroma? 
- 4) Would you purchase this product based on taste, appearance, and/or aroma? 
- 5) If this product was offered in the dining halls, would you choose to eat this? 
- 6) Is there any ingredient that could be added to improve the flavor? ☐ NO ☐ YES
If so, what would improve the flavor?
- 7) Is there any ingredient that could be removed to improve the flavor? ☐ NO ☐ YES
If so, what would improve the flavor?
- 8) Is there anything else that could be done to improve this product?

STAGE TWO

Sell 1000 or More

WHY

Establish the Price in Relation to the Product

Accurate costing with projected real sales

Example: Price/200 cases

Price/500 cases

Price/1000 cases

Determine what, if any, special equipment is needed

Do you use a co-packer

Take similar products for cost comparison

Cost/ingredient Slim Fast

Cost/ingredient Hot Chocolate

STAGE TWO

WHERE

Do You Get The Information

Distributors

End Users

Clubs/Warehouses

Specialty Brokers

STAGE TWO

HOW

Do You Use The Information

Actual Cost vs. Perceived Cost

Selling Price vs. Market Price

Example 10 grams of 24kt Gold = \$141.10
Made into a piece of jewelry = \$400-600

STAGE TWO

Unique Products

Example Snapple vs. Coca-Cola 16 oz. bottle
Price \$1.09 vs. \$.75
Cost of Production SAME
Size SAME
Package SAME

Past 1000 units >>>> Market Force

Price vs. Acceptance or Replacement

Example CEREAL
Cost \$.20 / LB
Selling Price \$ 3.50-4.50 / LB

STAGE TWO

Private Label Products

Pick Trends and Match With Products That
Allow You To Produce In Your Plant With A
Market And A Consumer Savings

Examples Lipton's Noodle & Sauce
Selling Price = \$ 1.39

Private Label's Noodle & Sauce
Selling Price = \$.89 - .99

Manufacturer's Return Gross at 25% to 35%

STAGE THREE

FACTORS NEEDED

Must know market trends. (Reference Hilly Goldman and John Fourney.)

Must have access to price information and market plans.

Product can be produced on existing equipment with little or no new purchases.

Strong marketing to customers of benefits of a private label.

STAGE THREE

MORE FACTORS NEEDED

Ability to produce start up amounts and large quantities. Consider cash flow position.

Be FIRST - There are only three positions.

First Place

Second Place

Private Label

Private Label allows you to fill the third position .

STAGE THREE

OTHER CONSIDERATIONS

Small Markets / Special Markets

Small Volume Can Equal Large Return

Specialty Products for:

Ethnic market

Vegetarian market

Health Food market

Gourmet Food market

Specialty Food market (Dove Bar, Godiva Chocolate)

All the above applies to a small volume, but is quite meaningful

Example Yogurt Product 12000 cases = \$800,000 sales

Ziti With Ground Turkey

<u>INGREDIENT</u>	<u>Weight for 8 servings</u>	<u>Cost per serving</u>	<u>Cost per 100 servings</u>
ZITI	12 OUNCES	.05000	\$ 4.75
GARLIC	2 TABLESPOON	.01000	1.00
ONIONS	8 OUNCES	.04000	4.00
GROUND TURKEY	16 OUNCES	.25000	25.00
TOMATO PRODUCT	16 OUNCES	.04000	4.00
BASIL	1 TABLESPOON	.00250	.25
OREGANO	1 TABLESPOON N	.00750	.75
PARSLEY	1 TABLESPOON	.00620	.63
SALT	1/2 TABLESPOON	.00000	.00
PEPPER	1 TABLESPOON	.00375	.38

Serving Size = 8.5 ounces

MACARONI WITH CHEESE AND CHICKEN

INGREDIENT	Weight for 8 servings	Cost per serving	Cost per 100 servings
MACARONI	7 OUNCES	\$.03000	\$ 3.43
CHICKEN (DICED)	8 OUNCES	.10000	10.30
CHEDDAR CHEESE	12 OUNCES	.16000	15.73
MILK	16 OUNCES	.04000	3.87
ROSEMARY	1 TEASPOON	.00288	.29
THYME	2 TABLESPOON	.01000	1.00
SALT	1/2 TEASPOON	.00000	.00
PEPPER	1/2 TEASPOON	.00429	.43

Serving Size = 6.3 oz.

Total Cost Per Serving = \$.35

Total Cost per 100 Servings = \$ 35.04

Market Research

Ziti with Ground Turkey

Macaroni and Cheese with Chicken

Sampling

Students were randomly asked to participate in a taste test for two food products.

The testing was conducted at the Busch Campus Student Center.

***91 Students volunteered for the Ziti survey
28 Females, 63 Males***

***87 Students volunteered for the M-A-C survey
28 Females, 58 Males***

Example of Survey

Do you like the taste?	Yes	Undecided	No
Do you like the appearance?	Yes	Undecided	No
Do you like the aroma?	Yes	Undecided	No
Would you purchase this product based on taste, appearance, and/or aroma?	Yes	Undecided	No
If this product was offered in the dining halls, would you choose to eat this?	Yes	Undecided	No
Is there any ingredient that could be added to improve the flavor?	Yes	No	
If so, what would improve the flavor?			
Is there any ingredient that could be removed to improve the flavor?	Yes	No	
If so, what would improve the flavor?			
Is there anything else that could be done to improve this product?			

Results of Ziti Survey

Do you like the taste?	56% YES
Do you like the appearance?	64% YES
Do you like the aroma?	55% YES
Would you purchase this product based on taste, appearance and/or aroma?	56% YES
If this product were offered in the dining halls, would you choose to eat this?	63% YES

Results of Ziti Survey

44% Indicated suggestions for improvement

Add more tomato sauce

Make spicier / zestier

**Add salt, garlic, onion, pepper, oregano,
cheese, meat**

Use less salt, onion, oregano, basil

Make it a healthy dish

Results of Macaroni and Cheese Survey

Do you like the taste? 61% YES

Do you like the appearance? 73% YES

Do you like the aroma? 52% YES

**Would you purchase this product based
on taste, appearance, and/or aroma? 54% YES**

**If this product was offered in the dining
halls, would you choose to eat this? 61% YES**

Results of Macaroni and Cheese Survey

41% Indicated suggestions for improvement

Add more salt

Sharper / stronger cheese flavor

Thicker sauce

Lower fat and/or calorie content

Add more chicken

Add more pepper

Add vegetables (mushrooms)

**"PRODUCTION WORKSHOP"**

Appendix 4.15

120 New England Avenue, Piscataway, NJ 08854

March 23, 1995

Objective: Review development of a quality control plan (HACCP and PQC), thermal process definition and filing for any thermostabilized product, label approval, identification of raw material sources, process conditions/key control points and assessment of process variability, scale-up assessment.

Resources: John Coburn, Associate Director CAFT, Director CRAMTD
Stanley Cajigas, Manager CAFT Technology Extension Program
Guy Gimson, Consultant
David Moore, Director Quality Assurance for Papetti's Hygrade Egg Products
Norman Davis, President, Top Inc.
Bruce Rex, Former President of Ontario Foods
John Paolini, President of Paolini Food Brokers
John Van Ness, Van Ness & Associates

AGENDA

9:00 AM	- Welcome	John Coburn
9:15	- Session Outline	Stan Cajigas
9:30	- Topic <i>Process Engineer</i>	Guy Gimson
10:15	- Topic Novel Process, Retorting & Refrigerating	John Van Ness
11:15	- Topic <i>Packaging</i>	Norman Davis
12:00	- Lunch	
1:00	- Topic <i>Production Planning</i>	Bruce Rex
1:45	- Topic <i>Quality Control</i>	David Moore
2:30	- Topic Selling to Institutions & Distributors	John Paolini
3:30	- Windup	Stan Cajigas John Coburn
4:00	- Adjourn	

Food Process Engineering

- Takes product concept through preliminary engineering to final design
- Includes economic analyses in successively greater detail
- When complete, results in :-
 - Process flowsheet
 - Process and equipment development needs
 - Equipment lists and costs
 - Operating costs
 - Economic sensitivity analysis

Food Process Engineering

Step Action Output

- | | | |
|----|---|--|
| 1. | Marketing and Research identify product, package and capacity | Design basis |
| 2. | Develop design database | Vendor data
Material properties |
| 3. | Develop process concept | Process concept |
| 4. | Document initial assumptions | Capacity, yields
shifts/yr, materials,
regulatory issues |
| 5. | Prepare preliminary flowsheet | Flowsheet, Material &
Energy balances |

<u>Step</u>	<u>Action</u>	<u>Output</u>
6.	Identify regulatory needs	USDA, FDA regs, OSHA, EPA permits, safety issues
7.	Review process alternatives	Batch/continuous steps, automation benefits vs risk
8.	Identify development needs	Process/ equipment changes
9.	Prepare development schedule	Time/ cost estimates
10.	Prepare preliminary investment & operating costs	Capital costs, prelim unit costs
11.	Review process	Go/ No Go decision
12.	Complete development plan	Cost/ schedule

Step Action Output

13. Complete final flowsheet

P & ID (Copy & Instructed A Doc)

14. Layout process and building

Process layout, building design, utility and services

15. List equipment

Equipment list purchase specs and orders

16. Prepare final capital and operating cost analysis

Cap cost est and operating costs

17. Perform sensitivity analysis

Cost sensitivity

18. Complete design schedule and package

The advantages and disadvantages of each freezing method are listed in the table 4.1:

Table 4.1. Advantages and disadvantages of the three freezing options

	Advantages	Disadvantages
N₂ Immersion	Low dehydration losses (~1%) Highest production rates Easy installation & simple operation	Uses expendable cryogen IQF is not possible May cause thermal shock in thin skinned fruits (10% defectives) Violent boiling of N₂ at product surface Uses more N₂ than the cryogenic fluidized bed
Mechanical Fluidized Bed	No special storage needed for freezing medium-air Air is inexpensive to cool IQF is possible	Large capital costs Moisture may plug evaporator coils Time-consuming clean-up Slow freezing rates cause large crystal formation resulting in cell damage High dehydration losses (3-5%)
Cryogenic Fluidized Bed	High heat transfer rates Fast freezing cycle Crust forms rapidly on food surface to lock-in flavor & quality Low dehydration losses ~1% IQF is possible Low initial cost Rapid installation & start-up Virtually maintenance free Easy clean-up	N₂ safety-inhalation of vapors, severe cold burns N₂ boil-off loss 0.5-1% per day Uses expendable cryogen

6.2. Waste Disposal

The effective minimizing of the pollution loads produced in the AFVI plant is important to both the economic and social status of the enterprise. The quality and characteristics of the fruit and vegetable-processing plant waste are diverse. Waste from the AFVI plant is neither pathogenic nor toxic and includes:

- polluted water produced during washing, cooling, blanching and cleaning of floor and equipment
- spoiled raw materials
- spoiled manufactured product

The concentration and characterization of pollution loads in the fruits and vegetable process wastes are measured by the test of biochemical oxygen demand or BOD. This test is designed to determine the amount of organic matter in waste by measuring the ability of bacteria present or added to the sample to degrade it. For example, data in Table 6.2 shows pollution load generated by some vegetables like peas and lima beans:

Table 6.2. Pollution load of lima beans and peas.

	Waste Water (10 ³ gal/Ton)	BOD (lb/Ton)	Solid Residual (lb/Ton)	Suspended Solids (lb/Ton)
Lima beans	9.0	25	80	280
Peas	5.0	50	10	260

AFVI waste will be discharged directly to a municipal sewer. However, limitations exist regarding the volume and the amount of BOD to be discharged. Waste discharge is regulated by the EPA'S National Pollutant Discharge and Elimination System (NPDES). Table 6.3 shows the EPA's NPDES regulations for disposal of waste produced during peas' processing.

Table 6.3. EPA's NPDES regulations for disposal of peas' waste water

	BOD effluent limitation (lbs/tons raw material)	Total Suspended Solids (lbs/Ton)
Maximum for any day to be discharged	5.33	9.6
Average daily value for 30 days should not exceed	3.3	4.8

Pollution loads exceeding regulations will be subjected to higher taxes. Therefore, minimizing the quantity and strength effluent by practicing good housekeeping and attempting to reuse or recover some of the effluent from the works of a particular process in the plant are important factors to be considered since the volume and strength of wastes to be discharged, are the basic factors which determine the overall costs of the waste treatment. In the AFVI plant, effluent reuse can be considered for certain unit operations (e.g.blanching). However, it should be made clear that the goal of any waste water treatment system is to comply with the regulations in a cost effective manner.

The selection of an on site waste water treatment in the AFVI plant is an option that could be considered. In fact, discharge of the plant waste to a public treatment center works might not be adequate to treat the high volume of water effluent of the plant considering the fact that the AFVI is located in a rural area, and that the processing of the different fruits and vegetables is a highly seasonal business. If so, discharge of waste to the public facility would result in high taxes. Also, an advantage of an on site waste water treatment is that the treated water could be marketed for spray irrigation as well as fertilizer produced from conversion of suspended solids. However, such waste treatment facility will represent a high capital cost. Future on site waste treatment should include the two following stages:

- a) primary sedimentation (removal of suspended solids through screening)
- b) secondary treatment (biological oxidation using trickling filter to remove 90% of BOD.

The decision on the selection of the type of waste treatment to be implemented in the AVFI plant was not part of the scope of the project, since a precise location was not identified.

Table 7.1. Baseline values of design parameters and other properties used in the material and energy balances (literature or assumed values).

Parameter/property	Value
Capacity	9090 [Kg/hr]
Initial temperature of raw material	28 [°C]
Target freezing temperature	-18 [°C]
Blanching temperature	90 [°C]
Utility water temperature	17 [°C]
<i>Water</i>	
Freezing Point	0 [°C]
Specific heat above freezing point	4.18 [KJ/(kg K ⁰)]
Specific heat below freezing point	2.1 [KJ/(kg K ⁰)]
Density	1000 [kg/m ³]
Latent heat of fusion	334 [KJ/Kg]
Latent heat of vaporization	2257 [KJ/Kg]
<i>Nitrogen</i>	
Boiling point	-196 [°C]
Specific heat (gas)	1.04 [KJ/(kg K ⁰)]
Density (gas), at 0°C	1.17 [kg/m ³]
Density (liquid), at -196°C	808 [kg/m ³]
Latent heat of fusion	210 [KJ/Kg]
Specific heat of air	1.007 [KJ/(kg K ⁰)]
Air temperature in mechanical freezer	-30 [°C]
Mass flow ratio in washer	4 [Kg product/Kg water]
Mass flow ratio in blancher	6 [Kg product/Kg steam]
<i>Nitrogen efficiency</i>	
Fluidized bed freezer	267 [KJ removed/Kg product]
Immersion freezer	174 [KJ removed/Kg product]
Heat losses in mechanical freezer	949644 [KJ/hr]
<i>Product losses</i>	
Washing	5 [%wt]
Blanching	2 [%wt]
Cooling	1 [%wt]
Freezing (dehydration losses)	
Nitrogen fluidized bed	1 [%wt]
LIN immersion freezer	1 [%wt]
Mechanical freezer	3 [%wt]

Table 7.2. Properties of fruits and vegetables.

	Water content (% wt)	Freezing point (°C)	Specific heat		Latent heat of fusion (KJ/Kg)	Enthalpy	
			above fr.point (KJ/Kg K ⁰)	below fr. point (KJ/Kg K ⁰)		at fr.point (KJ/Kg)	at -18°C (KJ/Kg)
Peas	74	-0.6	3.53	1.77	248	321	56
Limas	67	-0.6	3.35	1.68	224	321	56
Blueberries	82	-1.6	3.73	1.87	275	342	53
Cherries	80	-1.8	3.68	1.85	268	318	66
Rasberries	81	-0.6	3.70	1.86	271	342	53
Composite	77	-1.0	3.60	1.806	257	329	57

* From ASHRAE Handbook (1986).

7.2. Qualitative Design Criteria

The most important criteria upon which we based the design of our processing line are the following:

- product quality
- safety and environmental considerations
- maximize cost effectiveness for the requested production rate
- minimize product losses (dehydration, washing, blanching etc.)
- reliability
- flexibility

Figure 8.2. Flowsheet for LIN immersion freezer option

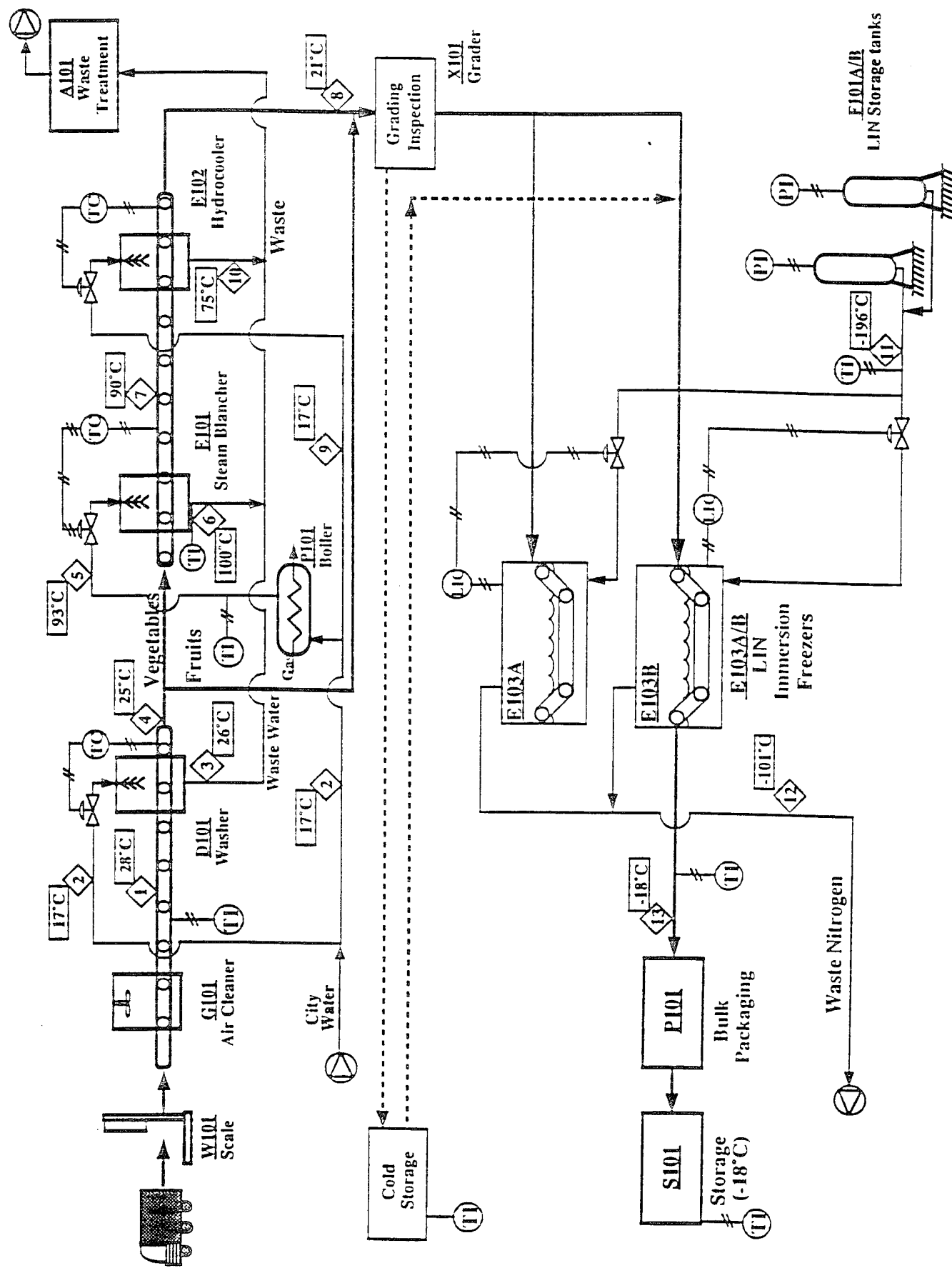


Table 9.1. Process streams description.

Stream#	1	2	3	4	5	6	7	8	9
	Raw Product	Wash Water	Wash Water	Cleaned Product	Steam In	Steam Out	Blanched Product	Cooled Product	Cooling Water
T (°C)	28	17	27	25	93	100	90	21	17
P (atm)									
Water (%)		100	83.31						100
Steam (%)					100	89.29			
Product (%)	100		16.69	100		10.71	100	100	
Nitrogen (%)									
Air (%)									
Total (Kg/hr)	9090	2269	2724	8636	1439	1612	8463	8378	8598

Stream#	Cryogenic Fluidized bed			LIN Immersion freezer			Mechanical freezer		
	10	12	11	13	12	11	13	12	11
	Cooling Water	Coolant N2	Coolant N2	Frozen Product	Coolant N2	Coolant N2	Frozen Product	Waste Air	Coolant Air
T (°C)	75	-67.7	-196	-18	-101.1	-196	-18	5	-30
P (atm)			1			1			
Water (%)	99.03								
Steam (%)									
Product (%)	0.97	0.93		100	0.83		100	0.22	
Nitrogen (%)		99.07	100		99.17	100			
Air (%)								99.78	100
Total (Kg/hr)	8683	11111	11004	8294	17020	16873	8294	111131	110880
									8127

Table 11.2. Critical control points and required documentation for AFVI HACCP program.

C.C.P	STEP	HAZARD	CONTROL	MONITORING PROCEDURES			RECORD	ACTION	VERIFICATION
		CONCERN	MEASURE	WHAT	HOW	FREQUENCY			
H-1	AIRWATER CLEANING OF RAW FRUITS AND VEGETABLES	Physical Hazard Microbial Contamination	Sanitation		Air blower/ washer	Continuously Upon receipt	Inspection Sheet	Reject foreign material (sticks, stones, bruised materials and trash) Adjust Temperature	Observe operation and review record
H-2	BLANCHING	Enzyme Activity	Steam temperature and pressure	All Vegetables	Temperature/ time indicator (TTI) and pressure sensor	Continuously	Inspection Sheets	Adjust Temperature and Steam pressure	Observe operation and review record
H-3	INSPECTION AND HAND GRADING	Physical hazard	Presence of Metal	All fruits and Vegetables	Metal Detector Visual observations	Continuously upon receipt	Inspection Sheets	Reject Metal and contaminated materials	Observe operation and review record
H-4	COLD STORAGE	Microbial Contamination	Room Temperature	All blanched Vegetables and Washed Fruits	Temperature Indicator(T.I)	Continuously	Inspection Sheet	Adjust proper Room Temperature	Review record
H-5	FREEZING	Microbial Contamination	Temperature/ time	All blanched Vegetables and fruits	Temperature/ Time Indicator (TTI)	Continuously upon loading	Inspection sheet	Adjust the Temperature and freezing Time	Observe operation and review record
H-6	PACKAGING	Physical Hazard	Presence of Metal		Metal detector	continuously upon Loading	Inspection Sheet	Reject metal	Observe operation and review records
		product specification	product/ package volumetric feed and thickness package	Loads of frozen Fruits and vegetables	product/ package analyzer control	continuously upon loading	Inspection Sheet	Adjust proper product/ package specifications	Observe operation and review record
		code date for product	Check ink-jet code	Code	visual	every hour	Finished packaging form	Stop line and recode product	Observe Operations and review records
H-7	ENVIRONMENT AND EQUIPMENT SANITATION	Biological Chemical hazards	Biochemical activity	Equipment, Environment	Bio- luminescence microbiology sensor system	every 16 hours	Standard Swabbing techniques	Notify of lack / proper sanitation	Observe Operations and review record

13. EQUIPMENT LIST AND COST

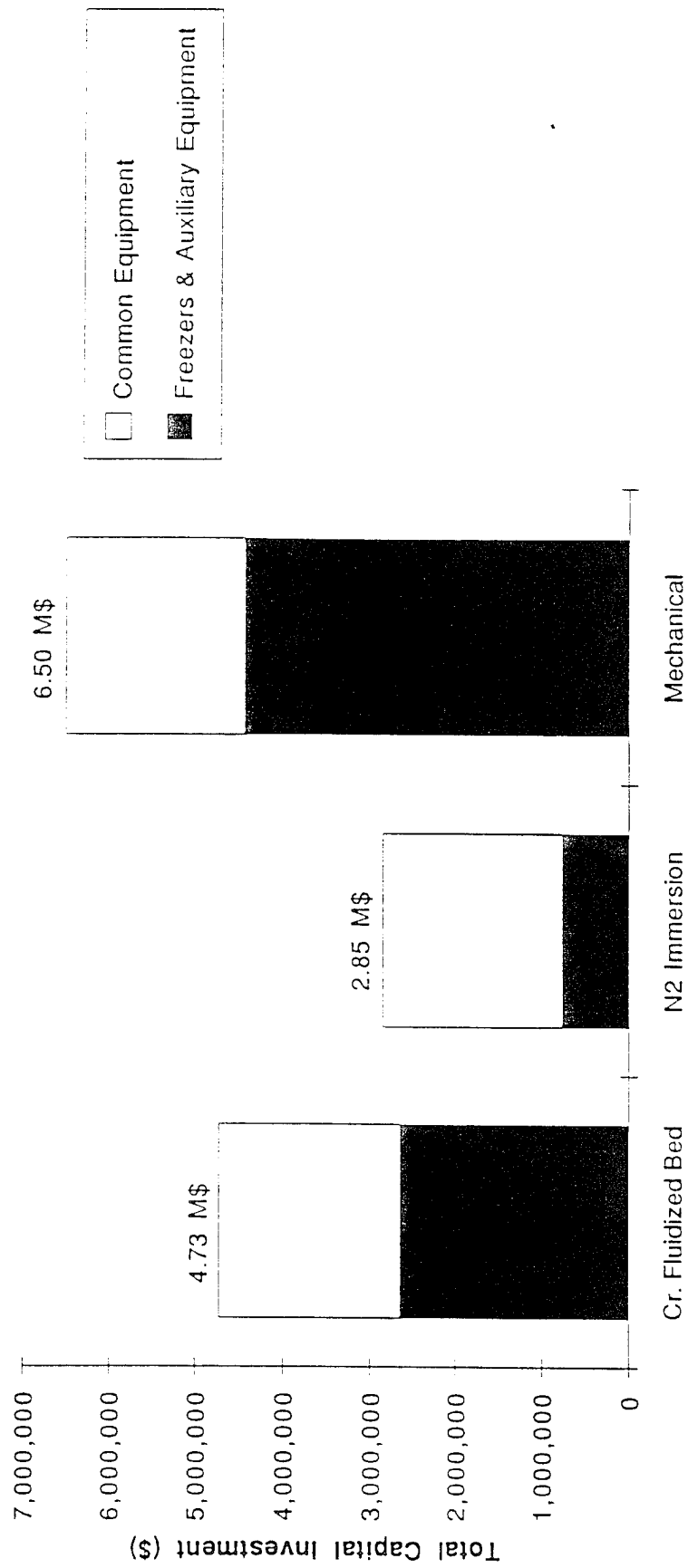
A list of the equipment that will be used in the AFVI plant along with their cost is shown in Table 13.1.

Table 13.1. Equipment list and cost

Equipment	Item #	Manufacturer	Characteristics	Quantity	Price (\$)
Truck Scale	W101	Toledo		1	10,000
Air Cleaner	G101	AK Robins	5'x12'x8' 1 HP	1	30,000
Rotary Washer	D101	AK Robins	4'x15' x8' 3 HP,10 GPM	1	35,000
Rotary Grader	X101	AK Robins	6'x20'x8' 2 HP	1	50,000
Steam Blancher	E101	AK Robins	7'x35'x6' 3 HP,10 GPM	1	127,000
Hydrocooler	E102	AK Robins	7'x25'x6' 3 HP,70GMP	1	50,000
Boiler	P101	AK Robins	50 BHP	1	30,000
Conveyor Belts			width 36"	100m (\$393.7/m)	39,370
Packaging Equip.	P101				75,000
Mechanical Freezer	E104	York	54'x18'6"x16	1	550,000
Refrigeration Unit (compressor, auxiliary eq.)	F101A	York		1	600,000
LIN Immersion Freezer	E104A/B	Airco	7x11'5"x5'8.5"	2(86,900)	173,800
LIN Tank (leased)	F101A/B	Airco			
Cryogenic Fluidized Bed	E104A-G	Airco	54'x18'x6'	7(85,000)	595,000
LIN Tank (leased)	F101A/B	Airco			

*The size of all equipment can satisfy production capacity of 9,090 Kg/hr

Figure 14.1. Graph with capital investment



utility costs for the three freezing systems. The main portion of the utility cost originates from the freezers. In particular, as stated previously, nitrogen cost has the largest contribution for the cryogenic systems, and electricity cost for the mechanical system due to the high energy requirement of the refrigeration unit.

Table 15.1. Raw material and selling prices of the various products and the composite.

Product	Price* (\$/Kg)	
	Raw Material	Finished Product
Peas	0.29	0.91
Limas	0.42	1.84
Blueberries	1.17	1.76
Cherries	1.10	2.43
Raspberries	2.43	2.87
Composite	1.08	1.96

* provided from Airco (1993).

Table 15.2. Raw material and packaging material costs.

Raw material cost for all options			
	Kg/yr	\$/Kg	\$/yr
Composite	39,268,800	1.08	42,437,314
Packaging material cost			
	Kg/yr	\$/Kg	\$/yr
Cr. fluidized bed	35,831,724	0.015	537,476
LIN Immersion	35,831,724	0.015	537,476
Mechanical	35,107,850	0.015	526,618

Table 15.3. Utility cost summary.

	Cr.Fluid.	LIN	Mechanical		Cr. fluid.	LIN	Mechanical
	bed	Immersion			bed	Immersion	
	Units/yr	Units/yr	Units/yr	\$/unit	\$/yr	\$/yr	\$/yr
Process Water (Mgal)	9.81	9.81	9.81	600	5888	5888	5888
Cooling water (Mgal)	2.93	2.93	2.93	300	878	878	878
Steam (Kg)	1439	1439	1439	0.011	68,393	68,393	68,393
Electricity (KW-hr)	638,704	511,470	4,171,812	0.1	63,870	51,147	417,181
Nitrogen* (m ³)	59,272	93,163	-	82.91	4,941,323	7,751,198	-
Total yearly cost					5,080,353	7,877,505	492,341

* Including the nitrogen tank lease (2 tanks, 1500\$/month per tank).

Table 15.5. Total manufacturing cost.

	Cryogenic fluid.bed		LIN Immersion		Mechanical	
	Yearly Cost	% total	Yearly Cost	% total	Yearly Cost	% total
	(\$/yr)		(\$/yr)		(\$/yr)	
<i>Direct Costs</i>						
Raw Materials	4,243,7314	81.18	42,437,314	77.95	42,437,314	88.80
Packaging Materials	537,476	1.03	537,476	0.99	526,618	1.10
Utilities	5,080,353	9.72	7,877,505	14.47	492,341	1.03
Labor	1,211,760	2.32	1,133,074	2.08	1,054,389	2.21
Supervision	181,764	0.35	169,961	0.31	158,158	0.33
Maintenance	246,549	0.47	148,707	0.27	339,337	0.71
Operating Supplies	36,982	0.07	22,306	0.04	50,901	0.11
Laboratory Charges	181,764	0.35	169,961	0.31	158,158	0.33
Patents & Royalties	552,850	1.06	575,341	1.06	505,480	1.06
Total Direct Costs	50,466,813		53,071,645		45,722,695	
<i>Indirect Costs</i>						
Depreciation	410,915	0.79	247,845	0.46	565,562	1.18
Property Taxes	61,637	0.12	37,177	0.07	84,834	0.18
Insurance	20,546	0.04	12,392	0.02	28,278	0.06
Interest	330,787	0.63	199,516	0.37	455,278	0.95
Total Indirect Costs	823,885		496,930		1,133,953	
Plant Overhead	984,044	1.88	871,046	1.60	931,131	1.95
Total Production Cost (\$/yr)	52,274,742	100	54,439,621	100	47,787,779	100

Figure 17.2. Effect of the raw material price on the total annual profits after taxes.

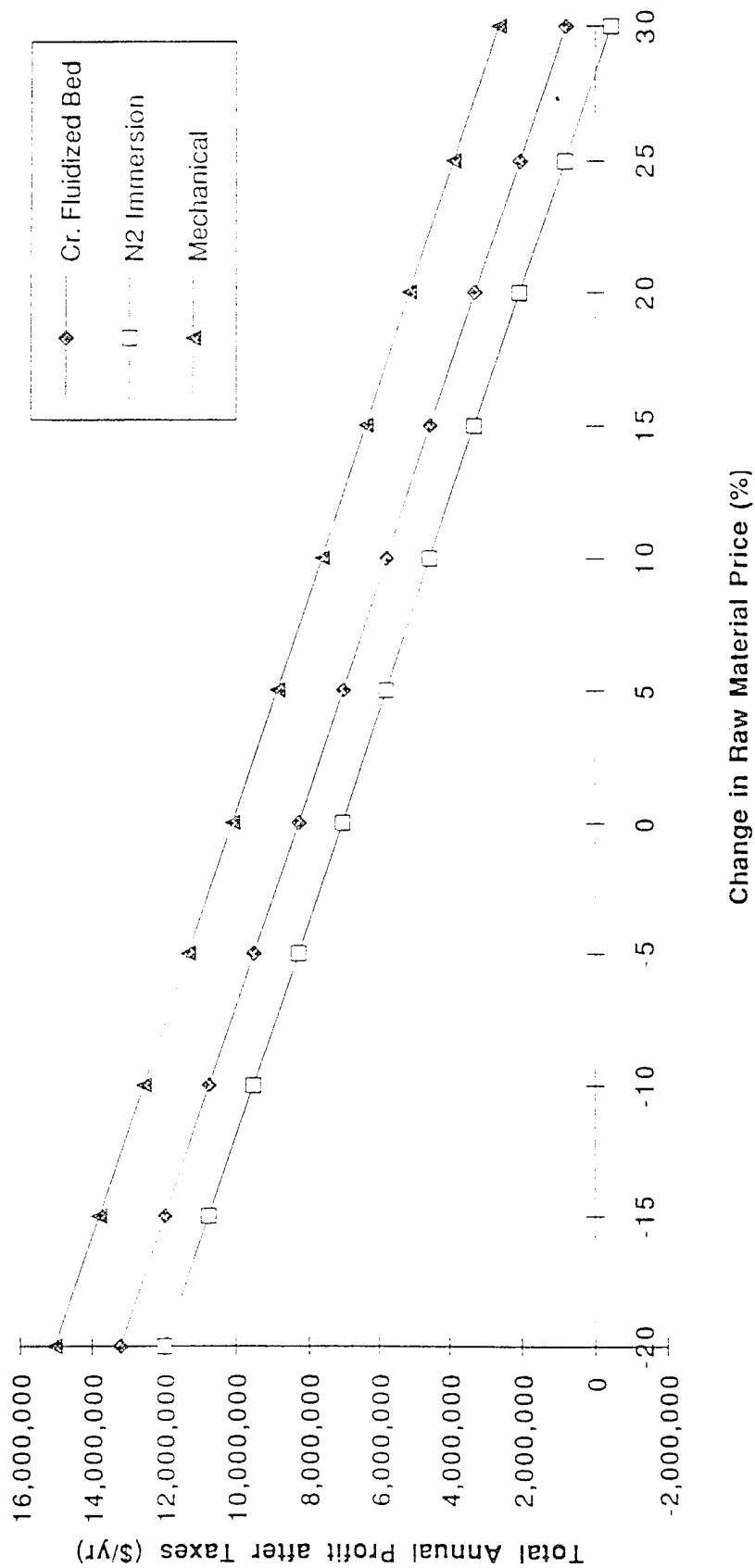
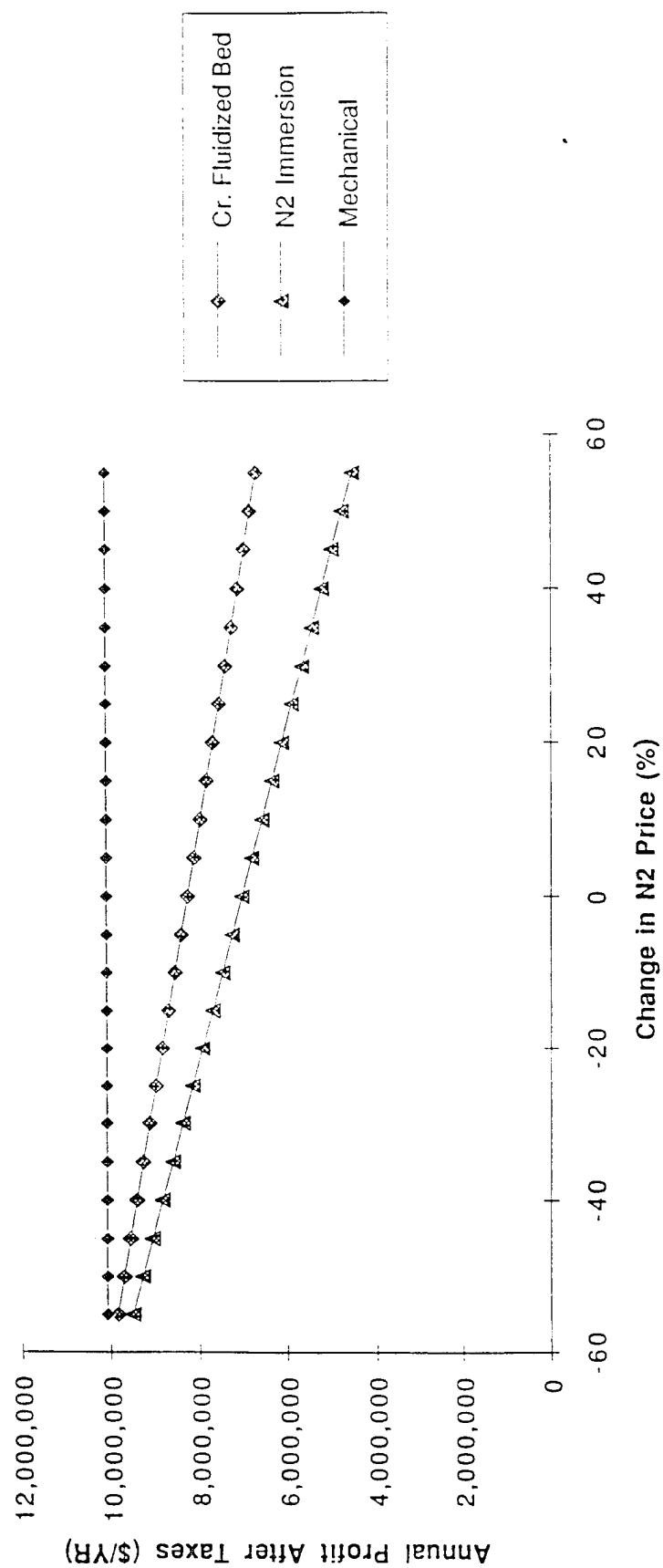


Figure 17.4. Effect of the nitrogen price on the annual profits after taxes.



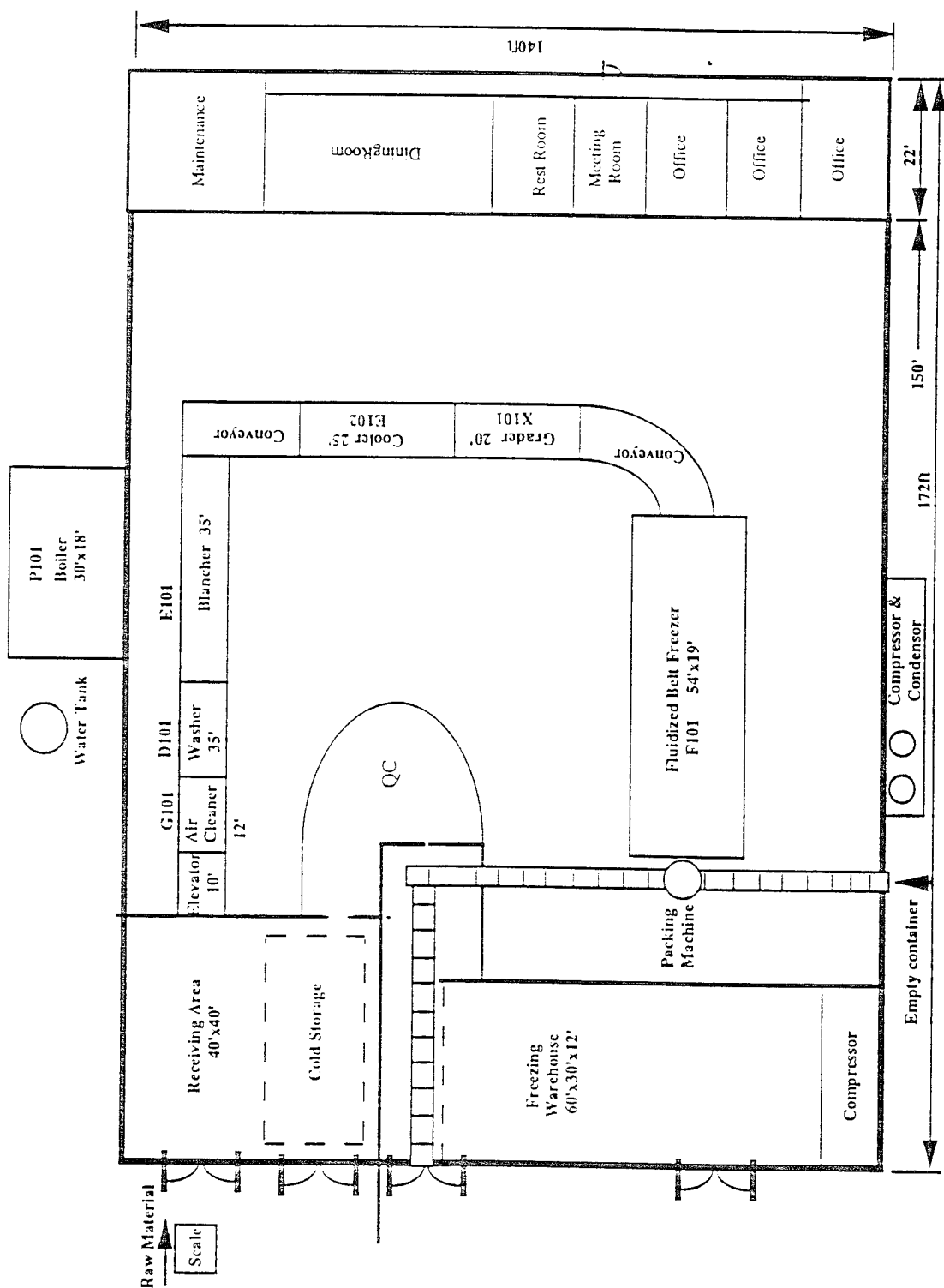
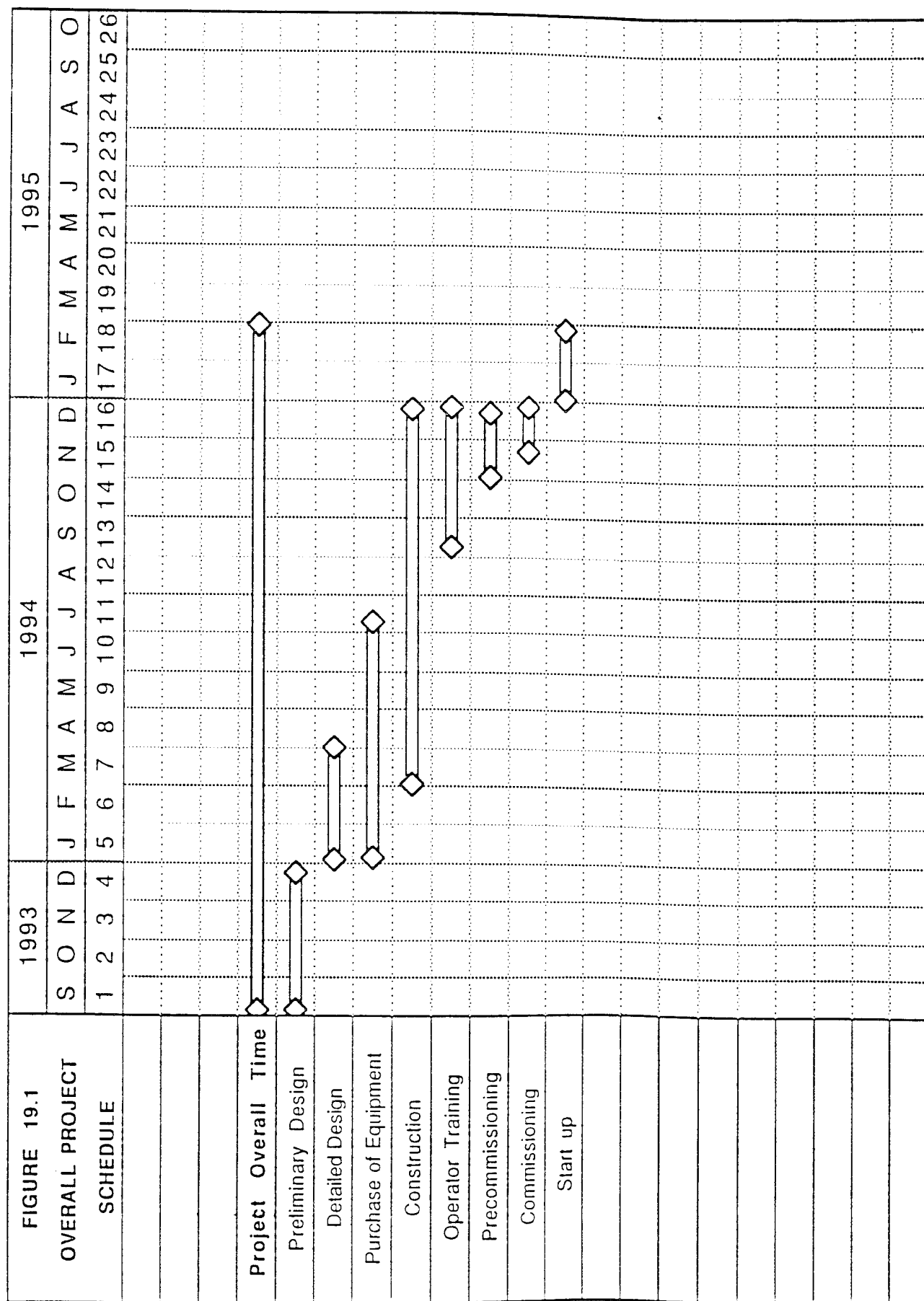
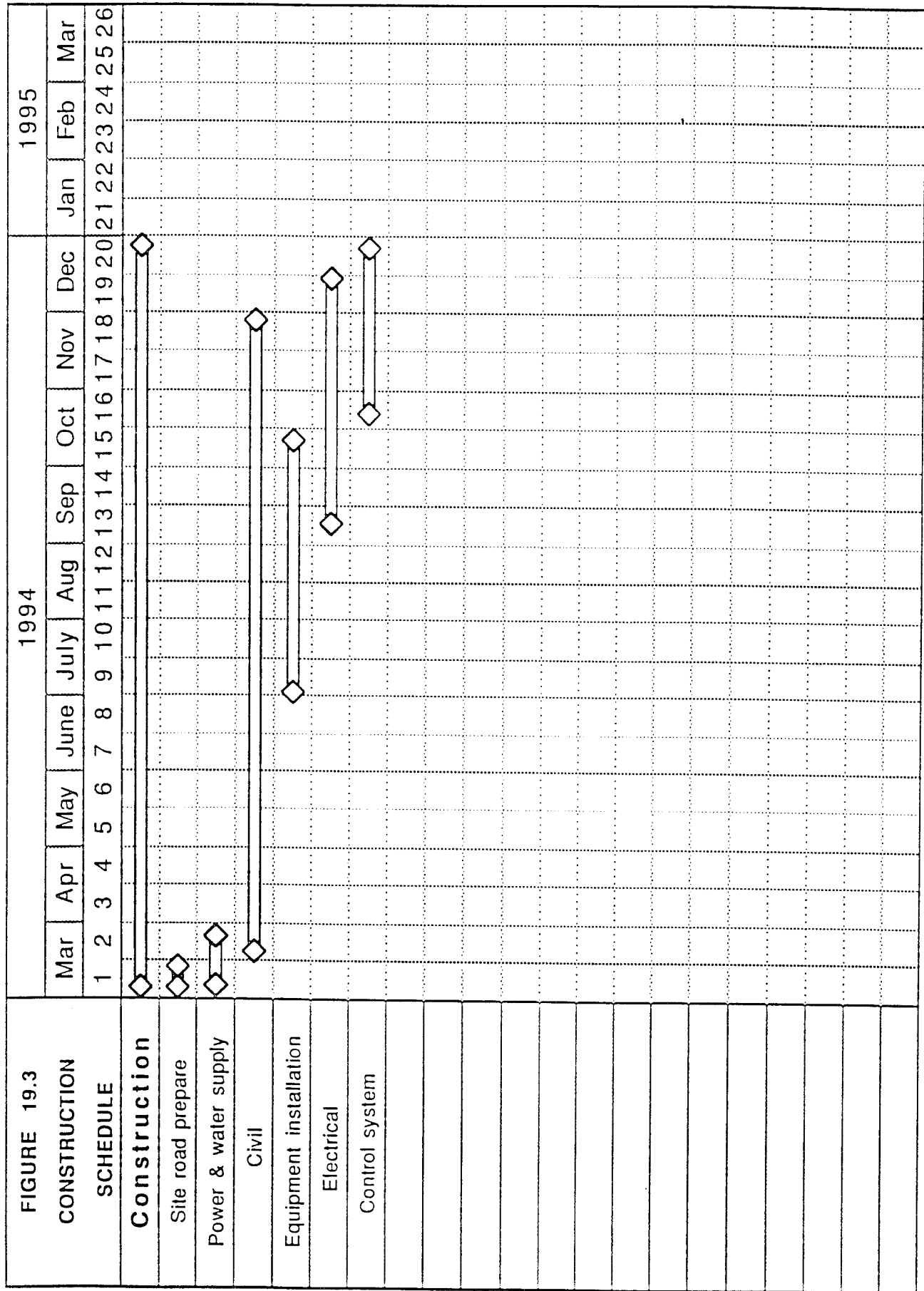


FIGURE 18.3. PLANT LAYOUT FOR MECHANICAL OPTION





RUTGERS

3/23/95

VAN NESS CONSULTING

2 DAVID'S LANE
OSSINING, NY 10562

Optimizing process conditions to yield a greater variety of high quality products.

OUTLINE

Thermal processing:

- 1) Definition of processing to commercial sterility.
- 2) Obtaining and filing a process for commercial sterility
- 3) Critical control points.
 - a) Particle size
 - b) Weights
 - c) Viscosity
 - d) other factors to consider
 - e) formula changes
- 4) Assessment of variability.
 - a) Calibration and repeatability of measuring instruments.

Using the process to cook a raw product.

- a) hydration rates
- b) heating characteristics

Sous Vide:

What is it?

- a) no process need to be filed because it is a refrigerated product
- b) what are we trying to do

Critical control points.

- a) sanitation
- b) traceability of ingredients and exposure conditions

Refrigerated foods and what this means

- a) shipping control
- b) abuse indicators

Flash cooling an aid or suppliment to better quality products.

- a) principle of operation
- b) advantages
- c) mix, cook, cool in one vessel
- d) examples of cool times for 3 products

Optimizing process conditions to yield a greater variety of high quality products.

OUTLINE

Shelf Stable canned foods

Thermal processing:

- 1) Definition of processing to commercial sterility.

In order to process low acid canned foods the products must have their processes filed with the FDA or other regulatory agency. When filing a process with the FDA critical factors must be defined. Over twenty critical factors are listed on filing form (FDA 2541a) along with a blank for other factors delineated by the process authority to assure commercial sterility.

- 2) Obtaining and filing a process for commercial sterility

is done by using accepted determination procedures and taking into account observations made on site to assess the capabilities and practices of the processor.

Thermal processing usually delivers a commercially sterile process to low acid foods and a $F_{16/200}$ value to acid foods $\text{pH} \leq 4.5$. Significantly shortened retort processing times based on the makeup of the product could have application to foods where the $\text{pH} \leq 5$.

4) Assessment of variability.

Must be part of arriving at a process that can effect "public health significance".

a) Calibration and repeatability of measuring instruments.
controlling the critical factors must be defined and maintained.

3) Critical control points.

Such as particle size and weight, number of particles deposited, the viscosity or other factor influential to the heating medium within the container, head-space, vacuum or other point may be a critical control point.

a) If particle size & b) Weights

are considered critical, the range of the variation in weights expected must be established. Acceptable limits may then be set. A target weight is set through observation or statistical sampling and considering the resolution of the weighing means a range can be established.

ANECDOTE

"For example, if a target weight of 2 oz is desired yet the resolution of the scale is .2 oz a weight of 2.4 or 2.6 oz may be set as a critical limit so that a critical control chart can be developed and adhered to. If a piece weight or a RDW can be closely maintained with little variation these limits can be finely tuned."

c) Viscosity

is often a critical factor because heat penetration is effected by the thickness of the product. Therefore the ingredients that influence these factors are increased, say, 10-15% over formula weight or as determined by "limitation" studies for the process determination. Careful records are to be kept to show that consistency influencing components are kept as close to formula as practical without exceeding the critical limits. Starch lots may be tested for variation in their influences and a correction table for variation be developed. Any correction will usually be maintained throughout that lot.

d) other factors to consider

might be filling temperature, vacuum, head space (as might be the case where agitation increases the heating rate) etc. Careful records must be kept to present to the appropriate regulatory agencies when requested.

e) formula changes

as well as ingredient changes may be considered critical factors.

ANECDOTE

"An inspector comparing a formula with purchasing information may see an ingredient stated as frozen but on the invoice the ingredient may be stated as IQF (individually quick frozen) and the inspector may make an observation that a change in formula has occurred. Not all inspectors have intimate knowledge of food production."

Once critical factors are established they must be adhered to. If the critical control points are varied from, the results must be evaluated and recorded. New studies may need to be performed duplicating the variation if the loss of the product is to be considered. If a process deviation is released without proper evaluation and clearance procedures a recall may be initiated and serious consequences could develop. Public reaction, major expense and in the worst case a health hazard could result.

Using the process to cook a raw product.

a) hydration rates

&

b) heating characteristics

Uncooked components such as some dried vegetables, pasta, meats can be cooked in the process if their hydration rates, performance and resulting

heating characteristics are determined. Sometimes problems of different softening rates are found and a process is established to adjust for these differences. Clumping may be a consideration and the addition of an oil to, say, a dried pasta might minimize sticking. Macaroni with cheese and meat and pastas with turkey are other examples.

Extended shelf life refrigerated products:

include Thermostabilized (TS) foods where extended shelf life under prescribed conditions (eg. refrigeration), is accomplished without achieving commercial sterility values. These products could be processed to a some heating value to attenuate microbial growth. The actual values could be determined through inoculation challenge studies or storage and plating studies. Shelf-life for a refrigerated product may be extended from (1) one week to (3) three weeks.

These TS products require a more stringent control program prior to the application of a heat process. A HACCP program will greatly lower risks and extend shelf life because the uncooked microbiological load will be minimized.

This usually involves adhering to a tracking and sanitation regimen to tightly control the critical points. Procedures for maintaining safe products are documented.

Sous Vide:

What is it?

Is a process where the food is partially cooked to preserve fresh characteristics and to shorten finished product preparation time. This process is not filed with a regulatory agency because it is a refrigerated item. It presents a more convenient item at both the institutional and consumer level. The refrigerated shelf life of the product is extended over non-thermostabilized refrigerated products (approximately 2-3 weeks total).

I believe that Rutgers as well as MIT have done studies in these areas.

Determining a process for a Sous Vide product requires some additional studies over commercially sterilized products such as canned food because the product is in effect only pasteurized. This process should render inactive the refrigerator spoilage organisms that could survive under these storage conditions. The process does not destroy *C. botulinum* or thermophilic spores.

Refrigerated foods and what this means

Spore-formers are much harder to kill and most cannot be controlled with the "Sous Vide" technique. Therefore refrigeration is a post process requirement.

These types of retail products may be more suited to the up-scale market that wants a premium entree without waiting for the product to defrost.

what are we trying to do in this process

is to cook a packaged product to an internal temperature approximating a well cooked entree. The internal temperatures attain those prescribed by the USDA to ensure minimal microbiological threat for that specific food type . Examples may include poultry, beef, pork and Rack of lamb

195 170 185 180

Conditions attained with Sous Vide:

- 1) anaerobic with refrigeration.
- 2) No anaerobic growth. Salmonella does not grow-at refrigerator temperatures and is killed by pasteurization equivalent to that given milk.
- 3) entered thermophile range for a time, product should be rapidly cooled.
- 4) Most yeasts and molds will be killed at 140F for 10-15 minutes.

Thermal Death Times for Bacterial cells

Salmonella thyphosa 4.3min/50C-122F

Streptococcus thermophilus 15min/75C-167F

As protective substance content (protein and fats) decrease
the temperature needed to kill the organism in 10 min decreased.

E. coli 30min/57.3C-135.14F

Various media					
	broth	whey	skim milk	whole milk	cream
10 min kill C/F	61/141.8	63/145.4	65/149	69/156.2	73/163.4

Lactobacillus bulgaricus 30min/71C-159.8F

Various media				
	whey	skim milk	whole milk	cream
10 min kill C/F	83/181.4	89/192.2	91/195.8	95/203

Critical control points.

a) sanitation

Sanitation begins with good GMPs. All employees especially the line personnel must understand their role in producing a safe and high quality product. Good QC is dependent on the cleanliness and habits of the line workers.

They must to insure a safe product:

Wash their hands periodically at the local wash station

Clean the utensils used in product preparation in a sanitizing solution

They should wear uniforms and not street clothes while working on line

There may be a need for more involved sanitation procedures depending on product and process involved.

b) traceability of ingredients and exposure conditions:

Incoming raw materials should be lot coded and tested for necessary functionality and possibly bacteriological load.

If the temperature of the production room is to be kept cool a chart should show this.

Batching cards should record the lot # and quantity of the ingredient used. This information should be traced to the individual container code.

Since refrigerated foods are perishable

a) tight shipping control as far down the line as possible is desirable

This product must be refrigerated at all times after processing and should be labeled to indicate this.

b) abuse indicators may be necessary

There may be indicators available to indicate that the product has been exposed to temperatures higher than refrigerator temperatures.

Flash cooling is sometimes an aid in producing premium high quality products.

a) principle of operation

This method uses the principles of evaporative cooling. The process utilizes excess water and removes dissolved air allowing for lower vacuums where needed. For every pound of vapor removed 1000 BTU of heat are removed from the product

b) advantages

These systems require minimal operating supervision and are low in maintenance.

The product being cooled does not contact the cooling equipment. This allows for a wider selection of construction materials. These systems can reduce time requirements, increase plant capacities and help meet some stringent federal requirements for rapid cooling.

The speed of vacuum processing (cooling) may help preserve product quality, enhance shelf life, and enhance perceived freshness.

c) mix, cook, cool in one vessel

It is possible to mix, cook and cool on the same vessel. This can reduce processing time while eliminating a product transfer step which could in turn eliminate a critical point.

d) Examples of rapid vacuum cooling:

1000 gal red sauce 200F-45F in 14 minutes

2000 lbs potatoes 210F-40F in 20 minutes

2500 lbs palletized mushrooms 75F-35F in 20 minutes

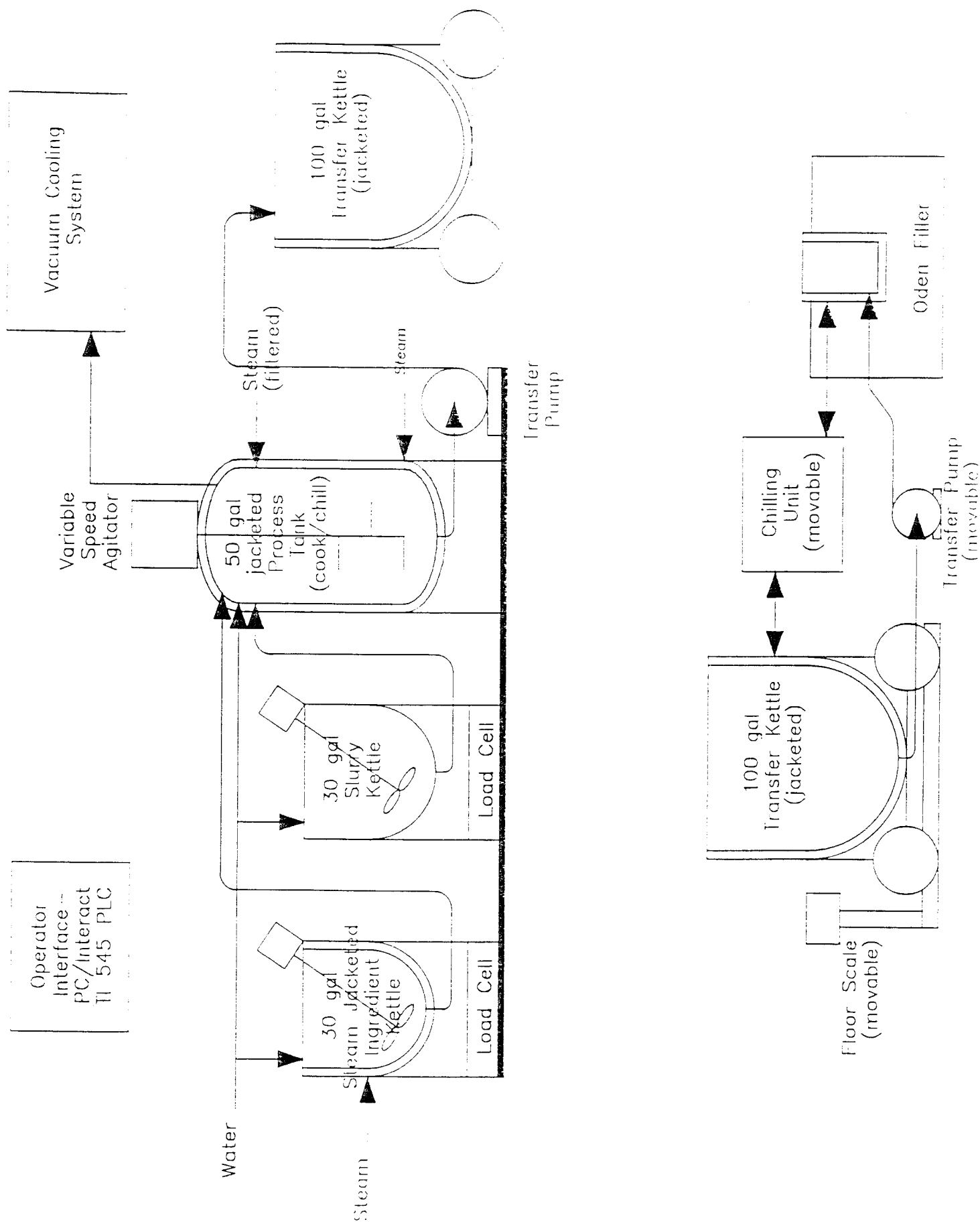
Flash cooling from high temperatures to or near ambient temperature is not usually classified as refrigeration but such intermediate cooling requirements are becoming more important in food production.

The resulting effect on flavor components must be assessed for the product cooled.

What I tried to do today was to give you a general overview of some of the different process approaches that you can choose from to provide a high quality product. When you approach these processes in a systematic way it will allow you to improve your efficiencies at the same time.

Gravy Processing System

Dec. 3, 1993



CENTER FOR ADVANCED FOOD
TECHNOLOGY

TECHNOLOGY EXTENSION PROGRAM

PACKAGING	-	Vertical f/f/s Thermostabilization
		Horizontal /f/f/s w/o Thermostabilization

PACKAGE:

A WRAP OR BOX FOR PRESERVING A MATURE PRODUCT.



He was a good family man. A man who dedicated his professional life to the advancement of packaging technology. And according to the ink jet expiration date printed on his forehead—he is a man who will keep remarkably fresh well into the next century.

O STATUS QUO

FOODS ARE FORMULATED USING IN-PLACE
PACKAGING LINE PACKAGING TECHNOLOGY

O STRETCH PACKAGING PRODUCTION CAPABILITY
FORMULATE FOODS USING NEW
PACKAGING LINE TECHNOLOGY

FOOD PRODUCT QUALITY -

QUALITY CONTROLLED PRODUCTION

CONTROLLED SHELF LIFE

RE-CONSTITUTION BY CONSUMER

FOOD PACKAGE -

RETAIN FOOD PRODUCT QUALITY

PROVIDE SHELF LIFE

EASILY OPENED

ENVIRONMENTALLY POSITIONED

VALUE COST RELATIONSHIP

PACKAGE MATERIAL

○ PHYSICAL PROPERTIES

FORMABILITY

SEALABILITY

○ BARRIER PROPERTIES

MVTR

OXYGEN

ATMOSPHERE CONTROL

○ SIZE

MULTI SERVICE

SINGLE SERVICE

SHELF LIFE - FOOD PACKAGE
FORMULATED FOOD MENU PRODUCTION
CANNED OR POUCHED

0 3 to 5 YEARS

RETORT PROCESSING

LONG TERM SHELF LIFE

CHANGES/DESTROYS FOOD FLAVORS

CHANGES/DESTROYS FOOD TEXTURE

VARIETY OF PACKAGING MATERIALS

RIGID CONTAINER OR FILM POUCH

LOW COST PROCESS

O 6 MONTHS TO 1 YEAR.....

NO RETORT PROCESSING

SHORT SHELF LIFE

LESS FLAVOR CHANGE/DEGREDAATION

DUPLICATES INITIAL COOKED FOODS TEXTURE

VARIETY OF PACKAGING MATERIALS

RIGID CONTAINER OR FILM POUCH

PACKED ASEPTIC ENVIRONMENT

HIGHER COST PROCESS

PRODUCTION REQUIREMENTS NON RETORTED PRODUCTS

FOOD PREPARATION ROOM SAME AS RETORT
CLEANLINESS ROOM CONDITION - PACK OUT AREA
CLEAN f/f/s MACHINE
"CLOSE TO" ASEPTIC HANDLING & ENVIRONMENT
SHROUD FILLING (f/s) AREA
CLEAN FORMED UNTOUCHED TRAYS
GAS FLUSH PROCEDURE TO APPROACH STERILITY

THESE PROCEDURES ARE NOT NEW.....

UHT PROCESSED DAIRY PRODUCTS 2 WEEKS MAX
w/STERILIZED CARTON STEP NOW 6 WEEKS +

OJ PACKED IN GABLE TOP CARTONS 3 WEEKS
W/ESL CRITERIA CONDITIONS NOW 8 WEEKS

REFRIGERATED ENTREES DEPENDS ON SOURCE

REFRIGERATED PRODUCE

MAJOR CONCERN MICROBIOLOGICAL SAFETY

70-90 DEGREES C TARGET TEMPERATURE MINIMUM

TIME DURATION CONTINGENT ON EACH:

FOOD PROCESS CONDITIONS

TRAY/PACKAGE THROUGH LIDDING

GABLE TOP CARTON ERECTION AND FILLING

SANITATION FEATURES

BENEFITS

Metering bowl is hermetically sealed and product is on both fill piston.

Eliminates possibility of contamination from air contact.

Insulate product tank to reduce condensate.

Minimizes condensate drip contamination.

Fill system completely enclosed for automated cleaning.

Requires no hand cleaning of full bowls.

Condensate control on all welded mandrels and a UV sterilizing system limits recirculating solution contamination.

Minimizes carton contamination by cooling solution leaks.

Fogs & sprays all carton and external product contact surfaces.

Minimizes carton and product contamination.

stainless steel as all other carton and product surfaces.

chemicals, latic & citric acids.

SS covers from infeed to discharge.

Maximizes protection from water entry.

Filler frame completely enclosed w/ interlocked doors and plexi windows.

Prevents operator from operator handling, touching components.

All machine air is manifolded and collected for venting outside of filling room.

Improves atmosphere inside machine and keeps filling room air as clean as possible.

HEPA filtration "controlled environment" system w laminar air flow.

Improves product quality and sanitation. Extends refrigerated shelf-life beyond normal expectations.

Source:
Evergreen Packaging Equipment

PROGRAM FOCUS -

MENU

MACARONI & CHEESE W/CHICKEN
ZITI W/GROUND TURKEY

VERTICAL
f/f/s POUCH

PACK PRODUCT f/f/s MACHINE
ALUMINUM FOIL POUCH or =
RETORT PACKAGED PRODUCT
FREEZE/REFRIGERATE PRODUCT
SECONDARY PACKAGE
LABEL

HORIZONTAL
f/f/s TRAY w/LID

COMPLETE MENU PREPARATION

DEPOSIT MENU IN FORMED TRAY

MINIMIZE
MICROBIOLOGICAL CONTAMINATION

LID IMMEDIATELY

SECONDARY PACKAGE

LABEL KEEP FROZEN

REFRIGERATE UNTIL USE

DRIVING FACTORS BEHIND CHANGE IN FOOD PACKAGING

BUSINESS RETENTION

CONSUMER DEMANDS

PRODUCT COMPETITION

NICHE FOOD PRODUCTS

PACKAGING MATERIAL PRODUCERS

BETTER QUALITY MENUS

CURRENT MARKETS -

RIGID

METAL CANS
GLASS JARS

METAL LID PLASTIC BODY CUPS
FILM LID/ PLASTIC TRAYS

FILM POUCH

ALUMINUM FOIL
MONO-LAYER FILMS

MRE
POTATO CHIPS
MOISTURE
PROTECTION ONLY

MULTI-LAYER FILMS

MOISTURE
OXYGEN
GAS
PROTECTION

DESIGNED
PROTECTION
SPECIFIC FOODS

PLAN YOUR FUTURE

O STATE OF THE ART PRODUCTION

O PLANT CLEANLINESS

O SHELF LIFE

O MARKET DRIVEN PRODUCT

"PEOPLE DONT PLAN TO FAIL

THEY JUST FAIL TO PLAN"

CAFT PRODUCTION WORKSHOP
PRODUCTION PLANNING
MARCH 23, 1995
BRUCE REX

PRODUCTION

- * MARKET OPPORTUNITIES
- * MARKET DEVELOPMENT
- * PRODUCT DESIGN
- * PRODUCTION PLANNING

PLANNING PROCESS

FOUNDATION:

- BILL OF MATERIALS
- ECONOMIC ORDER SIZE
- BATCH SIZE
- MIN. PRODUCTION RUN

REQUIREMENTS:

- SALES FORECAST
- CUSTOMER ORDER
- MIN. INVENTORY

LEAD TIMES:

- MARKETING/SALES
- CONTRACT
- PRODUCTION

PRODUCTION LEAD TIMES

PURCHASE SUPPLIES

QUALITY CLEARANCE

PROCESSING

PACKAGING

QUALITY CLEARANCE

PLANNING PROCESS

REQUIREMENT/EXISTING INVENTORY

PURCHASING

INVENTORY

OPEN ORDERS

ECONOMIC ORDER QUANTITY

PURCHASE ORDER

APPROVED VENDORS

WAREHOUSE RECEIPT

SCHEDULING

PRODUCTION PLAN 12-16 WEEKS

MACHINE LOADING 6-8 WEEKS

WEEKLY

MACHINE TIME HOURS

MANPOWER HOURS

PLANNING PROCESS-CONTINUED

WAREHOUSE RECEIPT

SHIPPING ORDER

BILL OF LADING

CUSTOMER INVOICE

INVENTORY ADJUSTMENTS

CYCLE COUNTS

DEFECTIVE MATERIAL PROCEDURES

IDENTIFY

DISPOSITION

SALES SAMPLES

PLANNING SYSTEM MUST BE ABLE TO TIE TOGETHER
INFORMATION PERTAINING TO:

SALES
PRODUCTION
COSTS/VARIANCES
INVENTORY VALUES
PURCHASING

OTHER CONSIDERATIONS
LOT TRACKING-RECALL
CHANGES
SALES/MARKETING
CUSTOMER
MANAGEMENT-BETTER & CHEAPER

PRODUCTION WORKSHOP

QUALITY CONTROL

QUALITY INVOLVEMENT

Plant Layout

Product Design

Manufacturing

QUALITY PROGRAMS

HACCP

Recall Program

Good Manufacturing Practices

Lab Manual

CUSTOMER INSPECTIONS

Old Audits

Customer Specifications

Auditors Background

KOSHER PRODUCTION

Kosher Certificates

Labeling

SCHOOL LUNCH PROGRAM

Child Nutritional Labeling

Product Analysis

FDA CONTINUING COMMUNITY GUARANTEE

QUALITY INVOLVEMENT

Plant Layout

Equipment Layout

Traffic Patterns

Sanitary Design

Product Design

Labeling Requirements

Kosher Requirements

Manufacturing Limitations

Manufacturing

On Line Quality Control

Cost Savings - Weight Control

QUALITY PROGRAMS

Hazard Analysis Critical Control Points

Product Flow Diagram

Plant Floor Plan

Critical Control Plants

Specifications

Responsible Officers

Record Locations

Action Plan for Deviations

Corrective Action

Verification of Critical Control Points

Recall Program

Written Program with Current Names and Phone Numbers

Crisis Flow Chart

Customer Complaint Form

Recall Statement

Current Distribution List

Shipping Log

Hold Release Program

Written Program

Specifications

Hold Tags

Good Manufacturing Practices

Glass Policy

Hairnets and Shoes

Open Bags or Containers

Water Hoses

Pallets and 18 Inch Perimeters

Lab Manual

Written Test Procedures

Products to Test

Testing Frequency

Reference

Revision Date

CUSTOMER INSPECTIONS

Old Audits

Auditing Form

Review All Previous Audits

Customer Specifications

Review All Specifications

Check Product Against the Specification

Auditors Background

Education, Experience, Preferences

Walk Through Inspection

Bathrooms

Parameters

Records

Pest Control

Repair Before Audit

KOSHER PRODUCTION

Kosher Certificates

Certificate

Effective Date

Labeling

Symbol of Certification

Pareve Symbols

Dairy or Meat Symbols

SCHOOL LUNCH PROGRAM

Child Nutritional Labeling

Labels USDA Approved

Eligible Products

Product Analysis

Product Analysis Form

FDA CONTINUING COMMUNITY GUARANTEE

Continuing Guarantee Form

Adulteration

Mislabeleding

Good Manufacturing Practices

Other FDA, USDA, State, and Local Ordinances

s s s THE COST TO SELL s s s

RUTGERS, THE STATE UNIVERSITY OF NEW JERSEY

CENTER FOR ADVANCED FOOD TECHNOLOGY

PRODUCTION WORKSHOP

MARCH 23, 1995

OBJECTIVE: MAXIMIZE SALES AND PROFITS.

COST + PROFIT = "SELLING PRICE"

SOME COST FACTORS

- ♦ **BRICK AND MORTAR**
- ♦ **EQUIPMENT AND MANUFACTURING**
- ♦ **RAW MATERIALS AND PACKAGING**
- ♦ **MARKETING AND ADMINISTRATION**
- ♦ **SALES AND DISTRIBUTION**

"COST TO SELL"

COMPETITION

***PRODUCT QUALITY**

***PACKAGING**

***PROMOTION AND ADVERTISING**

***PRICE**

CLASS OF TRADE

***FOOD SERVICE OR RETAIL**

***DIRECT BUYER OR DISTRIBUTOR**

***CHAIN OR INDEPENDENT**

SALES EXPENCE

***DIRECT SALES FORCE**

***BROKER SALES FORCE**

CLASS OF TRADE

FOOD SERVICE

***HOTELS & RESTAURANTS**

***MASS FEEDING PROGRAMS**

◆ CAFETERIA AND VENDING

◆ HEALTH CARE INDUSTRY

◆ EDUCATION

◆ GOVERNMENT

RETAIL TRADE

***TRADITIONAL GROCERY STORE**

◆ INDEPENDENT GROCERS

***SUPERMARKETS**

◆ CHAIN AND CO-OP

***ALTERNATIVES**

◆ WAREHOUSE/CLUB STORES

◆ CONVENIENCE STORES

◆ AUTO SERVICE CENTERS

WHO MAKES THE BUYING DECISION?

- ♦ **CORPORATE BUYING STAFF**
- ♦ **UNIT MANAGERS**
- ♦ **STORE OWNERS**
- ♦ **DISTRIBUTORS**
- ♦ **ORDER CLERKS**

3 BASIC RULES OF SELLING

- 1) YOU CAN'T SELL TO SOMEONE WHO DOESN'T WANT TO BUY.**
- 2) ALL BUYERS WANT TO FEEL SECURE IN THEIR DECISIONS.**
- 3) MAKING BUYER'S SECURE COSTS \$\$\$.**

BUYER'S ULTIMATE CONCERN

**HOW DO I LOOK MAKING THIS
DECISION?**

TAKING AWAY THE RISK

CONCERN: IS THERE ROOM FOR NEW ITEM?

SOLUTION: SLOTTING FEE AND ACCRUAL

CONCERN: WILL THE PRODUCT PERFORM?

SOLUTION: GUARANTEE SALE

CONCERN: WILL THE PRODUCT SELL?

SOLUTION: PROMOTIONS AND AD PURCHASE

CONCERN: WILL I BE UNDERSOLD?

SOLUTION: GUARANTEE PRICE INTEGRITY

TRADE RELATED COSTS

***"SLOTING FEE", "SET UP" FEE**

- ◆ ONE TIME CHARGE
- ◆ COST OF LISTING PRODUCT
- ◆ "FLAT DOLLAR" COST

***HEADQUARTER / DISTRIBUTOR ACCRUAL**

- ◆ ON-GOING PROGRAM
- ◆ SELL YOUR ITEMS
- ◆ \$/CS PAID QUARTERLY

***AD PURCHASE**

- ◆ "FLAT DOLLAR" AMOUNT
- ◆ ADVERTISEMENT PLACEMENT

***PROMOTIONAL ALLOWANCE**

- ◆ COST REDUCTION
- ◆ PASSED THRU DISTRIBUTOR
- ◆ SPECIFIED PERIOD & PURPOSE

***HEADQUARTER / DISTRIBUTOR INCENTIVE**

- ◆ ESTABLISH & ACHIEVE OBJECTIVES
- ◆ SET TIME FRAME
- ◆ \$/CS PAID WHEN PERIOD ENDS

***END USER PROGRAM PROGRAM**

- ◆ DISTRIBUTION ALLOWANCE
- ◆ FREE MERCHANDISE
- ◆ SUGGESTED RECIPES
- ◆ PREPARATION INSTRUCTIONS

***LEAKER ALLOWANCE / GAURANTEE SALE**

WHAT KIND OF SALES FORCE SHOULD I HAVE?

DIRECT - PAYROLL

- INSURANCE**
- AUTO EXPENSE**
- ENTERTAINMENT**

BROKER - INITIAL RETAINER

- COMMISSION**

ZITI WITH GROUND TURKEY

Features: Fully prepared. Ease of preparation. Low in fat. Just heat and serve.

Directions: Preheat oven to 300°, heat for 40 - 45 minutes. Serve.

Product Description: Fully prepared dish. Ziti and ground turkey with a flavorful blend of herbs and spices to give the dish a zestful tang using low calorie and low cholesterol turkey.

Shelf Life: 30 days when refrigerated. One year shelf stable (retorted).

Packaging: 6 LB Pouch / Tray, 6 / case

FDA Status: All products used in manufacturing are GRAS and meet the specifications set by the FDA.

Ingredients: Ziti, tomato sauce, turkey, chicken broth, garlic, onions, oregano, salt, basil, black pepper.

Serving Information - Four ounce serving / 115 grams

Calories	172.06
Protein	9.45
Carbohydrates	14.51
Fat	8.47
Sodium	194.03

	120 Servings	Cost	Cost/serving
Ziti	5 lbs	\$ 2.55	\$.02125
Oil	12 oz	.56	.00467
Turkey	7 lbs	7.00	.05833
Garlic	1 lb	1.25	.01042
Onion	1 lb	.64	.00533
Oregano	4 oz	.48	.004
Basil	2 oz	.14	.001167
Black Pepper	1 oz	NA	NA
Salt	2 oz	NA	NA
Chicken Broth	44 oz	1.32	.011
Tomato Sauce	12 lbs 3 oz	4.17	.03475
Parsley	2 oz	.20	.00167
Total	30 lbs 6 oz	\$ 17.06 plus labor / serving	\$.1422 .10 .2422

MACARONI AND CHEESE WITH CHICKEN

Features: Ease in preparation. Fully prepared - just heat and serve. Nutritious, containing all food groups.

Directions: Preheat oven to 300°, bake for 45 minutes. Serve.

Product Description: Fully prepared dish. Macaroni and cheese with chicken pieces and a few spices added.

Shelf Life: 30 days when refrigerated. One year shelf stable (retorted).

Packaging: 6 Lb Pouch / Tray, 6 / case

FDA Status: All products used in manufacturing are GRAS and meet the specifications outlined by the FDA.

Ingredients: Macaroni, cheese, chicken, milk, vegetable oil, black pepper, salt, sage, rosemary.

Serving Information - **Four ounce serving / 115 grams**

Calories	260.96
Protein	17.86
Carbohydrates	9.96
Fat	16.63
Sodium	376.57

	120 Servings	Cost	Cost/serving
Oil	12 oz	\$.56	\$.00373
Chicken (diced)	9 lbs	12.87	.0858
Rosemary	1 oz	.07	.000467
Sage	2 oz	.14	.0093
Salt	2 oz	NA	NA
Black Pepper	4 oz	NA	NA
Cheese Sauce	13 lbs 4 oz	10.98	.0732
Cheddar Cheese	3 lbs	4.35	.029
Macaroni	5 lbs	2.70	.018
Milk	96 oz	1.92	.0128
Total	37 lbs 9 0oz	\$ 33.60	\$.223927
		plus labor /serving	.10