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BAKED, LEAVENED BREADS

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INDUSTRY PROFILE #19 (1991)

VITA

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INDUSTRIAL PROFILES

THIS INDUSTRY PROFILE IS...

one of a series briefly describing small or medium-sized industries. The Profile provides basic

information for persons wishing to start manufacturing plants in developing countries. Specifically,

the Profile contains general plant descriptions, financial and technical factors for plant

operation, and sources of information and expertise. The series is intended to be useful in determining

whether the industries described warrant further inquiry, either to rule out or to decide

upon investment. The underlying assumption of the profiles is that the individual making use of

them already has some knowledge and experience in industrial development.

Dollar values are listed only for machinery and equipment costs, and are primarily based on

equipment in the United States. The prices do not include shipping costs, duty, or taxes, which

must be considered and will vary greatly from country to country and with the type of equipment.

Requirements, but not costs, are given for land, labor, materials, fuel, etc., to provide potential

investors with a general checklist of considerations for setting up a business.

THIS INDUSTRY PROFILE IS NOT...

a substitute for a feasibility study. Before any investment is made in a plant, a thorough feasibility study should be conducted. This may require skilled economic and engineering expertise. The following questions illustrate the range of answers that may be required:

- * Is there a market for the product? What is the extent of the present demand for the product, and how is it being satisfied?
- * Will the estimated price and quality of the product make it competitive?
- * How will the plant be financed?
- * Has a realistic time table been developed for construction, equipment delivery, obtaining materials and supplies, training, and start up?
- * How are needed materials and supplies to be procured? How will machinery and equipment be maintained and repaired?
- * Are trained personnel available? Is training available?
- * Are there adequate facilities for transportation, storage, power/fuel, communication, water, etc.?

- * What management controls for design, production, quality control, and other factors have been considered?
- * Will the industry complement or interfere with development plans for the area?
- * What social, cultural, and technological considerations must be addressed regarding the manufacture and use of this product?
- * What will be the environmental impact of the manufacture and use of the product?

Fully documented information responding to these and many other questions should be compiled before proceeding with implementation of an industrial project.

Professional engineers who specialize in industrial design can be found through their national associations or by referring to the published cards in many engineering journals. The services of a professional engineer are desirable in the design of even small industrial plants. An experienced engineer can design a plant that provides the greatest economy in the investment of funds and which will be capable of expansion without extensive alteration.

Manufacturers of industrial equipment employ engineers familiar with the design and installation

of their specialized products. These manufacturers are usually willing to give prospective customers the benefit of engineering advice to help determine the suitability of their equipment in any proposed project.

ABOUT VITA

Volunteers in Technical Assistance (VITA) is a private, nonprofit, international development organization.

It make available to individuals and groups in developing countries a variety of information

and technical resources aimed at fostering self sufficiency. VITA provides assistance in

needs assessment and program development support, by-mail and on-site consulting services, information

systems training, and management of long-term field projects. Special emphasis is

placed on the areas of agriculture and food processing, renewable energy applications, water supply

and sanitation, housing and construction, and small business development--areas in which self

sufficiency in the community is an essential step toward the well-being of the country.

On industrial development projects, VITA provides a range of assistance on a fee-for-service

basis. VITA keeps its costs low because of the extensive participation of skilled VITA Volunteer

industrial and process engineers.

The author and reviewers of this industry profile are VITA Volunteers, specialists in the field, who have donated their time to the preparation and review of this profile.

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PRODUCT DESCRIPTION

The Product

The product is a baked, leavened food whose basic ingredient is flour or meal, to which water is added, and often fat and salt, and sometimes sugar. The principal leavening agent is usually yeast.

The product is made in units (loaves or rolls) in a variety of sizes and shapes

to suit local laws, customs, and tastes. Spices, fruits, nuts, etc., may be added, depending on product and locality.

The Facility

This profile describes a small bakery operating with a single shift and producing 100 tons of baked products a year. It also describes a medium-sized plant operating on the same basis but producing 250 tons of baked goods a year.

Dry materials are received and water added to make dough, which is then blended and processed in a sequence of steps involving mixing the dough, allowing the dough to rise, then portioning, shaping, baking, cooling, and wrapping the loaves to trade requirements.

GENERAL EVALUATION

Outlook

Economic. The economic prospect should be good because many countries throughout the world consume baked goods. Even in areas where rice is the staple food, the consumption of baked goods made from wheat flour is steadily increasing. And in times of economic downturn in more affluent areas, many customers switch from more expensive foods to bakery

products.

Technical. Small, batch-process bakeries producing 200 to 500 kg daily, sold in one or a few locations, can maintain satisfactory market shares.

Manufacturing Equipment Flexibility

Flexibility depends on the variety of special products made. This in turn depends on production volume and market demands.

Knowledge Base

Special knowledge of food chemistry, mechanical engineering, and trade economics are needed.

Commercial baking experience is required. Specialized apprenticeship or formal training in a technical school is highly advisable.

Quality Control

Quality control aims at freedom from adulteration of product, quality assurance of ingredients and products, sanitary packaging practices, and proper storage. Quality control in production involves such variables as density, porosity, appearance, weight, mixture properties, volume, temperature controls, etc. These factors require instrumentation and laboratory testing in

proportion to plant capacities.

Constraints and Limitations

Traditionally, continuous rather than batch mixing is needed for economic operation as production increases. The production level above which continuous operation is needed depends largely on labor costs. But if modern, high-speed mixing is used, energy costs may become important.

MARKET ASPECTS

Users

Users are individual consumers and institutions. Individuals may obtain a wrapped unit either directly on the premises where baked goods are made, or transported from a large wholesale bakery in a distant place. Institutions often obtain their bread from wholesalers. The degree of integration, including transportation and labor costs, determines the cost-price relationship.

Suppliers

Suppliers include millers who mix grain types and bulk ship through food brokers to bakeries.

Construction services originate or improve the plant. Machine erectors install special-purpose devices. Public utilities provide water, sanitation, and electricity.

Sales Channels and Methods

Sales channels and methods depend on the origin of merchandise. Sales to consumers may be made at the bakery site or at multiple sites integrated by centrally located dominant producers. Advertising may cost from 0.1 percent to 5 percent of sales.

Geographic Extent of Market

The geographic range of individual bakeries depends on their capacities, transportation costs, and competition. For bread, the range is usually limited by the extent to which distant markets can be reached in a day's time by surface transport. Improvements in technology have extended the shelf lives of some other kinds of bakery goods from large bakeries.

Competition

In very thinly populated areas, demand may be so low that many products are available only through wholesale distributors. In sparsely populated areas, about 90 percent of the market will be controlled by small producers. In large cities with large producers, the price

structure may be dominated by a few of them. However, small companies may also set prices if the industry does not quickly pass on cost savings to consumers.

Market Capacity

User income level is a major determinant of baked goods acceptability. About 45 kg of the product per year per capita is consumed in the United States. In low-income areas of the world 300 kg would be likely. Baked goods consumption in most high-income societies tends to decline because as income goes up people's preferences shift from cereal-based food to meat. In the United States, the decline is about 1 percent per capita annually.

PROCESS DESCRIPTION

Sample Layout of a Medium-Size Plant, about 250 square meters.

The space required depends not only on the level of production and the kind of product, but on whether production involves two or three shifts per day. <see plant layout>

PRODUCTION AND PLANT REQUIREMENTS

Small Plant Medium Plant

Annual Output: 100 tons/yr 250 tons/yr

1. Infrastructure, Utilities

Land 750 sq m 750 sq m

Building 150 sq m 200 sq m

Power 50 KW 100 KW

Fuel oil 4 KW 4 KW

Water 1 t/hr 2 t/hr

Other

2. Major Equipment & Machinery (thousands of \$US)

Tools & Machinery

ingredient handling-RR car

unload, pneumatics trucks,

conveyors, weigh and meter 300 500

dough-handling troughs,

mixers, proffers, dividers,

rounders, molders, and

homogenizers 400 900

baking and cooling ovens,

conveyors, and racks 200 400

bread-handling slicers,

wrappers, etc. 50 80

Support Equipment & Parts

Refrigerators, pan washers,

depanners, lab equipment 100 500

***TOTAL ESTIMATED COST**

building and land

turnkey on stream 1,800 3,000

*Based on \$US 1987 prices. The estimated costs provide a general idea of the investment required for machinery. Actual costs will depend on just what is purchased, when, and where.

3. Materials & Supplies, tons per year**Raw Materials**

flour 55 140

water 200 500

salt 0.8 2.0

sugar 1.2 3.0

milk 1.2 3.0

fat 2.1 5.3

yeast 0.4 1.0

Supplies Small Plant Medium Plant
miscellaneous food items, shop,
office, and sanitation

Packaging

cartons, boxes, foils, and films

4. Labor

Skilled

supervisor 1 2

Semi-skilled

mixer, weigher, batcher 3 5
(3 for a three-shift operation)

Unskilled

machine operators 10 15

Indirect

warehouse, QC, office 2 4

5. Distribution/Supply flow

Amount in per day 200 kg 500

Amount out per day

(loaves/units) 500 1,250

6. Market Requirements

Retail outlets 1 or 2 2 to 5

7. Other Requirements

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Periodicals

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Bryn Mawr
Avenue, Chicago, Illinois, 60631 USA. 13 issues per yr.

Bakery Production and Marketing Buyer Guide, Chicago: Gorman Publishing Co.

Bakery Production and Marketing Red Book, Chicago: Gorman Publishing Co.

Food Processing. Chicago: Putnam Publishing Company, 301 East Erie Street,
Chicago, Illinois
60611 USA.

Trade and Professional Organizations

American Institute of Baking, 1213 Bakers Way, Manhattan, Kansas 66502 USA. This
not-for-profit
education and research organization offers a large variety of training and
certification
courses in bakery technology. Some courses are offered by correspondence, and
some course brochures
are available in Spanish.

American Society of Bakery Engineers, 2 North Riverside Plaza, Room 1733,
Chicago, Illinois
60806 USA.

Retail Bakers of America, 6525 Belcrest Road, Hyattsville, Maryland 20782 USA.

VITA Resources

VITA has a number of documents on file dealing with industrial processes. In
addition, VITA can
assist with plant design, equipment acquisition, etc., on a fee-for-service
basis.

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