



Industrial Bread Production

GUILAN FOREIGN INVESTMENT SERVICE CENTER

1398



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Introduction:

Bread is the product of baking a mixture of flour, water, salt, yeast and other ingredients. The basic process involves mixing of ingredients until the flour is converted into a stiff paste or dough, followed by baking the dough into a loaf.

The aims of the breadmaking processes used in this project (mechanical dough development, bulk fermentation and no-time doughs) are to produce dough that will rise easily and have properties required to make good bread for the consumer.

To make good bread, dough made by any process must be extensible enough for it to relax and to expand while it is rising. A good dough is extensible if it will stretch out when pulled. It also must be elastic, that is, have the strength to hold the gases produced while rising, and stable enough to hold its shape and cell structure.

Two proteins present in flour (gliadin and glutenin) form gluten when mixed with water. It is gluten that gives dough these special properties. Gluten is essential for bread making and influences the mixing, kneading and baking properties of dough. When you first start to bake bread, learning to mix the ingredients is very important.

Bread manufacturing process

Bread is the product of baking a mixture of flour, water, salt, yeast and other ingredients. The basic process involves mixing of ingredients until the flour is converted into a stiff paste or dough, followed by baking the dough into a loaf. The aims of the bread making processes used in New Zealand (mechanical dough development, bulk fermentation and no-time dough's) are to produce dough that will rise easily and have properties required



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Hearth bread or sour bread: This category of bread is produced with or without lactic acid fermentation. Hearth breads are baked in an open hearth. These breads are becoming popular in France. } Flat bread or roti/chappati: This category of bread is popular in Asian countries. The product is unfermented and flat. This baked on a flat hot pan.

Rolls and other small fermented breads: These products generally have higher levels of sugar and fat in the formulation and thus typically have sweeter taste and softer bite characteristics. The basic recipes for bread making include wheat flour, yeast, salt and water. If any one of these basic ingredients is missing, the acceptable product cannot be prepared. θ Other ingredients are known as optional, for example, fat, sugar, milk and milk product, malt and malt product, oxidants (such as ascorbic acid and potassium bromate), surfactants and anti-microbial agents. θ Each of these ingredients has specific role to play in bread making: – wheat flour - main ingredient in bread production. It is primarily responsible for bread structure and bite characteristics.

Water - transforms flour into a visco elastic dough that retains gas produced during fermentation and it also provides medium of all chemical reaction to occur. – Yeast - it ferment sugars and produces carbon dioxide gas and ethanol. It, thus, give us porous and leavened bread. – Sugar - Source of fermentable carbohydrate for yeast and it also provides sweet taste. – Salt – It enhances flavour of all other ingredients and adds taste to the bread. It also strengthens the gluten network in the dough. – Fat - Makes the bread texture softer and improves its freshness and shelf life. – The oxidising agents such as ascorbic acid, potassium bromate, potassium iodate and azodicarbonamide are used at parts per million levels to enhance dough strength loaf volume and softness. – Surfactants - Antistaling agents. – Calcium propionate - prevent mold growth.

The general formulation of white pan bread is as follows: θ General Bread making involves the following basic steps: } Mixing ingredients } Rising (Fermentation) } Kneading } Second rising } Baking } Cooling INGREDIENTS PERCENTAGE Flour 100 Water ~ 60 Sugar 6 Fat 2 Yeast 2-4 Salt 2

BREAD MAKING PROCESS The bread making processes have following common processing steps for converting wheat flour into bread. } Mixing of flour with other ingredients to develop a dough or gluten network. Each of bread making method has a requirement of mixer for kneading the ingredients together to form cohesive dough. } Fermentation to mature or ripen the dough. } Baking to transform aerated dough into baked product. θ **FUNCTIONS OF BREADMAKING PROCESS** } Development of a gluten network in the dough to retain gas and produce spongy bread texture. } Incorporation of air bubbles within the dough during mixing. } Creation of particular flavor compounds in the dough. } A preliminary modification of the shape of the divided dough pieces. } Fermentation and expansion of the shaped dough pieces during proofing.

Further expansion of the dough pieces and fixation of the final bread structure during baking.

MAJOR BREAD MAKING PROCESSES • The processes used for commercial production of bread differ principally in achieving dough development. • These may be classified into three broad processing groups although there are numerous variations and also elements of overlap between each of the individual groups. ∞ **LONG FERMENTATION PROCESSES:** } Example: Straight dough bulk fermentation process and Sponge & dough process. } In these processes resting periods (floor time) for the dough in bulk after mixing and before dividing are longer. } In straight dough method all the ingredients are mixed in one step. In sponge and dough process, a part of the dough formulation receives a prolonged fermentation period before being added back to the remainder of the ingredients for further mixing to form the final dough.

STRAIGHT DOUGH BULK FERMENTATION PROCESS • The dough is fermented in bulk. This is the most traditional and most 'natural' of the bread making process. • Essential features of bulk fermentation processes are summarized as follows: 1) Mixing of all the ingredients to form homogeneous dough. 2) Fermentation of the dough so formed in bulk for a prescribed time (floor time), depending on flour quality, yeast level, dough temperature and the bread variety being produced. 3) Dough formation for bulk fermentation is usually achieved by low speed mixers or may be carried out by hand. • During bulk fermentation the dough develops by enzymatic action. Since enzymatic actions are time and temperature dependent, therefore, adjustment of added water levels will have to be made to compensate for these changes.

Weigh all ingredients Develop dough by mixing & ferment (2½ hr) Punching & ferment for 55 min Dividing & intermediate proofing (25 min) Moulding and putting in bread tins & final proofing (55 min) Baking Fig: A straight dough bulk fermentation bread process.

SPONGE AND DOUGH BULK FERMENTATION PROCESS The key features of sponge and dough processes are: 1. In this process a part flour (generally two-thirds), part of water and yeast are mixed just to form loose batter or dough (sponge). 2. Sponge is allowed to ferment for up to 5hr. 3. Mixing of the sponge with the remainder of the ingredients to develop the dough optimally. 4. Immediate processing of the developed dough with a short period of bulk fermentation period

Weigh part of flour, water and whole yeast Mix to loose dough (sponge) & ferment for 3-5 hr Add rest ingredients & develop the dough and rest for 40 min Dividing & intermediate proofing (20 min) Moulding and putting in bread tins & final proofing (55min) Baking Fig: Sponge and dough bread process.

. Role of the sponge The primary role of the sponge is to modify the flavor and to contribute to the development of the final dough through the modification of its

rheological properties. } The flavor is developed by yeast in the sponge. The sponge fermentation conditions should be closely controlled and care should be taken to avoid a build-up of unwanted flavors by thorough cleaning of storage containers after use. During the sponge fermentation period, the pH decreases with increasing fermentation time. The rheological character of the gluten formed during initial sponge mixing will change as fermentation progresses, with the sponge becoming very soft and losing much of its elastic character. As standing time increases, the condition of the sponge increasingly resembles over fermented dough. The sponge and dough process produces soft bread with uniform crumb grain structure. The sponge and dough process has tolerance to time and other conditions.

RAPID PROCESSES: In these methods a very short or no period of bulk fermentation is given to the dough after mixing and before dividing. **ACTIVATED DOUGH DEVELOPMENT (ADD).** This process was developed in the USA during the early 1960s and became popular in smaller bakeries in the USA and the UK thereafter. Its essential features are: The use of a reducing agent generally L-cysteine Hydrochloride, proteolytic enzymes and ascorbic acid to reduce mixing time of flour. The use of oxidizing agents other than added at the flourmill. The use of a fat or an emulsifier. Extra water in the dough to compensate for the lack of natural softening. Extra yeast (1-2%) to maintain normal proving times.

MECHANICAL DOUGH DEVELOPMENT PROCESS: } Here a primary function of mixing is to impart significant quantities of energy to facilitate dough development, and the dough moves without delay from mixer to divider. } The dough is developed by high level of energy imparted at the stage of mixing. **CHORLEYWOOD BREAD PROCESS (CBP)** The essential features of the CBP are: 1. Mixing and dough development takes place in a single operation lasting between 2 and 5 minute at a fixed energy input of 11Wh/kg of dough. 2. A combination of fast and slow acting oxidizing agents such as potassium bromate and potassium iodate. 3. Addition of a high melting point fat, emulsifier or fat and emulsifier combination. 4. Use of extra water to adjust dough consistency to be comparable with that from bulk fermentation; 5. Use of extra yeast to maintain final proof times comparable with those obtained with bulk fermentation; 6. Control of mixer headspace atmosphere to achieve given bread cell structures.

The main difference between the CBP and bulk fermentation processes lies in the rapid development of the dough in the mixer rather than through a prolonged resting period. • The aim of both processes is to modify the protein network in the dough to improve its ability to retain gas from yeast fermentation in the prover. • In the case of the CBP this is achieved within 5 min of starting the mixing process. **FROZEN DOUGH PROCESS** } This process is generally used for retail or household baking for fresh bread, rolls and Danish pastries. } The end product cost could be maintained at par with the method of production by saving on labour and other overheads. } The frozen dough's require longer

proof time due to decreased yeast cells during freezing cycle. } The dough's are made usually from strong flour or by using additional vital dry gluten. } The presence of emulsifiers and oxidants overcome the deleterious effect during freezing.

MICROWAVE PROCESS } In this process the heating begins immediately and it is very fast. } The heating depends greatly on moisture, mass, dielectric properties, geometry, etc. } The processing cost could be reduced and capacity increased by this process. The microwaves fall in the frequency range of 300 MH (106) to 300 GHz (109). } Heating is caused due to the ionic induction and dipole movement influenced by rapidly changing polarity of electric field. The microwave heating is quite expensive in terms of equipment and operation cost.

ADVANTAGES AND LIMITATIONS OF VARIOUS BREAD PROCESSES ω
LONG BULK FERMENTATION PROCESSES The advantages of straight dough and sponge & dough bulk fermentation processes are as follows: 1. These processes are traditional processes where fermentation time is longer and hence, flavour development in such processes is considered better. 2. Taste of bread is superior. 3. Cell structure of breadcrumb is more preferred. 4. Lesser requirement of chemicals and yeast as time available is sufficient for dough ripening. 5. Less cost of plant & machinery as simpler & less sophisticated equipments such as low speed mixers are used.

Limitations 1. More space requirement for processing. 2. These processes take longer overall time to convert flour and other formula ingredients into bread. 3. More expenses on labour hiring. 4. Product quality may vary from batch to batch due to poor process control.

MECHANICAL DOUGH DEVELOPMENT & CHEMICAL DOUGH DEVELOPMENT PROCESS Advantages: 1. A drastic reduction in processing time. 2. Space savings from the elimination of long bulk fermentation. 3. Improved process control and reduced wastage in the event of plant breakdowns 4. More consistent product quality. 5. Financial savings from higher dough yield through the addition of extra water and retention of flour solids that are normally fermented by yeast in long fermentation

Limitations: 1. Faster working of the dough is required because of the higher dough temperatures used. 2. A second mixing will be required for the incorporation of fruit into fruited breads and buns. 3. In some views, a reduction of bread crumbs flavour because of the shorter processing times. 4. Use of chemicals not considered wholesome by consumers. • Processes where length of bulk fermentation is kept longer give better flavor in the product. • If increased flavor is required in breadcrumb made by the CBP or no-time dough or chemically developed dough, then the use of a sponge or a flour brew is recommended. • Bulk fermentation after the completion of dough mixing in these processes is not recommended because of the adverse changes that occur in the dough and the loss of subsequent bread quality.

Characteristics of good bread • To define a good loaf, one must have some knowledge of the desirable qualities of a particular type of bread and how these qualities are produced.

- The desirable features of a good loaf can be listed under two headings, external and internal. External Internal Volume Colour Symmetry of shape Structure Bloom Sheen, texture Crust colour Flavour and aroma Evenness of bake Crumb clarity and elasticity Oven break Moistness Cleanliness Cleanliness

A good loaf is the result of: – good quality ingredients – good processing – good workmanship

EXTERNAL CHARACTERISTICS

- Volume – A fair volume with a structure, which is not too open, is required for common bread.
- Symmetry of shape – The dictionary defines it as a beauty resulting from right properties, or a harmony between the parts. It is brought about by correct dough fermentation and moulding.
- Bloom – Natural bloom is the glow that denotes excellent fermentation, the use of good raw materials and fine workmanship.
- Crust colour – The right baking temperature, good raw materials and correctly fermented dough will obtain the right colour. Pale dull coloured bread is mainly caused by the absence of sugar. A harsh red- brown colour is caused by an under fermented dough. A dried out skin will give a poor crust colour.

Evenness of bake – Depends on the quality of the oven and the way the oven is operated like loading, heating etc.

- Oven break – Properly processed dough will "break" properly during the first period of the baking process. When an oven break is not required give the dough a longer final proof.

INTERNAL CHARACTERISTICS

- Colour – The type of flour used and the structure of the crumb influence the colour. The right fermentation, manipulation and proving and baking conditions cause a fine regular crumb structure.
- Structure – The structure of an ordinary tin loaf should have round fairly small dough cells and they should be regularly and evenly distributed. First class raw materials and good processing of the dough achieve this.

Sheen and texture – The way a cut surface reflects light will indicate the condition on the structure, which is called sheen. Over fermented dough will give a "woolly" and tight dough will give a "drummy" texture.

- Flavour and aroma – The use of yeast, proper processing and baking will give a well-developed flavour and aroma. Longer fermentation processes will give a fuller taste, short processes are characterised by a flat taste.
- Crumb clarity and elasticity – The crumb, when pressed, should return when the pressure is raised, this is called elasticity.
- Moistness – The water content, the fermentation, the salt, other ingredient like fat and malt and the baking conditions determine the moistness of a loaf.

Bread faults, their causes and remedy • The following gives some of the more prominent faults in white bread production:

- } Lack of volume
- a. Use of weak flour
- b. Too much salt
- c. Lack of shortening
- d. Yeast dissolved in hot water
- e. Too much or not enough dough for the mixer
- f. Under mixing
- g. Over mixing
- h. Young dough
- i. Extremely old dough
- j.

Too much machine punishment k. Too long an intermediate proof l. Insufficient pan proof m. Excessive steam pressure in oven n. Oven too hot

Too much volume a. Not enough salt b. Use of wrong type of flour c. Dough slightly overaged d. Too much dough for pans e. Over proofing f. Cool oven } Crust color too pale a. Too lean formula b. Flour lacking diastatic activity c. Excessive mineral yeast food d. Old dough e. Insufficient humidity in proof box f. Cool oven g. Under baking

Crust color too dark a. Too much sugar b. High milk content c. Old dough d. Oven too hot e. Over baking } Blisters under the crust a. Young dough b. Excessive steam in proof box c. Over proofed d. Rough handling at oven } Crust too thick a. Insufficient shortening b. Low sugar content c. Old dough d. Lack of moisture in proof box e. Excess steam in proof box f. Cool oven g. Over baking

Shell tops a. Green or new flour b. Stiff dough c. Dough too young d. Lack of moisture in proof box e. Not enough pan proof f. Excessive top heat } Lack of break and shred a. Weak flour b. Excessive amount of mineral yeast c. Young dough d. Extremely old dough e. Excessive proof } Crumb is grey a. Use of too much malt b. Old dough c. Excessive proofing d. Pans too large for amount of dough

Streaked crumb a. Improper incorporation of ingredients b. Sponge or dough crusted over during fermentation c. Sponge not broken up properly d. Excessive trough grease e. Scrap dough picked up during make up f. Excessive use of divider oil g. Excessive dusting flour h. Dough crusted during intermediate proof i. Too much machine punishment j. Rough handling at oven } Coarse grain a. Weak flour b. Improper mixing c. Improper moulding d. Excessive proof e. Rough handling at oven f. Cool oven g. Slack dough h. Young dough i. Old dough

Poor Texture a. Weak flour b. Lack of shortening c. Improper mixing d. Slack dough e. Excessive trough grease f. Young dough g. Old dough h. Excessive use of divider oil i. Excessive dusting flour j. Improper moulding k. Cool oven

Flavour and taste are poor a. Improper storage of ingredients b. Poor quality ingredients c. Off-flavoured ingredients d. Improper amount of oil e. Under fermented dough f. Old dough g. Unsanitary shop h. Dirty pans i. Under-baking j. Over baking k. Bread cooled under unsanitary conditions

Holes in Bread a. Unbalanced formula b. Flour too strong c. Improper incorporation of ingredients d. Under mixing e. Over mixing f. Excessive trough grease g. Young dough h. Old dough i. Excessive use of divider oil j. Excessive dusting flour k. Too much machine punishment l. Proof box too hot m. Over proofing

Poor keeping qualities a. Too lean formula b. Poor quality ingredients c. Improper storage of ingredients d. Old dough e. Stiff dough f. Over proofing g. Cool oven h. Bread cooled too long before wrapping • In checking these faults an analysis of the various causes will show inferior ingredients, unbalanced formula, improper mixing, incorrect fermentation time, poor control of temperature, time and humidity throughout the production process, poor makeup procedures, poor oven conditions as well as improper handling in cooling, wrapping and shipping account for most of bread faults. • A process of elimination must be instituted, the possible cause or causes determined and the proper remedy applied.

PACKAGING OF BREAD • A wide variety of bakery products are available including bread, biscuits, cookies, cakes, buns, rusk, etc. • Bakery industry is one of the largest foods processing industries in India and is rapidly growing because of increased demand for baked goods as a result of industrialization and urbanization. • Packaging of baked goods constitutes 10-30% of the entire cost of the pack. • The main functions of a package are: – containing the product – to protect the product – to help in selling of the product

To perform the functions satisfactorily, the packaging materials should have: – Necessary strength properties to withstand conditions of processing, storage and transport. – Should protect from environmental factors such as humidity, oxygen, light and heat. – Should have desired machinability, heat sealability and printability. – It should preferably be economic and easily available. • Baked goods are very susceptible to physico-chemical changes under adverse climatic conditions – e.g. desiccation in bread, loss of crispness and rancidity in biscuits and microbiological spoilage. • So a package designed for these products must take these factors also into consideration.

Packaging requirements for bread • Packaging of bread must ensure hygiene, conserves moisture and prevents staling to keep it in as fresh a condition as possible. • The bread crust has to be protected from moisture pick-up and breadcrumb should be protected from evaporation of moisture. • A good moisture barrier promotes mold growth and makes the crust soft while in a poor barrier the bread dries out and stales. • Staling occurs in 4-7 days after manufacture and is a property of flour, method of baking and storage conditions. – The ideal bread packaging material must have following properties: • A barrier against contaminating agents and ensure a hygienic wrap free from dust etc. • To have optimum water vapor transmission rates (WVTR). It should conserve the moisture loss, prevent rapid desiccation and staling. However, preventing condensation of water inside package may cause growth of microbes and softening of the crust. • To have requisite physical strength property to provide some physical protection against bruising of the product during transportation and storage.

To have requisite physical strength property to provide some physical protection against bruising of the product during transportation and storage. • The packaging material should possess good stiffness, tensile strength and tear resistance which are required during bag forming, filling and sealing operation. • It should also resist the effect of creasing and

folding. • It should have good printing surface and appearance. • Should be economical in keeping with the cost of the product. • It should provide user facilities such as easy opening and re closure.

Conventional packages – In the organized sector bakeries, bread is sliced and wrapped on automatic machines while in unorganized sector, it is sold in relatively cheaper wraps such as poster paper, newspaper, etc. – Which result in excessive moisture loss, stickiness, and even contamination of the product by surface printing ink and tainting. – The standards of weight and measures act (SWMA) stipulate that bread should be sold in weights of 100, 200, 400, 500 and 1200 grams and hence generally bread is sold in waxed sulphite paper which carries printed information regarding the brand, type and weight etc. – Waxed papers used for bread and bun packaging is generally made of a base paper made of bleached sulphite pulp with coating of wax blend comprising paraffin wax, microcrystalline wax and hot melts.

Loose wrap: Loosely wrapped unsealed packs generally obtained by using one side waxed paper. } Primary pack (Regular): Individual pack made by using both sides waxed, printed paper having play value and to be dispensed as a unit. } Secondary pack: A pack in which a product is pre-packed in a carton and subsequently over wrapped with protective waxed wrappers. } Types of waxed papers: o Type 1: Both sides waxed, bleached TiO₂ loaded paper, generally used for packaging bread. o Type 2: One side waxed, bleached TiO₂ loaded paper, generally used for loose wraps of biscuits. o Type 3: Both sides waxed, bleached, TiO₂ loaded paper, generally used for primary packs (regular) of biscuits. o Type 4: Both sides waxed, bleached, greaseproof paper, generally used as inner wrapped in secondary packs. o Type 5: Both sides waxed, bleached paper, and generally used as outer wrapper in secondary packs.

Other requirements: • Fixed paper: The material shall be uniformly coated with paraffin wax or its blends. They shall be uniform in thickness and should not rupture on folding or twisting. • Newer packages – Apart from waxed paper, cellophane was the next widely used packaging material for bakery industry. – The search for lower cost, packaging materials resulted in selection of polyolefin plastics, LDPF, HDPE, HMHDPE, CPP and BOPP. Newer developments in the field of bread packaging include certain process modifications in the product to provide longer shelf life and modified and controlled atmospheric packaging using carbon dioxide For these applications, better barrier materials comprising coated PP, polyamide, polyester (plain and metallized) and coextruded films have to be used.

Project's location

Province:

Gilan with area of 14042 square km is located in the north of Iran and south of Caspian Sea and it has dense woods with humid and mild climate. Rasht is the capital city which is 30km distant from the project. Gilan is an agricultural zone with most important

products including rice, tea, olive, caviar, silk, chicken, fish, citrus, and special kinds of cookies.

the County:

Bandar-Anzali is one of the most active harbors among 5 countries on the border of Caspian Sea and the biggest port in the north border of Iran in which sailing has been current since 350 years ago. This harbor is close to Rasht by 30 km distance.

This city is of vital importance as it is located in the transit path of North-to-South, East South Asia countries, border of Persian Gulf, Middle Asia Republics, Qafqaz, Russia and Europe. Anzali port not only has commercial trade with the northern and southern harbors of Europe via Volga River, but also has special status in business transaction between Caspian sea courtiers and middle Asia (CIS countries) because of its adjacency to Astrakhan, Lagan at Russia, Crossnodesk at Turkmenistan, Aktao at Kazakhstan and Baku at Azerbaijan.

Project Location:

This project is located in Anzali in a vast land area of 3200 hectare and water land area of 40 square Km which includes Golshan region (Business Phase & Industry Phase), Hasanrood Industrial Town and harbor zone of Gilan Sailing & Harbors Organization. The area of industrial-Commercial free zone of Anzali includes:

1- Golshan region with 2091 hectare includes

appropriate natural lands with low population density and residential areas having access to suitable coasts and tourism and entertainment places and establishments.

2- Hasanrood industrial town and its surrounding area with 946 hectare include industrial town, national resources lands and adjacent lagoon.

3- Harbor area of Anzali free zone is around 106 hectare which has increased the industrial-commercial utility and attraction of Anzali free zone for providing facilities in the field of loading, unloading and etc.

This project is supposed to be established in the main area of industrial ranges and workshops with three-digit code S121. The above mentioned plan is going to be established in a land area of 3800 square meters and infrastructure of 1800 square meters.

Row	Infrastructure Required	Distance to project location	The location of Infrastructure preparation
1	Water	Existed in project location	Water & Sewage of Gilan
2	Electricity	Existed in project location	Regional Power Company of Gilan
3	Gas	Existed in project location	Gas Company of Gilan
4	Telecommunication	Existed in project location	Telecommunication Company of Gilan

5	Main Road	Existed in project location	Organization Internal resources
6	Secondary Road	Existed in project location	Organization Internal resources
7	Airport	In 30 km distance	International Airport of Rasht Sardar Jangal
8	Harbor	About 5 km	Bandar Anzali
9	Railway Station	Preparation for connecting Anzali free zone to under construction railway of Rasht-Qazvin-Anzali is predicted	Organization Internal resources or private department participation

Technical Specifications of plan:

Product:

Bread as the most important food used by people has the biggest share in families' nutritional programs and since this saint food is the dominant force of people, more than 80% calorie, 60% energy, 50% vitamin and 40% protein of the body of all people are provided by consuming bread. About the bread dietary value it is enough to say that there are 274 calories in 100g bread which equals with double meat, triple potato and quadruplicate milk. So, bread has the most important role in health improvement and energy supply.

Also industrial bread is called to that kind of bread which its production process from the beginning of production line that flour comes into the system to the end that bread is packed, is almost done without manual intervention as well as doing proper fermentation on dough and preserving bread dietary value (production with automatic machinery and daily capacity of more than 20 tons flour). Development of industrial bread in the country is possible through a long-term process which will not be successful if preparations are not done for its entry to the market. Researches show that industrial breads have very less wastes than other breads and whole of them are used. Industrial bread has got a good dietary position due to high quality cooking, wide variety of product, proper durability and the most important complete fermentation stage. One of the problems related to other bread produced in the country is lack of fermentation stage which will cause some problems in the body one of them is zinc deficiency which causes short stature. Some of the many benefits of industrial breads are increasing flour and wheat exports, competitive products and better control on its price. In addition, as other benefits one can refer to health and durability of bread and its increased quality, adding standard packing to its baking process and carrying out fermentation process in scientific method and under supervision of experts.

Project's Requirements:

Space and infrastructure required:

The required land area for the project is 15000 square meters with infrastructure of 9034 square meters which includes production building with area of 6700 square meters, warehouse area of 1100 square meters, four silo foundation area of 300 square meters and welfare-official buildings and other spaces totally with area of 934 square meters.

Easy access to roads, airport and railway (in near future) and also proper access to water, electricity, gas and telecommunication are specifications of this region. Service infrastructures of the region contain bank, insurance restaurant, clinic and goods & services market. Expert and cheap human resource is of special competitive advantages of the region.

Equipments and machinery:

Row	Details	Quantity
1	oven	2
2	Dough proofer	3
3	Mixer	2
4	Bake ware	1
5	Small wares	4
6	Dough sheeter	3
7	Bread slicer	4
8	Sheet pan racks	5
9	Dry storage	1
10	Refrigeration	1
11	Doughnut cake fryer	1
12	Display case	1
13	Wood Top Work Table	5

Raw material and intermediate component

Flour, salt and preserving materials

management and human resources:

No.	Skill level	Number	Salaries (wages) (Rials)
1	Expert	3	50.000.000
2	Skilled	20	25.000.000
3	non-skilled	97	17.000.000

Ownership and legal permission

Land ownership:

At present the land of this project belongs to Anzali free zone and is capable to be transferred according to investor's application and legal regulations of the zone. Provided that the project is accepted, economic deputy through investment management will ask department of civil and urban development to introduce appropriate options for project implementation.

Spiritual ownership and privileges:

The spiritual ownership is those rights which let its owners to exploit man's intellectual and creative activities. It has got economic value and is tradable but its subject is not a special material thing. From intellectual ownership one can refer to literature or art creators' rights known as author's right or propagation's right, invention's right, customer's rights such as goodwill of merchants and artisans due to their fame, commercial and industrial signs and commercial secrets known as commercial and industrial ownership.

In this project, spiritual rights are the same as exploitation right and brand of project's owners.

Brand or Commercial Sign includes every type of color, image and sign which represents a product and distinguishes that product or service from the other products and services. Having been registered, a brand will have legal validity and law protection.

Anzali free zone is one of the highly susceptible zones to internal and external investment due to its suitable rules such any tax exemption and creating security in invest and property. This zone intends to cause diverse activities in provinces with developing electronic commerce, virtual markets, IT and also holding international exhibitions.

legal permission:

The place of project implementation is in Anzali free zone which has got some processes for getting the required permissions for project establishment and exploitation according to following items:

- Referring to Article 11 of law about how to manage free and economic zones, issuing permission for any kind of allowable economic activity such as building structures and tenure of any occupation by rightful and lawful individuals in the zone's limit, is under the control of that zone. In addition, if the project requires other permissions from competent organizations and institutions such as Environment, Standard, Ministry of Health, Treatment and Medical Education (especially for medical products, food and projects like Health Village) and Agricultural Jihad, the zone will do necessary inquiries for getting these permissions and investor should only follow the issue.

Market study and Competition:

World Bread Market and Trends

Regardless of the level of income and status, ethnicity or age group, many people eat bread and hold it dear. It is the main reason of daily grueling and is a reflection of cultures of all regions and territories. Wheat and bread constituted people's essential food. A slice of bread sometimes is the reflection of wealth while sometimes it represents the waste and extravagance. As the world population increases, the growing bread market is expected to exceed 215 billion USD in 2020.

The food that can present the most nutrients to human beings is wheat bread. There is a growing demand for different kinds of bread day by day. Especially in the metropolises, with the increasing tendency of healthy eating, different types of bread began to take place on the shelves. As the industrial furnaces, whose number has been increasing in recent years, are able to deliver their products even in distant places with their new distribution channels, local bread varieties began to disappear. Demand for varieties of bread made with oats, whole wheat and oily seeds are on the rise. In addition, packaged and sliced bread is preferred.

Bread is prepared by mixing wheat flour, water and salt. This mixture is shaped with or without yeast and then cooked. Wheat flour is mostly preferred but bread is prepared with other grain flours like corn and rye. Generally, bread can be consumed with other foods. As the number of alternative foods and type of different bakery increases, the consumption of local bread decreases.

Wheat and bread have been the basic food of mankind for centuries. Because environmental conditions cause changes in nutritional habits, the nutrients consumed by people living in different regions have different effects on the body. Thus, it will be wrong and have a negative impact on the physiological structure if Anatolian people, who live the main homeland of wheat for centuries and consumed wheat and its varieties as the main food, take out or reduce flour or bread from their table.

The structure of the market for bread and bakery products around the world shows a serious change from country to country. Bread production, a source of diverse work, underlines a chain of values that can be seen throughout society. From a cultural point of view, bread represents a strong economic sector in Europe. The European bakery sector consists of over 190 thousand SMEs and 2 thousand and 200 large companies. In the European Union, more than 2 million people are employed in this sector.

In 27 countries that make up the EU, the bread market is around 32 million tons. Bread consumption habits are quite different within the EU, but in most countries an average of 50 kilograms per person is consumed per year. The highest consumption levels are recorded in Bulgaria (approximately 95 kilograms) and the lowest consumption in the UK

(approximately 32 kilograms). Market structure varies across Europe. For example, the industrial sector represents 80 percent of production in the UK; 40 percent in Germany, 35 percent in France and 19 percent in Spain. According to The Gira European Bakery Company's Panaroma report, 79 percent of the value of the market for baked goods consumed in Europe constitutes bread. Fresh products dominate 68 percent of the market. Growth in packaged products, along with salted pastry products, is the most important part of sector growth. Turkey ranks the first in the world in the per capita consumption of bread. Bread consumed throughout the world by product type still retains its overwhelming superiority in all world markets. Bread consumption plays an indispensable role in healthy and balanced nutrition in European countries as it does in Turkey. A healthy and balanced diet constitutes the foundation of good life. The main reason behind the decline in consumption of bread in Europe is the change of eating and living habits. Despite that, bread will continue to be an indispensable part of healthy living.

According to United Nations data, when the market activity of the bakery products sector in the world market between 2007 and 2014 are analyzed, it is seen that the positive growth in both export and import volume continues. In terms of value exports of bread and bakery products, it is seen that there is an increase of 4.3 percent in 2014 compared to the previous year. According to this; total export volume, which was 30 billion 122 million dollars in 2013, reached 31 billion 422 million dollars in 2014. From these numbers, we can deduce that the reason why we cannot see big changes in the figure of bread sale is that bread is still consumed by many households for a long time. However, it is obvious that the demand for new types of bread is increasing. There is a significant increase in whole grain bread containing oat and whole-wheat, particularly in breakfast bread varieties. The increase in consumption of such products can be thought to affect the sales graph of white bread.

EXPECTATION IN 2020 IS 215 IN BILLION DOLLARS

The global bread and sandwich bread market, which reached \$187.1 billion in 2015, is expected to reach \$215.8 billion by 2020, according to Technavio / Bakery and Snacks. Especially, it is estimated that 53.6 percent of the \$215.8 billion market to be formed in 2020 will come from European countries, and America will get a share of 28.6 percent from the market. The countries of the Middle East and Africa (MEA) are expected to receive a minimum share of 6.9 percent from the market, while Asia Pacific countries are expected to receive a share of 10.9 percent from the market. The common result of global surveys including USA, Europe, Middle East-Africa and Asia-Pacific is that bakery products sector has been growing and changing with all the dynamics. It is an unquestionable reality that Europe is in a dominant position in the bakery products market.

Consumer trends and changing consumption habits, which paved the way for changes in the sector, are the driving forces. Metropolitan life, quick and on-site consumption, fresh consumption demand, healthy eating tendency, changes in distribution channels and trends in traditional products caused changes in the sectorial change.

Especially metropolitan life, busy traffic, and city population continue to direct consumption habits all over the world. Turkey is also affected by this change rapidly. That's why quick and on-site consumption, fast food chains, and snack bakery products are popular nowadays. The number of chains producing hamburger, pizza and similar products increased in Turkey quickly due to the culture transfer and Western eating habits. Metropolitan life and the increasing percentage of working women have led eating out. Restaurant chains are expanding on-site serving as well as take-away. This change mostly affected bakery goods sector since it is suitable for fast food. Industrial furnaces began to take place of traditional ones while standard bread are replaced by high added value bread.

Iran bread market:

According to the Food and Drug Administration, bread consumption per capita in Iran is 5 kg, which is twice that of Europeans, but the major share of bread consumed in Europe is industrial bread, while the share of industrial bread in our country is 2% to 4%. There is a good deal of risk-free investment in this area to boost production, improve nutrition, and create employment.

In recent years, industrial bread has become a good opportunity for money making and currency. Good progress has been made in this field in the country and many brands have expanded their operations in this sector and given the neighboring countries' capacity for export, this industry can be seen as a valuable industry. Neighboring countries in Iran have a capacity of about 5 million people, which is welcomed by good export measures, which can provide Iran with a good income. Industrial bread brands in the country have gained domestic market over the past few years and have attracted domestic customers with the variety of quality products they produce. It can even be said that Iranian products have a lot more fans than their foreign counterparts. However, the industry was able to experience good growth because of less imports due to the type of goods.

Therefore, this experience should be used in other fields as well as by reducing the export of other industries to provide growth and development. Fortunately, the quality of industrial breads has increased in recent years, and we have managed to export high-end products to the Gulf, Iraq, and even Canada and Germany. Given the good potential in the industry, exports should increase. Iran has a high potential in the production and export of industrial bread, and if the government adopts supportive policies to accelerate the development of this industry, there will be a very bright future for bulk bread exports.

Iranians are the second biggest consumers of bread in the world with a per capita of 160 kilograms per person, which is six times higher than the global average.

According to a report newly published by Financial Tribune's sister publication Donya-e-Eqtasad, Turks consume the most bread with a per capita of 199 kg annually. In France and Germany, per capita bread consumption is 56 kg and 70 kg respectively. The annual bread production in Iran stands at 15 million tons.

In the large-scale bread industry, most of the work is handled by machines. However, traditional bread in Iran is baked manually in traditional ovens.

Industrial bread bakeries have a 20% share in the total bread production in Iran while the rest belongs to traditional bread bakers. When it comes to consumer market, industrial breads account for as little as 12% of the consumer market. Only 2% of the total flour share allocated for all bakeries belong to industrial bakeries while the remaining 98% pertain to traditional bakers.

Currently, 80% of the flour distributed across the country are subsidized and the rest is supplied at market rates.

Introduce target market:

. Bread itself as the main and basic food of many countries in the world is the supplier of the large part of energy, protein and minerals needed by human body and in the case of getting richer it can cover more needs. The importance of this issue is more obvious in poor and developing countries. Generally, bread is one of the basic items in people's diet. Per capita consumption of bread in Iran has been reported 139-164 kg. The average per capita consumption of bread is 68 kg in European Union countries which has an outstanding difference with our country. However, a large part of bread is spoiled in our country; nevertheless, applying optimization methods in making different kinds of bread will not only help the health of community but also will increase efficiency due to correct use of wheat and flour and consequently reduce wastes.

In the recent few years the bread consumption has been increased significantly for different reasons such as increasing the price of other foods. It is crystal clear that optimal production and supply methods must be applied in order to meet the basic nutritional needs of people especially those with low income. One of these methods is producing more durable breads with the least wastes and enriched with protein, vitamin and minerals. Thus on the one hand suitable background should be prepared for using industrial bread in the country by presenting a scientific definition and introducing qualified bread to people and making the community familiar with the problems of traditional breads and on the other hand, bread production should be changed from traditional method to modern and industrial one. Currently those breads produced and supplied in traditional way are the main rival for industrial breads. Therefore, traditional breads are supplied with a price rather cheaper than industrial breads and this is one of the reasons of tendency of people to using traditional and flat breads instead of industrial breads. Another reason is nutritional habits and taste of people is mostly towards traditional breads. However, in the recent few years this habit is automatically changing as a result of changes in life style and more consumption of fast food, so people prefer to use industrial breads and crumpets.

4.installation of machinery																			
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Financial Projection

The cost estimate:

The cost estimate

No.	Subject	costs (million Rials)
1	Fixed investments	808245
2	Operating costs	286800

Fixed Investment Estimate

No.	Subject	costs (million Rials)
1	land purchase cost	450
2	Site preparation and land improvement	4850
3	Civil works and building construction	131070
4	Machinery and Equipment's	607225
5	Auxiliary and Service Equipment's	16650
6	Pre-production expenditures	10250
7	Unpredicted Expenditure	37745
Total		808245

Circulation Capital Estimate (production costs)

No.	Subject	costs (million Rials)
	Current Expenditures	3441625
1	Raw Materials	3213000
2	Human Resource	24475
3	Other Current costs	204150
	Fixed cost	8064425
4	Raw Material	7497000
5	Human Resource	57125
6	Depreciation cost	283975
7	Other fixed costs	476325
Total Operating cost		11756050

Estimating Revenues:

The project revenue in the first five years after exploitation (million Riasl)

No.	subject	Year 1	Year 2	Year 3	year 4	year 5
1	Sell Revenue	507250	571250	634060	634060	634060

Duration of project exploitation:

The exploitation duration of the project is estimated as 10 years.

Break- even analyses:

The break-even point (BEP): In economics & business, specifically cost accounting, the break-even point (BEP) is the point at which cost or expenses and revenue are equal: there is no net loss or gain, and one has "broken even". A profit or a loss has not been made, although opportunity costs have been "paid", and capital has received the risk-adjusted, expected return.

The average break- even point in 10 years desired project operation is 49 percent. It means that as long as the firm continues to activity with 49 percent capacity, it will be profitable and in a lower capacity, it will cause loss.

Cost-benefit Analysis:

The Table of Project Efficiency Indicators

Present value of total cost of implementation and exploitation(Million Rials)	1968770
Present value of total income of implementation and exploitation(million rials)	2696945
Net present value (NPV) (Million Rials)	316775
Benefit/Cost Ratio B/C	1.38
Internal Rate of Return (IIR)	30%

Sensitivity Analysis of the Project:

Sensitivity Analysis Table

Percentage changes	Change of Internal rate of return due to change of revenues	Change of Internal rate of return due to change of costs
-20%	12%	48%
-10%	21%	38%
0%	30%	30%
10%	37%	22%
20 %	44%	15%

Conclusion:

"Summary of Project Economic Issues"

Activity	Exact title of activity	Product Name	Nominal Capacity (unit)
Production	Industrial Bread Production	Industrial Bread	15000 tons
Implementation Duration	Total fix investment (Million Rials)	Annual Circulation Capital (million Rials)	Required Human Resources
1 year	808245	286800	120 people
Internal rate of return (IIR)	Net present value (million Rials)	Applicant Share (million Rials)	Benefit-cost ratio *B/C
30%	316775	30% of total investment	1.37

The Way of participation and preparation of the required capital:

For providing the project required capital, foreign investment participation is used for providing 70% of the fix capital needed and 50% of circulation capital needed.

Capital Payback period:

The capital payback period is approximately 4 years and 3 months.

Incentives, features and advantages of project:

This project is established in Anzali free zone and generally activity in free zones includes the following advantages and incentives:

- Rightful and legal individuals employed in different economic activities in the zone, are exempted from paying tax of income & property for any economic activity in free zone for 15 years from the exploitation time mentioned in the permission and this time has been increased to 20 years.
- Entry and exit of capital and profit acquired from economic activities are free in each region.
- Capital and legal rights of foreign investors, whose capital has been approved by ministry board, are fully guaranteed and protected by investment organization and technical-economic aids of Iran according to the protection law of foreign investment.
- Entry of machinery and raw materials to Anzali commercial-economic free zone is free from any customs or commercial profit.
- Entry of foreigners is possible without taking visa.
- Easy registration of companies, industrial and cultural institutes and spiritual ownership is according to regulations of the zone.
- Easy selling and renting land for Iranians and long-term rent of land for foreigners is possible in this zone.
- There are special regulations for monetary and bank operations in order to offer monetary and bank services.

Incentives and Benefits of Foreign Investment

- Foreign Investment Promotion and Protection Act (FIPPA) Features and Advantages of FIPPA
- There is no restriction on the percentage of foreign shareholding
- The possibility of registering an Iranian company with %100 foreign capital
Transfer of principal capital, dividend and the profits gained through the utilization of capital in the form of foreign currency or goods. Enjoyment of same and equal treatment as accorded to domestic investors by foreign investors. The possibility of investment by foreign natural and juridical persons and Iranians living abroad.
- Allowing investing in all areas which are permitted to the private sector. Granting protection coverage to different foreign investment schemes.
- Quick approval of the Foreign Investment Application Issuing a three-year residence Permit for Foreign Investors, directors, experts as well as their immediate family members
- Risks covered under FIPPA:
- Expropriation and Nationalization Unlimited transfer of capital and dividend
Guarantee of the Purchase of the goods and services resulting from investment projects in BOT investment schemes where the government acts as the sole purchaser.

Tax Exemption

1. Agricultural

The income derived from all agriculture and horticulture activities, animal rearing, fish farming, bee-keeping, poultry husbandry, fishing, sericulture, revival of pastures and forests, is exempt from payment of tax. All the natural and juridical persons (Iranian and Foreign) can enjoy above mentioned exemption at the outset of their activities.

2. Salary Income Exemption

- 50% of the salary tax of the employees working in less developed regions, as per the list prepared by the State Organization of Management and Planning shall be spared. All natural persons (Iranian and foreign) working in the less developed regions can enjoy tax exemption until their workplace is included in the above-mentioned list.

3. Sport, Services and Education Activities Exemption

- The income derived from education and training activities by non-profit schools, whether elementary, junior or senior secondary, technical or vocational, or by non-profit universities and higher education institutions, as well as the income derived from taking care of mental and physical invalids by the institution engaged in such

activities, shall be exempt from tax, provided the aforesaid institution having permission from the respective authorities.

- The income of sporting institutions and clubs having permission from the physical training organizations shall also be exempt from tax, if it is derived purely from sport activities.

4. Cultural Activities Exemption

All cultural, artistic, and journalistic activities licensed by Iran’s Islamic Culture and Guidance Ministry are tax-free. All the natural and juridical persons (Iranian and Foreign) can enjoy the said exemption by observing the regulations of note 3 of the above article.

5. Cooperative Exemption

100% of the income derived from cooperative companies formed by villagers, tribesmen, farmers, hunters, workers, clerks and students are tax-free.

6. Export Exemption

a) 100 % of income derived from Export of Services, Non-oil goods, Agricultural Products and 20% of income derived from Export of Non – Processed goods

b) 100% of the income derived from exportation of different goods which have been, or will be, imported to Iran on transit, and are exported without making any changes in the substance there of, or doing any works on them, shall be Exempt from Tax.

7. Handicraft Exemption

- The revenues of handicraft and carpet weaving workshops and the relevant cooperative firms and production unions are tax-free.
- All real and juridical persons can enjoy above mentioned exemption by observing the regulations.

8. Production Activities Tax Exemption

Income Tax with Rate of 0.0%	Duration of Exemption
Industry, Mining & Services (Hospital & Hotels)	5 Years
Industry, Mining & Services (Hospital & Hotels) in Industrial Parks and Special Economic Zones.	7 Years
Industry, Mining & Services (Hospital & Hotels) in Less Developed Areas	10 Years
Industry, Mining & Services (Hospital & Hotels) in Less Developed Areas located at Industrial Parks and Special Economic Zones	13 Years
100% of Income Derived from Agricultural Activities	Perpetual
100 % of Income Derived from Export of Services, Non-oil goods, Agricultural Products and 20% of Income Derived from Export of Non – Processed goods	Perpetual

Investment Facilities and Incentives in Free and Industrial Zones

- 20 year tax exemption for all economic activities No visa requirement for the entrance of foreigners No limitation on the transferring foreign currency Flexible monetary and banking services Exemption of raw materials and industrial machineries of producing units from customs duty.
- Easy registration of companies, industrial and cultural institutions and intellectual property ownerships circumstances for re-export and transit of commodities
- Easy regulations for the import commodities allowed by law
- The possibility of exporting products to the mainland within the framework of the added value regime.
- Sale/lease of the land for the Iranian and long-term lease for the foreigners
- Suitable rates for the energy consumption

Other Incentives and Benefits of Investment in Iran

- Unique geographical situation as the junction of the Middle East, Europe and Asia
- Huge domestic market with more than 70 million population and quick access to the markets of the neighboring countries with more than 300 million population
- A massive resource of efficient, trained and economic-friendly workforce
- Advanced infrastructure across the country in the fields of telecommunication, energy and rail/road transportation
- Huge energy resources and low costs of production and public services
- Suitable climate conditions which allow agricultural activities in all parts of the country and in all seasons .