

TECH-KNOWLEDGE

The Official PMG Engineering Newsletter



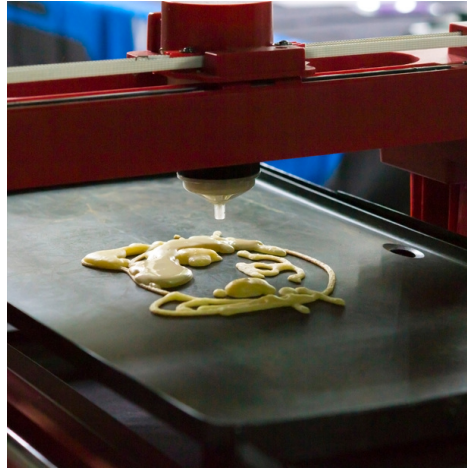
**FOOD & BEVERAGE
INDUSTRY**



**ENGINEERING
& DESIGN**

**SCIENCE &
TECHNOLOGY**

CONTENTS



1. WHITE PAPER

- A. Tetra-pack
- B. 3D food printing

2-5

2. INDUSTRY BUZZ

Latest Food Industry News Updates

6-7

3. WEEKS HIGHLIGHT

A Look Into The Main Events Of The Week

8

4. DID YOU KNOW?

Fascinating Food Facts To Expand Knowledge

9-11



TETRA-PACKS



Introduction

A tetrapack comes under the category of aseptic packages. For a material to be aseptic, it should have the following features-

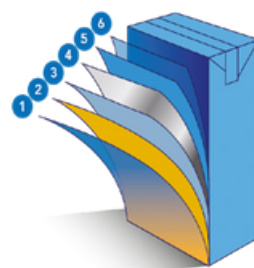
- The packaging material must be compatible with the product intended to be packed.
- The physical integrity of the package is necessary to assume containment of the product and maintenance of sterility.
- The packaging material must be able to withstand sterilization and be compatible with the methods of sterilization.
- The package must protect the product from oxygen; also, the package must retain the product's aroma.

Tetrapack is the most common name for aseptic cartons used for liquid food items which have to be stored for up to one year without refrigeration. Aseptic here means "free from pathogenic micro-organisms, " so this packaging process eliminates the food and packages from harmful elements. This type of packaging also blocks light completely to preserve vitamins A, B2, B6, B12, C and K, which are all photosensitive and would become damaged in the presence of light.

Structure of a Tetrapack

A tetra pak is made of six layers, i.e.

- 1. Polyethylene** - Contributes 15% of the total packaging; it protects from outside moisture.
- 2. Paper** - Contributes 80% of the total packaging for providing stability, strength and smoothness to the printing surface.
- 3. Polyethylene** - Polyethylene acts as an adhesive layer between other layers.
- 4. Aluminium foil** - Contributes 5% of the total packaging. It forms a barrier against light and oxygen, eliminating the need for refrigeration and preventing spoilage without using preservatives.
- 5. Polyethylene** - Acts as an adhesion layer.
- 6. Polyethylene** - Seals the Liquid from inside.



- | | |
|---|--|
| 1 | Polyethylene - protects against outside moisture |
| 2 | Paper - for stability and strength |
| 3 | Polyethylene - adhesion layer |
| 4 | Aluminium foil - oxygen, flavour and light barrier |
| 5 | Polyethylene - adhesion layer |
| 6 | Polyethylene - seals in the liquid |

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Types Of Tetrapacks

These packages come in various sizes and shape configurations. These packages also have a variety of openings and closures appropriate to product and consumer needs. Depending on the two points mentioned, following diagrams shows the types of tetra paks available.

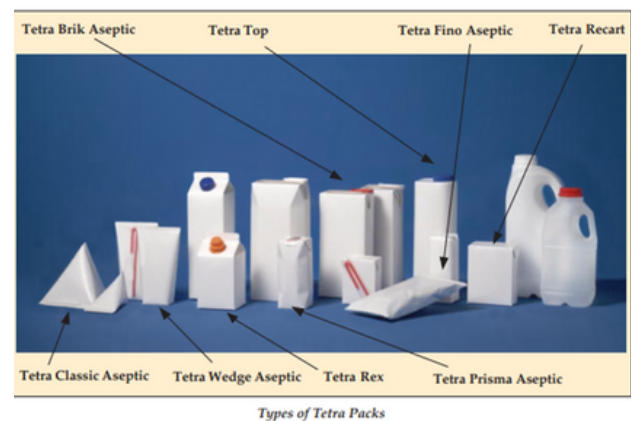
Myths related to tetrapackaging

1. Tetra packaged milk needs boiling

No, boiling of tetra pak milk is an unnecessary step. Tetrapackaging involves UHT treatment of milk into pre-sterilised packages in a sterile environment, thus there is no risk of contamination and therefore no need to boil the milk before use.

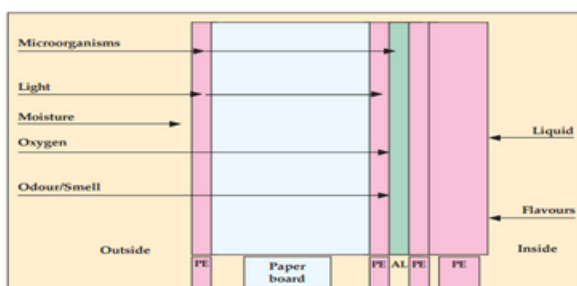
2. Tetrapackages are Sustainable

Tetrapacks are recycled, but the recycled part is not used for manufacturing of tetrapacks, hence they are said as non-sustainable. It is unclear whether this is because their paperboard needs to come from virgin sources to avoid contamination, or whether the quality of the recycled paperboard isn't high enough to make new cartons, or there is some other reason. Whatever the reason, it is turned into office paper.

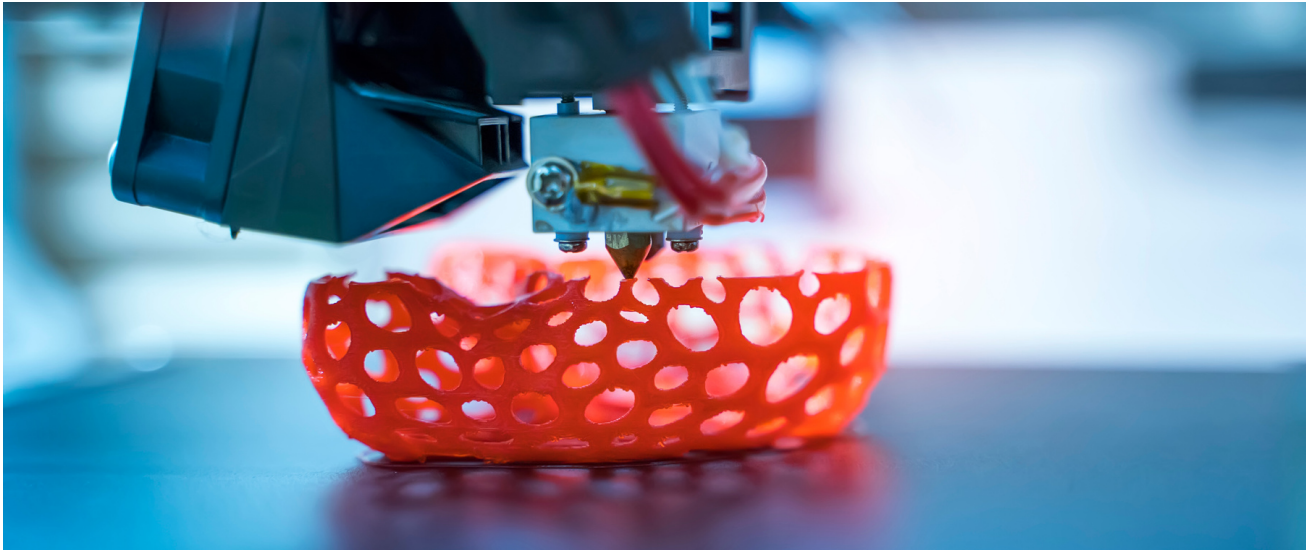


Conclusion

The Tetrapack carton is the future packaging – being primarily made using paperboard (a renewable forest-based resource) and fully recyclable. Not only this it offers consumers convenience, easy opening, optimal shelf life.



3D FOOD PRINTING



Introduction

3D Printing has emerged as a promising technology that finds vast applications in many fields such as machinery, biomedicine, engineering but recently this innovative technology has gained a huge popularity in area of food manufacturing sector due to its various advantages like customized food designs, personalized nutrition, simplifying supply chain and broadening of the available food material with varied attractive color, shape, and size. It is an additive process in contrast to some conventional processes of manufacturing which are subtractive. In conventional process like cutting, milling etc. the material is removed to form the required component, but in 3 D printing material is added as per requirement and design to be formed.

Nowadays, it is studied at global level to attain new techniques related to process so that it can be feasibly translated on larger scale for production of high volumes of product. This technology requires printers or scanners for formation of component through this procedure. It is also known as Additive Manufacturing which takes digital input in the form of Computer Aided Design (CAD) model and creates solid three-dimensional parts through an additive layer by layer process

Process

A 3D food printer comprises a food-grade syringe or cartridge that holds material, a real food item. 3D printing requires hardware and software to work in collaboration. Advanced 3D food printers are equipped with user-friendly interfaces and pre-loaded recipes with designs that can be easily accessed by the computer or even with a mobile or IoT device. Let us now understand the process of manufacturing food via printer in brief:

1.Printing the Model

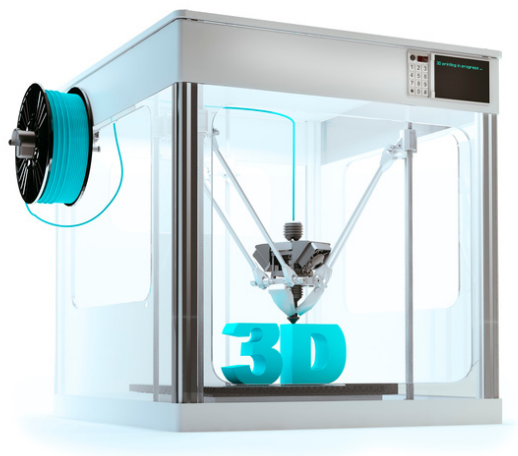
Depending on the design data, provided the printer lays down several layers of powder, liquid, paper, polymer, plastic, or other material depending on the material required. Printer resolution describes layer thickness and X-Y resolution in micrometers. 3D Printers give designers and concept development teams the ability to produce parts and concept models using a desktop size printer.

2.Finishing

Though the printer-produced resolution is sufficient for many applications, printing a slightly oversized version of the desired object in standard resolution and then removing material with a higher resolution subtractive process can achieve greater precision. In this process the supports would be dissolved which might be used to support overhanging features in the model to be printed.

Types of Printing Techniques

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1.Extrusion Based Printing:

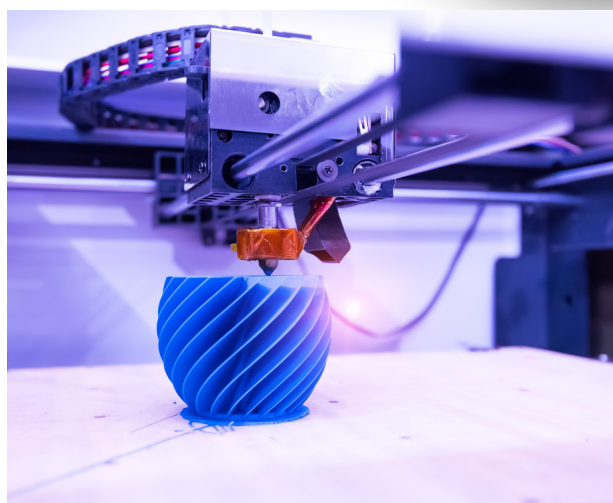
In this method, melted material or paste like slurry is extruded out continuously from a moving nozzle, and welds to the preceding layers on cooling. This type of 3D food printing applied in chocolate printing and soft materials printing such as dough, mashed potatoes, cheese, and meat paste. Additional structural objects used for supporting the product geometry is removed after completion of the printing process.

2.Selective layer Sintering

This method applies a power laser to selectively fuse powder particles together layer by layer finally into 3 D structure. In this method each cross section is scanned individually for fusion of all powder ingredients present in that cross section. After scanning each cross section, the powder bed is dropped, and a new layer of powder is covered on top. This process is repeated until the desired structure is achieved. If any unfused powder is left during process, then it can be recovered for next printing. It allows to produce free-standing complex 3 D structures with higher resolution. This method is specially used for powdered materials such as sugar, fat, or starch granule (low melting point). Properties like particle size, flowability, bulk density, laser type and laser spot diameter are critical to the printing precision and accuracy of fabricated parts.

3.Binder Jetting:

The binder jetting process uses two materials: a powder-based material and a binder. The binder acts as an adhesive between powder layers. The binder is usually in liquid form and the building material is in powder form. A print head moves horizontally along the x and y axes of the machine and deposits alternating layers of the build material and the binding material. After each layer, the object being printed is lowered on its build platform.



This method has the potential to fabricate complex & delicate 3D structures and produce colorful 3D edible objects by varying binder composition. But this method can be only used for powdered ingredients.

4. Continuous Jet Printer

In this method, ink is ejected continuously through a piezoelectric crystal vibrating at a constant frequency. To get a desired flowability of the ink, it is charged by the addition of some conductive agents. Ink is ejected out from heads under pressure exerted by valve. Generally, the printing rates of drop-on-demand systems are slower than that of continuous jet systems. Resolution and precision of produced images are higher. Generally, inkjet printing handles low viscosity materials that do not possess enough mechanical strength to hold 3D structure. For formulation of food ink food hydrocolloids plays a vital role. A hydrocolloid is defined as a colloid system wherein the colloid particles are dispersed in water. A hydrocolloid has a colloid particle spread throughout water and depending on the quantity of water available that can take place in different states e.g., Gel or sol (liquid). Food Hydrocolloid can form and hold 3 D structure easily.

3D printing is a ground-breaking technology that can improve the nutritional value of meals and even address hunger issues in countries where fresh and affordable ingredients are inaccessible. Therefore, global food industry should adopt 3D printing technology to make food production more efficient and sustainable.



INDUSTRY BUZZ

UP-based Gyan Dairy raises its daily output to 15 lakh litres in response to the rising demand.

The Uttar Pradesh-based CP Milk & Food subsidiary Gyan Dairy, which produces fresh milk and dairy products, has expanded its daily milk production capacity from 11 lakh litres to 15 lakh litres. The purpose of this effort is to take advantage of the increasing demand in the state of Uttar Pradesh for dairy products and milk.

At an estimated cost of Rs 120 crores, the business established a state-of-the-art factory with a five lakh litres per day capacity at GIDA Phase II, Gorakhpur. The factory occupies 20067 square metres in total. More than 1800 direct and indirect jobs have been created by the construction of this plant, and more than 1 lakh families who raise cattle will profit.

SC seeks a settlement with Britain and ITC about the packaging of butter cookies.

On Wednesday, the Supreme Court ordered ITC Ltd. and Britannia Industries to "exchange suggestions" in order to settle their disagreement with their misleadingly similar packaging. A bench led by Justice Sanjiv Khanna noted that both enterprises produce high-quality goods that are enjoyed by all, and they concluded that "it will be better if (the companies) can talk to each other" and settle the dispute. Additionally, it scheduled a follow-up hearing for January.

ITC had contested, on the grounds of infringement of Britannia's Good Day Butter Cookies packaging, the Madras High Court's November judgement prohibiting it from using Sunfeast MOM's Magic Butter Cookies packaging. The order of restraint was issued due to the purported resemblance between Sunfeast MOM's Magic blue packaging and that of.





Growing demand for high-end, luxury imported chocolates

According to marketers and merchants, the Indian market for luxury and premium imported chocolates is projected to witness a notable surge over the year-end season and beyond. The demand for these chocolates is expanding gradually. According to data from the commerce ministry, India imported chocolates worth \$27.84 million in the fiscal year 2023—a 45% increase from the previous year.

Half of CocoCart's revenues, according to co-founder Karan Ahuja, come from the premium chocolate sector. CocoCart is an omni-channel retailer and distributor of imported chocolates in India. Industry insiders forecast that imports of luxury dark, organic, vegan, sugar-free, and gluten-free chocolates into India would persist due to consumer demand.

Government to permit the production of ethanol from 1.7 million tonnes of sugar.

A few days after ordering sugar mills and distilleries not to use sugarcane juice and syrup for ethanol production in the 2023-24 supply year, the government is expected to permit the diversion of 1.7 million tonnes of sugar for the manufacturing of ethanol, according to an official with knowledge of the situation.

A new announcement from the government will permit the diversion of 1.7 million tonnes of sugar towards the manufacturing of ethanol. Concerns over decreased sugarcane production as a result of unfavourable weather patterns and growing local sugar costs were the focus of the directive.



PepsiCo joins the government backed ONDC.

Through the wide range of ONDC-affiliated seller applications, this relationship is anticipated to increase consumer outreach and make the company's product line more discoverable to potential customers. Prominent snack and beverage manufacturer PepsiCo India announced its Open Network for Digital Commerce (ONDC) membership on Monday. The company also stated that this relationship would help increase consumer outreach through the wide range of ONDC-affiliated seller applications and make the product catalogue discoverable by buyers.

"The creation of ONDC as a centralized solution for diverse consumer needs is a notable step by the Indian Government to reshape the national e-commerce industry," stated Ahmed ElSheikh, President of PepsiCo India, in a statement. Maximizing consumer choice in how they choose to source our products is a top priority for PepsiCo India. We're constantly trying to develop our models for going to market.

WEEKS HIGHLIGHT



11 DECEMBER

UNICEF DAY

UNICEF, or the United Nations Children's Fund is celebrated on 11 December, which is responsible for providing humanitarian and developmental aid to children across the globe. The agency is one of the most extensive and distinguished social-welfare organizations in the world, with a presence in 192 countries and territories.



17 DECEMBER

INTERNATIONAL MOUNTAIN DAY

International Mountain Day is celebrated annually on 11 December to promote awareness for mountain communities around the globe. Mountains play an integral role in the daily lives of much of the world population. Much of the world's usable freshwater supply originates from mountain areas.

DID YOU KNOW?



OTHER INGREDIENTS FOR BAKING

1/3



THERE ARE MANY OTHER INGREDIENTS COMMONLY USED IN BAKING, INCLUDING:

1. **Flour:** The primary ingredient in most baked goods, flour provides structure and texture to baked goods. It is typically made from wheat but can also be made from other grains like rice, corn, or oats.
2. **Sugar:** Provides sweetness and helps baked goods to brown and caramelize. Granulated sugar is the most used type of sugar in baking, but brown sugar, powdered sugar, and other types of sugar are also used.
3. **Eggs:** provide structure and richness to baked goods. They are also a source of protein and fat.
4. **Butter or Margarine:** provides baked goods flavor, moisture, and richness. It is often used in recipes for cookies, cakes, and pastries.
5. **Leavening Agents:** help baked goods to rise by creating gas bubbles in the dough or batter.
6. **Salt:** enhance baked goods' flavor and balance out the sweetness.
7. **Milk or Water:** Milk or water is used to hydrate the dough or batter and to create a smooth texture.
8. **Flavorings:** used to add flavor to baked goods.
9. **Spices:** Cinnamon, nutmeg, and ginger are commonly used in baking to add flavor and aroma to baked goods.
10. **Nuts, Chocolate Chips, or Dried Fruit:** These ingredients are often added to baked goods to add texture, flavor, and nutrition.

Market scope

According to a report by Mordor Intelligence, the global baking ingredients market size was valued at \$12.7 billion in 2020 and is expected to reach \$19.6 billion by 2026, with a compound annual growth rate (CAGR) of 6.8% during the forecast period.

The key players in the market include Cargill, Incorporated, Associated British Foods plc, Archer Daniels Midland Company, Kerry Group plc, and Ingredion Incorporated, among others. These companies offer baking ingredients, including flours, sweeteners, flavors, and emulsifiers.

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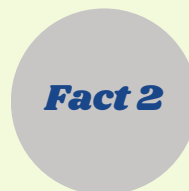
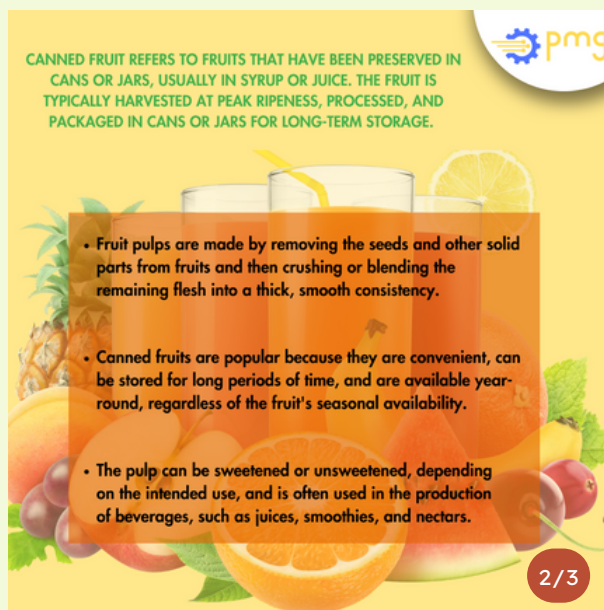
Commercial production

1. **Flour:**
Typically made by milling wheat, although other grains such as corn, rice, and rye can also be used. The grains are cleaned, conditioned, and ground into flour using specialized milling equipment. The flour is then sifted and packaged for distribution.
2. **Sweeteners:**
Made from various sources, including sugar cane, sugar beets, corn, and fruits. The raw materials are processed to extract the sweetener, which is refined, purified, and crystallized.
3. **Emulsifiers:**
Used to improve texture and stability. They are typically made by combining a fatty acid with a base such as glycerol or propylene glycol. The ingredients are mixed, heated, and cooled to create a stable emulsion.
4. **Flavors:**
Flavors are typically made from natural or artificial ingredients. Natural flavors are derived from fruits, vegetables, herbs, and spices, while artificial flavors are made from synthetic chemicals.
5. **Leavening agents:**
Leavening agents such as baking powder and yeast make the dough rise. Baking powder is typically made from a combination of baking soda, cream of tartar, and cornstarch, while yeast is made from a single-celled organism that ferments sugar.

3/3

Fact 1

In addition to flour, sugar, eggs, and butter which are commonly used in baking, there are several other important ingredients that contribute to the taste, texture, and overall quality of baked goods. for example, baking powder and baking soda, Salt, Vanilla extract, Milk, Yeast, Chocolate, and Nuts and dried fruits. Proper measurement and ratio, as well as the quality of these ingredients, are key factors in achieving delicious and well-baked treats.



Canned fruit and pulps offer convenience and versatility in our busy lives. They are pre-cut, pre-cooked, and ready to use, making meal preparation effortless. Canning preserves the natural flavors and nutrients of the fruits, ensuring a year-round supply of delicious and healthy options. Whether enjoyed as a refreshing snack, a topping for desserts, or an ingredient in recipes, canned fruit and pulps are a delicious addition to any pantry.

OTHER NUTRIENTS

1/3

Other nutrients are other substances that nourish and support various bodily functions besides macronutrients (protein, carbohydrates, and fats) and micronutrients (vitamins and minerals).

Examples

- **Fiber**

A carbohydrate important for digestive health and can also help reduce the risk of heart disease, diabetes, and certain types of cancer.

- **Antioxidants**

Compounds found in many fruits, vegetables, and other plant-based foods help protect cells from damage caused by free radicals.

- **Phytonutrients**

Found in plant-based foods have a range of health benefits, such as reducing inflammation, protecting against chronic diseases, and supporting immune function.

- **Omega-3**

Found in certain fish, nuts, and seeds important for brain function, heart health, and reducing inflammation.

2/3

- **Probiotics**

Live bacteria and yeasts that benefit gut health and can help improve digestion and immune function.

- **Water**

An essential nutrient necessary for many bodily functions, including regulating body temperature, transporting nutrients and oxygen, and lubricating joints.

Market Scope

The global probiotics market is expected to reach USD 69.3 billion by 2025, with a compound annual growth rate (CAGR) of 7.4% from 2019 to 2025.

The global plant-based food market is expected to reach USD 74.2 billion by 2027, with a CAGR of 11.9% from 2020 to 2027.

Some of the major players in each of these industries include Nestle, Kellogg's, General Mills, PepsiCo, Danone, Coca-Cola, Kraft Heinz, Unilever, Hain Celestial Group, and Campbell Soup Company.

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Fact 3

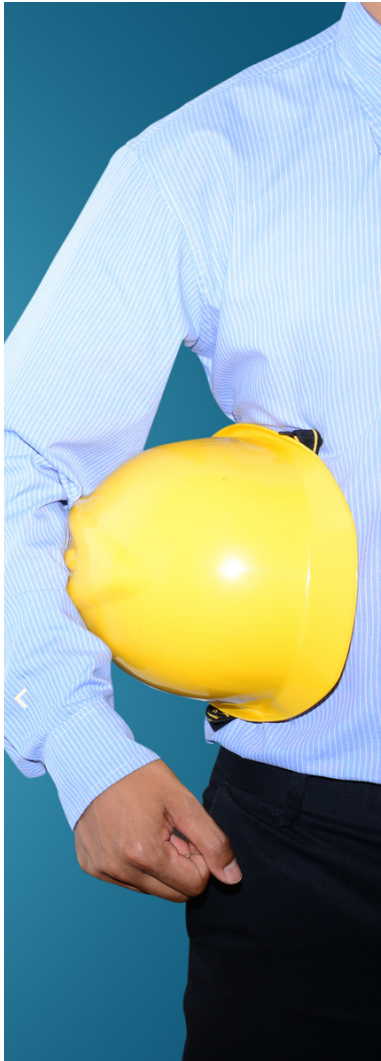
In addition to carbohydrates, proteins, and fats, other essential nutrients are vital for our overall health. Vitamins and minerals play key roles in supporting various bodily functions. They contribute to maintaining a strong immune system, healthy bones, and optimal growth and development. Additionally, fiber is crucial for digestion and maintaining a healthy weight. Ensuring a well-rounded diet rich in these nutrients is crucial for overall well-being.



PMG ENGINEERING

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Design & Construction Management in
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Meeting Global Benchmarks

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for FOOD and BEVERAGE Industry with SINGLE POINT ACCOUNTABILITY

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- MAKING CUSTOMERS THE INDUSTRY LEADERS
- ENGINEERING MUST CREATE BUSINESS VALUE
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