

# **Non-Thermal Processing Market – Global Industry Size, Share, Trends, Opportunity, and Forecast, 2028 Segmented By Product (Meat & Seafood, Fruits & Vegetables, Beverages and Others), By Type (HPP, PEF, Ultrasonic, Irradiation, Cold Plasma and Others), By Application (Quality Assurance, Microbial Inactivation, Cutting, Emulsification & Homogenization, Cleaning and Others), By Region, Competition, 2018-2028**

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## **Abstracts**

In 2022, the Global Non-Thermal Processing Market was valued at USD 871.39 million, exhibiting a robust CAGR of 7.58% throughout the projected period. The driving force behind this market revenue growth stems from the escalating demand for sustainable food, as expressed by both consumers and governments.

The integration of eco-friendly technology into the food production process takes center stage, with a primary goal of converting basic agricultural inputs into food products of superior quality and desirable attributes, all while enhancing production efficiency. Companies are strategically emphasizing competitiveness in response to the increasing emphasis on environmental sustainability among governments and consumers alike.

Non-thermal methods are gaining prominence as environmentally responsible alternatives to traditional food processing methods. They offer direct advantages such as reduced energy and water consumption during processing, along with indirect benefits that lead to decreased energy impact during storage. Additionally, non-thermal processing is anticipated to generate secondary benefits by curbing solid waste and

enhancing the value of biomass resources.

The indirect impacts of non-thermal processing on the sustainability of food processing could surpass the direct effects due to significant inefficiencies within the food manufacturing sector. These inefficiencies manifest as food waste, degradation of quality along the supply chain, and underutilization of by-products and processing residues, all of which are poised to contribute to the growth of market revenue.

## Key Market Drivers

### Increasing Consumer Demand for Safe and Natural Foods

One of the key drivers of the global non-thermal processing market is the growing consumer demand for safe and natural foods. Consumers are increasingly health-conscious and seek food products that are minimally processed, devoid of chemical additives, and retain their natural nutritional qualities. This demand for cleaner and safer food options has led to the adoption of non-thermal processing methods. As consumers become more aware of the relationship between diet and health, they actively seek out foods perceived as healthier. Non-thermal processing methods, such as high-pressure processing (HPP) and pulsed electric field (PEF) processing, enable food manufacturers to achieve microbial inactivation without compromising the nutritional and sensory attributes of food products. This aligns with the consumer trend towards healthier eating. The clean label movement is gaining momentum, with consumers closely scrutinizing food labels for artificial preservatives, additives, and chemicals. Non-thermal processing methods typically do not involve the use of chemical additives, making them a preferred choice for food companies aiming to provide clean label products. This trend is particularly pronounced in developed markets like North America and Europe. Ensuring food safety is a top priority for consumers. Non-thermal processing techniques have proven effective in eliminating harmful pathogens and bacteria, thereby making food products safer to consume. This is especially crucial in the case of products like fresh juices, ready-to-eat meals, and deli meats, where the risk of foodborne illnesses can be significant.

### Stringent Food Safety Regulations

Stringent food safety regulations and standards established by government agencies worldwide serve as a significant driver of the global non-thermal processing market. These regulations aim to ensure the safety of food products for consumers and compel manufacturers to adopt advanced processing technologies. Food safety authorities,

such as the U.S. Food and Drug Administration (FDA) and the European Food Safety Authority (EFSA), have implemented rigorous regulations concerning microbial safety in food products. Non-thermal processing methods, renowned for their ability to mitigate harmful microorganisms, aid food manufacturers in meeting these regulations. Foodborne illnesses continue to be a public health concern. Non-thermal processing technologies effectively eliminate pathogens such as E. coli and Salmonella, thereby reducing the risk of foodborne outbreaks and recalls. Businesses embrace these methods not only to comply with regulations but also to safeguard their brand reputation. In an increasingly globalized food market, adherence to food safety standards is indispensable for international trade. Non-thermal processing methods enhance the safety and quality of products, rendering them more conducive to export. They enable food companies to access new markets and compete on a global scale.

### Expanding Applications Across Food and Beverage Industries

Non-thermal processing technologies have evolved to cater to a wide range of food and beverage product categories, extending beyond limited sectors. For example, HPP is employed in the processing of seafood, poultry, and even guacamole, while PEF processing is applied to fruits, vegetables, and liquid foods. The value of non-thermal processing lies in its ability to prolong the shelf life of perishable products, which is particularly relevant for convenience foods in high demand due to changing lifestyles and increased urbanization. These technologies empower manufacturers to produce products with extended shelf lives, thereby reducing food waste and logistics costs. With the rapid growth of the market for functional and nutraceutical foods, non-thermal processing methods play a crucial role in preserving the bioactive compounds and health benefits of ingredients, such as vitamins and antioxidants. This enables the production of functional foods without compromising on nutritional quality.

### Key Market Challenges

#### High Initial Investment Costs

One of the notable challenges faced by the global non-thermal processing market is the substantial initial investment costs associated with the implementation of non-thermal processing technologies. While these technologies offer numerous advantages, such as enhanced food safety and prolonged shelf life without the use of chemical additives, the upfront costs can prove to be prohibitive for many food manufacturers. Non-thermal processing methods necessitate specialized equipment such as high-pressure processing (HPP) machines, pulsed electric field (PEF) systems, and ultrasonic

processors. These machines are often capital-intensive, with costs varying depending on the production scale and technological complexity. The setup of non-thermal processing equipment may require modifications to existing production lines or the construction of dedicated processing facilities, contributing significantly to the overall investment. In addition to upfront expenses, ongoing operating and maintenance costs can be substantial. Skilled technicians may be required to operate and maintain the equipment and spare parts can be costly. Ensuring effective operation of non-thermal processing equipment necessitates training and development of personnel. The expertise required for handling these technologies can incur additional costs in terms of staff training and development. Achieving a satisfactory return on investment (ROI) can take time, particularly for smaller food producers. This delayed return may discourage businesses with limited financial resources.

### Limited Consumer Understanding and Acceptance

Another key challenge in the non-thermal processing market is the limited understanding and acceptance of these technologies among consumers. Despite the scientific evidence supporting their effectiveness in enhancing food safety and quality, consumers often hold misconceptions or reservations. Many consumers are unaware of non-thermal processing methods and their functionality, leading to skepticism or misconceptions regarding the safety and quality of products processed using these technologies. Furthermore, some consumers associate 'natural' with minimally processed foods, which can create a perception that products processed using non-thermal methods are less natural. Educating consumers about the benefits and safety of these technologies is crucial. Additionally, there is a misconception that non-thermal processing methods may negatively affect the taste and texture of food products. In reality, these methods are designed to preserve the sensory attributes of foods, although consumer perceptions may vary. To build consumer trust, clear and accurate product labeling plays a critical role. Manufacturers face the challenge of transparently communicating the use of non-thermal processing methods on product labels, which can be constrained by limited label space and regulations.

### Key Market Trends

#### Expansion of Non-Thermal Processing into New Food Categories

A notable trend observed in the global non-thermal processing market is the ongoing expansion of these technologies into new food categories. Initially, these methods were primarily applied in sectors like fruit juice and dairy. However, non-thermal processing

methods are now finding innovative applications across a diverse range of products. They are no longer limited to specific food types but are being employed across various product categories, including fruits and vegetables, meats, seafood, and ready-to-eat meals. The adaptability of these technologies makes them suitable for a wide range of food and beverage applications. The industry is witnessing cross-category innovations, where non-thermal processing techniques traditionally used in one sector are successfully being applied to others. For instance, high-pressure processing (HPP), which was originally popular in fruit juice production, is now utilized in the seafood industry to extend the shelf life of products while preserving their quality. Convenience foods, such as pre-packaged salads, meal kits, and heat-and-eat meals, have become a focal point for non-thermal processing innovations. These technologies are used to enhance the shelf life of convenience products, ensuring they remain safe and fresh without the need for excessive preservatives. This trend also extends to the nutraceutical and functional foods segment, where non-thermal processing methods are leveraged to preserve the bioactive compounds and health benefits of ingredients, such as vitamins, antioxidants, and probiotics. This enables the creation of functional foods without compromising nutritional quality.

## Health and Wellness Market

There is ample opportunity for the continued growth of non-thermal processing methods in emerging food and beverage sectors. Manufacturers have the potential to explore inventive applications for these technologies in products such as plant-based meat alternatives, baby food, and functional beverages. By adapting these methods to diverse categories, companies can effectively penetrate new markets and reach untapped consumer segments.

## Segmental Insights

### Type Insights

HPP segment is expected to dominate the market during the forecast period. High-Pressure Processing (HPP) constitutes a significant sector in the global non-thermal processing market. HPP serves as a food preservation technology that employs elevated hydrostatic pressure levels to render bacteria, viruses, yeasts, molds, and other pathogens inactive in food products, all while maintaining their nutritional and sensory attributes. The HPP division has witnessed substantial growth in recent years owing to the rising consumer demand for minimally processed and safe food items. The market size has expanded considerably, with HPP finding adoption across various food

and beverage categories, encompassing juices, dairy products, ready-to-eat meals, seafood, and meat products. The primary impetus behind the HPP segment lies in the mounting concerns surrounding food safety. Instances of foodborne illnesses and outbreaks have underscored the risks associated with consuming contaminated foods. HPP provides an effective means to eradicate harmful pathogens, thereby enhancing the safety of food products for consumption. HPP finds extensive application in the production of juices, smoothies, and other beverages, enabling the preservation of the ingredients' fresh taste and nutritional value. With consumers consistently prioritizing food safety, clean label products, and extended shelf life, the HPP segment is anticipated to sustain its growth trajectory.

### Application Insights

Microbial Inactivation segment is expected to dominate the market during the forecast period. The segment of microbial inactivation has witnessed significant growth in recent years, driven by heightened concerns about food safety, consumer demand for minimally processed foods, and regulatory requirements. The market size has expanded as food manufacturers increasingly adopt microbial inactivation techniques to ensure the safety and quality of their products. The primary driver for the microbial inactivation segment is the growing global concern over foodborne illnesses and outbreaks, which continue to pose a significant threat to food safety. Consequently, food manufacturers are embracing microbial inactivation methods to mitigate the risk of contamination and safeguard their products. The adoption of microbial inactivation techniques is further propelled by consumer preferences for clean label products with natural ingredients. These methods, such as high-pressure processing (HPP) and pulsed electric field (PEF) processing, offer an alternative to chemical additives or excessive heat treatments, aligning with the clean label trend. In the beverage industry, microbial inactivation methods find widespread application, particularly in fruit juices, dairy products, and alcoholic beverages. Given that food safety remains a paramount concern for both consumers and regulators, the microbial inactivation segment is expected to continue its growth trajectory.

### Regional Insights

North America is expected to dominate the market during the forecast period. The market size of the region was primarily driven by its substantial population, diverse food industry, and consumer demand for safe and minimally processed foods. Non-thermal processing technologies found widespread applications across various product categories in North America, including fruit juices, sauces, dairy products, ready-to-eat

meals, and seafood. The convenience and ready-to-eat meal sector significantly benefited from non-thermal processing methods as they extended shelf life while preserving product quality. The market has been witnessing steady growth, with an increasing acceptance of non-thermal processing methods in the food and beverage industry. The regulatory environment for non-thermal processing in North America is well-established, with the U.S. Food and Drug Administration (FDA) and the U.S. Department of Agriculture (USDA) having regulations and guidelines in place to ensure the safety and quality of products processed using non-thermal methods. There is a growing consumer concern about food safety in North America, which has contributed to the rising adoption of non-thermal processing methods. These methods are considered effective in eliminating pathogens while retaining the nutritional value and sensory qualities of food products. Clean label and natural ingredient trends are prevalent, with consumers showing a preference for products that are free from chemical additives and preservatives.

#### Key Market Players

Elea Technology Gmbh

Dukane Corp.

Nordion Inc.

Hiperbaric S.A.

CHIC Group

Elea Technology

Gray\*Star, Inc.

Avure Technologies

Chic Freshertech

Pulsemaster

#### Report Scope:

*Non-Thermal Processing Market – Global Industry Size, Share, Trends, Opportunity, and Forecast, 2028Segmented...*

In this report, the Global Non-Thermal Processing Market has been segmented into the following categories, in addition to the industry trends which have also been detailed below:

Global Non-Thermal Processing Market, By Product:

Meat & Seafood

Fruits & Vegetables

Beverages

Others

Global Non-Thermal Processing Market, By Type:

HPP

PEF

Ultrasonic

Irradiation

Cold Plasma

Others

Global Non-Thermal Processing Market, By Application:

Quality Assurance

Microbial Inactivation

Cutting

Emulsification & Homogenization



Cleaning

Others

Global Non-Thermal Processing Market, By Region:

North America

Europe

South America

Middle East & Africa

Asia Pacific

Competitive Landscape

Company Profiles: Detailed analysis of the major companies present in the Global Non-Thermal Processing Market.

Available Customizations:

Global Non-Thermal Processing Market report with the given market data, Tech Sci Research offers customizations according to a company's specific needs. The following customization options are available for the report:

Company Information

Detailed analysis and profiling of additional market players (up to five).

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