



# Food Engineering for Minimal Processing

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In the 21st century, globalization and urbanization have increased the population of health-conscious consumers, who consider diet a key part of a healthy lifestyle. These consumers prefer processed foods that have fresh-like quality attributes, and few or no chemical preservatives. As the global population continues to increase, the demand for minimally processed, microbiologically safe foods with health-promoting nutrients will also increase.

This consumer demand has shifted the attention of food engineers toward developing minimal processing technologies using alternative treatments, such as pressure, electric fields, UV, gases, and ultrasound, to inactivate pathogens with little or no impact on the nutrients in food products. Foods that are prepared with such technologies may help reduce the risk of various lifestyle-related diseases without compromising the safety of the product.

The study of these minimal processing technologies is multidisciplinary and integrates advances in food process engineering, nutrition, product formulation engineering, microbiology, and medical science. We are just beginning to understand the unique advantages and limitations of these novel technologies for preserving the health-promoting properties of foods. More research is needed to understand how such foods are digested and the bioavailability of nutrients.

Industrial implementation of minimal processing technologies can also reduce energy and water use. To verify this benefit, life cycle assessments are needed of the various technologies. Effective solutions are also needed for reducing or reusing food packaging, and reducing packaging waste. Similarly, efforts are needed to develop sensors for improving the efficiency of various food manufacturing operations, as well as for product handling, tracking, and distribution.

## Tips for food engineering students

Food engineers work in a multidisciplinary, global, and collaborative environment. Thus, food engineering students need a broad education and a variety of soft skills, including the following:

- *Mastering the fundamentals:* Develop a solid foundation in process engineering (heat transfer, fluid mechanics, and mass transfer) and food science (food chemistry, microbiology, and nutrition).
- *Critical thinking and problem solving:* A solid technical foundation is not enough. Develop critical thinking and problem skills to make logical and informed decisions.



Bala and his students evaluate a continuous high-pressure process for beverages in the emerging food processing pilot plant at Ohio State's Center for Clean Food Process Technology Development.

- *Listening skills:* Food engineers need to develop listening skills to work effectively and communicate in multidisciplinary teams with people from different backgrounds.
- *Digital technology and data analytics:* With the ongoing advances in digital technology, food engineers collect and analyze increasingly large volumes of data. Thus, data management skills are essential.
- *Scientific communication to a diverse audience:* In this era of social media, all engineers must hone their communication skills, so they can share their work with the general public as well as their professional peers.

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## Further reading

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