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Radiofrequency Heating

Radiofrequency heating essentially funnels currents through a capacitor and its electrodes in order to evenly distribute heat energy into a targeted product. The current sent throughout the product triggers dielectric heating, which is responsible for processes such as drying, baking, sterilizing, pasteurizing, and unthawing food products (Punidadas). Dielectric heating works when radiofrequency waves generate heat. The electromagnetic energy initiates upon contact with moisture, and the combination of electromagnetism and moisture content causes the product to heat (IPPC). Radiofrequency heating systems are comparable to microwave ovens, with the interaction of currents and waves and moisture being the principle factor that makes radiofrequency heating possible.

Radiofrequency heating systems are primarily composed of two parts: a generator and an applicator. The generator supplies radiofrequency power, with free running oscillating systems being the most common generators used in food processing industries. The applicator consists of electrode plates that send electromagnetic currents through to the products through field applicators. These are the simplest, most commonly used applicators in processing industries (Tang et al).

There are various uses for radiofrequency heating in foodstuffs and biomaterials. Curing glues utilized in plywood, plastic materials that form fabricated articles, textiles, paper, fiberglass, and tobacco leaves are all examples of biomaterials that are created and or dried via radiofrequency heating (Tang et al). In food products, radiofrequency heating is used in order to

pasteurize and sterilize various products. Using radiofrequency to heat foodstuffs in place of older methods increased the efficiency in uniformly heating products such as breads, juices, and meats.

When assessing the phenomenon of higher temperatures in saltwater that are processed in a radiofrequency heater, principles of dielectric heating can be applied. Although food is generally not a good conductor of electricity, the ionic conductivity of salt in water creates an opportunity for lower frequency waves to impact the temperature of a substance. Thermal energy is generated within water as ions collide slowly against one another in a solution. The kinetic energy involved when a radiofrequency heater causes movement of these ions converts into thermal energy, which explains the higher temperature yield in saltwater solutions than in deionized water that has no additional mineral matter.

In conclusion, radiofrequency heating uses generators and applicators in order to funnel electromagnetic waves to biomaterials and foodstuffs for various necessary processes. Radiofrequency heating can serve as a way of heating, drying, pasteurizing, and sterilizing bioproducts to enhance the quality, taste, shelf-life, and safety of the biomaterials and foodstuffs involved. Radiofrequency heating is a very common practice in manufacturing industries, and is an important process for biosystems engineers in a variety of food, biomaterial, an manufacturing industries.

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