Advances of E-beam processing for Food preservation in Brazil

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Abstract. During last years the demand for pasteurization and disinfection of various food products (meat, chicken, sea products, vegetables, fruits, etc.) had increased. In Brazil Food Irradiation processing is increasing during last decade. Nowadays, electron-beam irradiation might be the perfect solution. In order to increase penetration and ensure uniform dose, products may be treated from both sides. Besides the possibility of being disconnected when not in use, this source does not need to be reloaded, is easily available and, streamlines the process and reduces logistics costs. Our paper intends to show the food irradiation market to e-beam application.

1. Introduction

In Brazil, food irradiation has been gaining impetus day by day, mainly due to commercial reason related to an increasing international trade of foodstuffs and to the increasing regulatory requirements of consumer markets. Around the world has been growing concern over food safety, aiming to provide a product not only healthy but also safe to consumer. Thus, the worldwide commercial application of E-beam processing has greatly advanced in recent years in order to reach this goal and Brazil has tried to follow this trendy.

Even so, most of E-beam processing services in the Brazilian territory target purposes other than food irradiation. High-current electron beam accelerators have been used in diverse industries to enhance the physical and chemical properties of materials. Thus, this technology is mainly applied to polymer modification (such as crosslinking of plastics, wires, cables and tubing), radiotherapy, sterilization of medical devices and pharmaceutical sterilization.

2. Present Status of Food Irradiation in Brazil

This scenario tends to change once Brazil responds for a considerable portion of radiation processing around the world. According to Kume [1] the total amount of food processed by irradiation (gamma radiation and electron beam) in the world in 2005 was around 405,000 ton. In Brazil, in 2005, the amount of irradiated foods reached 23,000 ton, the majority comprises spices (20,000 ton) followed by fruits (3,000 ton). This number seems small compared with China (146,000 ton), the U.S. (92,000 ton) and Ukraine (70,000 ton),

however it is significant in relation to the European Community (15,060 ton) and the rest of the world (58,744 ton).

Previous results of the Brazilian trade balance indicate an incessant increase of agricultural products exportations year by year, rising from US$ 21.145 million in 1996 to US$ 43.601 million in 2005 [2].

3. Brazilian Legislation

Another point in behalf of this technology is the Brazilian legislation itself. It follows international recommendations suggested by the Food and Agriculture Organization (FAO), International Atomic Energy Agency (IAEA) and Codex Alimentarius [3].

Brazilian Resolution No. 21 describes that, “any food can be irradiated taking into account the minimum and maximum dosage applied, and the lowest dose should be sufficient to achieve the intended purpose and the maximum, less than that would jeopardize the functional properties and/or sensory attributes of food”. This is characterized as one of the most permissible over the world allowing that all and any kind of food could be irradiated as soon as this processing fits to them [4].

Also, according to legislation, labeling is required for all irradiated foods and must be declared as such, regardless if an irradiated food is the final product or if it is used as an ingredient of another food [4]. However it does not fit to reality, mainly due to misinterpretations and poor consumer information that hinder its acceptance.

4. Up-to-Date Irradiation Facilities in Brazil

Official up-to-date data published by the Brazilian National Nuclear Energy Committee (CNEN) shows that the Brazilian market counts on both gamma rays facilities and E-beam ones. Currently there are ten gamma rays facilities and six electron beam accelerators. Among E-beam accelerators, two of them are installed at Nuclear and Energy Research Center (IPEN), located in São Paulo State. One is primarily dedicated to research for different applications (model JOB-188, 1.5MeV, 25mA) and another is exclusively dedicated to wire and cables irradiation (model JOB-307, 1.5MeV, 65mA). They consist of a Dynamitron Machine (Radiation Dynamics Inc., New York, USA). It is worth to emphasize that among the remaining four, three are exclusively dedicated to polymers modifications and only one also provides commercial service for food irradiation. The latter counts on two Linac linear e-beam accelerators (model Titan Beta 18/10, 18kW, 10MeV) [5, 6].

5. Future necessities

Ongoing difficulties in obtaining and shipping isotopic irradiators have made it more pressing to evaluate E-beam radiation as an alternative to gamma radiation. Future changes currently under consideration include ways to reduce expenses. The application of electron beams accelerated mechanically to foods without using any radioactive source has increased its participation as a world widespread irradiation treatment for food preservation [7].

Unlike other countries, Brazil has invested heavily in the commercial use of irradiation technology and future trend is a gradual growth, probably reaching expressive levels such as EUA and China. Several producers are looking for this technology as a way to guarantee the quality and safety of their products.

6. Conclusion

As the use of low energy electron beam (EB) accelerators (less than 500 keV) for food processing and as a phytosanitary treatment is growing, there is also a need for mobile EB facilities for applications on site, such as seed disinfestations. The EB technology has been quite successful both in terms of customer acceptance and quarantine efficacy.

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8. References

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