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## Summary

### Radiation and Isotope Applications for Improving Everyday Life

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#### 1. Electron Beam Application for Environmental Protection

Coal burning provides 25% of global primary energy emitting significant amount of  $\text{SO}_2$  and  $\text{NO}_x$  which cause acid rain. In view of abundant reserve of coal, the development of clean coal technology is of importance. In Poland and China three industrial plants to remove  $\text{SO}_2$  and  $\text{NO}_x$  from flue gases of coal burning power station by electron beams have been in successful operation. This technology was first developed by JAERI and Ebara in Japan.

In Korea a pilot plant cleaning waste water from dye factories by using electron beams have been operated and an industrial plant construction has been proposed for partial government support.

#### 2. Radiation Applications for Food Safety and Sustainable Agriculture

Food irradiation applications have been expanded in more than 30 countries for food safety and longer shelf-life. Through the world 90,000 tons of spices are yearly disinfected by radiation. In China 100,000 tons per year of foods are irradiated. In USA irradiated meats for hamburgers are sold in 5,000 supermarkets to avoid food borne diseases. The irradiation of foods is also used for disinfestation instead of chemical fumigation which pollutes environment. In Japan 10,000 tons of potatoes per year are irradiated to inhibit sprouting. Radiation technology has large potential to replace chemical treatment to avoid environmental pollution.

In the field of agriculture, the mutation breeding to develop disease resistant varieties can decrease the use of pesticides. The sterile insect technique (SIT) has been successful in the eradication of med flies, tsetse flies and new world screwworm flies in a number of countries with good support of the IAEA. "Bio-fertilizer" using microorganism with irradiated carrier to enhance nitrogen fixation can reduce chemical nitrogen fertilizer.

### 3. Radiation Processing for Value-added Products

The radiation-induced crosslinking of various polymers have been extensively used in industry for upgraded products in terms of heat chemical and stress-cracking resistance for wire, cable, pipe, sheet and etc. The radiation grafting technology is also used for synthesis of functional polymers such as air-cleaning fibers and battery separator. The radiation cross-linked PVA hydrogel is about to be commercial product in Japan. Radiation crosslinking and degradation of natural polymers such as rubber latex, alginate, agar and starch are in new areas of application.

### 4. Conclusion

In Japan total economic scale of nuclear application is some US\$99 billion and about a half is that of radiation and isotope application. The radiation and isotope application have good potential to contribute further for environmental protection and sustainable development.