



4.8 Present Status of Radiation Processing and Its Future Development by Using Electron Accelerator in Vietnam

Tran Khac An, Tran Tich Canh, Doan Binh, and Nguyen Quoc Hien*
Research and Development Center for Radiation Technology (VINAGAMMA),
Nuclear Research Institute* (NRI), Vietnam

Abstract

In Vietnam, studies on Radiation Processing have been carried out since 1983. Some results are applicable in the field of agriculture, health and foodstuff, some researches were developed to commercial scale and others have high potential for development by using electron accelerator. The paper offers the present status of radiation processing and also give out the growing tendency of using electron accelerator in the future.

A. Status of Radiation Processing in Vietnam

1. Facilities

Although studies on radiation processing have been early carried out in Vietnam, due to the lacking in finance facilities used for research and development in this field are too modest. At present, the facilities used for radiation processing in Vietnam are listed in the table 1.

Table 1: Statistics of facilities used for radiation processing in Vietnam

No.	Facility	Main Characteristics	Owner
1	Gamma Cell	- Present activity: 3 kCi - Irradiation volume: 4 liters	Nuclear Research Institute - NRI (Dalat)
2	Co ⁶⁰ Industrial Irradiator	- 400 kCi in Feb. 1999 - Tote box type - $D_{Max}/D_{Min.} = 1.3$ at 0.2 g/cm^3	Research and Development Center for Radiation Technology - VINAGAMMA (Ho Chi Minh City)
3	Co ⁶⁰ Semi-industrial Irradiator	- 107 kCi in 1991 - Carrier type	Institute for Nuclear Science and Technique (Hanoi)
4	UV machine	10 kW	NRI (Dalat)

2. Manpower

Vietnam Atomic Energy Commission (VAEC) has 5 institutions named as Nuclear Research Institute - NRI (Dalat), Institute for Nuclear Science and Technique – INST (Hanoi), Institute for Technology of Radioactive and Rare Element (Hanoi), Center for Nuclear Techniques in Ho Chi Minh City and Research and Development Center for Radiation Technology – VINAGAMMA (Ho Chi Minh City).

The Research and Development of Radiation Technology is assigned to Nuclear Research Institute, Institute for Nuclear Science and Technique and Research and Development Center for Radiation Technology. The statistics of manpower is as follows:

Table 2: Statistics of manpower in the field of Radiation Technology

Institution	No. staff	Degree			Profession		
		Ph.D	Master	B.Sc.	Physics	Chemistry	Biology
NRI	12	1	3	8	0	6	6
INST	7	1	3	3	0	3	4
VINAGAMMA	6	1	1	4	2	2	2

Remark: Number of Technicians is not taken into account

B. Present activities of radiation processing

The present activities in the Radiation Processing field in Vietnam can be classified into three categories illustrated in the Table 3.

Table 3: Categories of activities in radiation processing

No.	Category	Scale	Product
1	Sterilization	Commercial	- Medical products - Traditional drugs - Tissue graft (Biology)
2	Pasteurization	Commercial	- Frozen food - Dried food
3	Material production	Research Commercial	- Hydrogel for burn treatment - Biodegradable material - Modification of Natural Polysaccharides - Radiation processing of NRL - Plant growth promoter

Among the irradiation facilities in Vietnam the irradiator SVST-Co60 at VINAGAMMA is the biggest one. The irradiator has been put into operation since March 1999 and economically runs. The total investment for the irradiator was near to 2 millions USD. The investment funds consist of a half million USD of Ministry of Science, Technology and Environment (MOSTE), near to a half million USD supported by IAEA and about one million USD borrowed from the bank. It is the first time researchers in the field of irradiation technology dared to borrow money from the bank to apply their research results to the country economics. The operation of the irradiator and processed products are given in the table 4.

Table 4: Statistics of the irradiator operation at VINAGAMMA for 3 years

Year	Irradiation time (hours)	Processed products		Remark
		Medical product (m ³)	Food (tons)	
1999	2,531	405	307	Since April, 1999
2000	6,934	654	3,756	
2001	7,745	777	4,671	
Total	17,210	1,820	9,125	

At present, the irradiator is running at full rate with the averaged turnover of about 65,000 USD per month. As the market demand is growing and the irradiator is in overload status. The feasibility study for construction of other irradiator is under consideration. Upon

our plan, the second irradiator is food irradiation type and hopefully will be operated at the end of 2003.

The operation of the irradiator in Hanoi has low effectiveness due to the lacking in products and low activity at present. It is necessary to modify the present design for sprouting inhibition and food preservation purposes to the purposes of medical product sterilization and food irradiation. The project on modification of the irradiator was submitted to MOSTE for consideration.

The gamma cell at NRI is the first irradiation facility in Vietnam. It is effectively exploited for studies on radiation processing. By using this gamma cell researchers of NRI have got a lot of success in the radiation processing of rubber natural latex, the production of plant growth promoter and in the production of hydrogel, etc.

Beside the effective activities in sterilization of medical products and food pasteurization there are several successful researches and their results became commodities. The technology for production of plant growth promoter has been transferred to one private company. This company well does business with this product. Production technology of hydrogel for burn treatment, natural rubber latex grafted with methyl methacrylate and irradiated chitosan used as fungicide in agriculture were completed and in a course of waiting for technology transfer.

The UV machine is only used for technology demonstration and for processing small volume of clear coating products.

C. Future Development of Radiation Processing by Using Electron Accelerator in Vietnam

Vietnam is a developing country. The country economics develops with rather high rate. The rate of GDP in 2001 is 6.8%. It is expected that the foreign investment will be higher and higher. In turn, the demand of radiation processing certainly will increase. There are the following fields in Vietnam that require using EB for processing:

- Production of heat shrinkable materials, wire and cable for electricity and communication.
- Production of biodegradable materials for packaging purposes in foodstuff.
- Production of degraded Natural Polysaccharides for plant growth promoter and protector.
- Radiation processing of NRL
- Hydrogel for utilization in medical and agricultural fields.

Upon the above-mentioned demands the further research and development requires an electron accelerator. The electron accelerator is intended to use for research and development purposes, technological demonstration, test production and production in pilot scale if possible.

One low energy electron accelerator should be equipped in the period of 2003-2004.

The utilization of the electron accelerator should be aimed at some feasible applications which could lead to invest electron accelerators for commercial purposes upon the requirements of the country industries.

The finance settlement for the accelerator is a burden for Vietnam scientists. We are looking for cooperations in finance, research, education as well as technology transfer.

Conclusion

The success in sterilization of medical products, food irradiation and other applications in healthcare and agriculture by using gamma irradiation is a great encouragement to Vietnamese researchers to step in using the new ionizing radiation source that is electron accelerator.

To reach the higher level of the radiation processing, Vietnam should choose the way for itself. A procurement of a low energy electron accelerator is the first appropriate step on the way of utilization of industrial electron accelerators for the country industries.

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5. Invited Reports

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