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### **Outline of FNCA Project on Application of Electron Accelerator**

Tamikazu KUME

*Project Leader of Japan for Application of Electron Accelerator  
Japan Atomic Energy Research Institute (JAERI), Takasaki*

#### **1. Backgrounds of the Project**

- 1) Objective of the project is to develop new technology of low energy electron beam (EB) irradiation system that has a variety of applications and good safety features, and to demonstrate its application. A self-shielded low energy accelerator system needs an initial investment much lower than a Co-60 facility. Its operation is simple and safe. The system can be applied in various fields such as radiation processing, environmental conservation, etc.
- 2) The first project in the field of industry aims at wider application of electron accelerator and also aims at implementation of practical application bring benefit for participating countries through not only the information exchange but also joint study by taking experimental data. This project was organized with the participation of eight FNCA countries including Japan.

#### **2. Activities for the Year 2003**

- 1) The 3rd Workshop was held from August 18 through August 22, 2003, at the Legend Hotel, Kuala Lumpur, Malaysia. The Workshop was sponsored by the Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan and hosted by Malaysian Institute for Nuclear Technology Research (MINT) and Japan Atomic Energy Research Institute (JAERI).
- 2) The main objective of the workshop was to discuss status of utilization of electron accelerator for thin films in the FNCA participating countries and to formulate future program.
- 3) The Workshop was attended by experts on application of electron accelerator from the participating countries, i.e., China (2), Indonesia (2), Japan (5), Korea (2), Malaysia (11), Philippines (2), Thailand (2) and Vietnam (2).

### 3. Achievement of the 2003 Workshop

#### 1) Summary

- On the first day, a National Executive Management Seminar on Application of Electron Accelerators was held and attended by 87 participants from industry, university and research institutes and members of FNCA Workshop.
- A mini exhibition on the application of electron accelerator was held in conjunction with the seminar. There were 11 exhibitors, 4 from Japan, 1 from Korea and 6 from Malaysia. The exhibition highlighted the potential products for commercialization, which include sago hydrogel, sago foam, palm oil acrylate resin for coatings, heat and flame resistance compounds, low energy accelerators for liquid irradiation and electron beam machines.
- A total of 8 country reports on the current status of application of electron accelerator, especially on thin film/hydrogel, in the participating countries were presented. The participants had the opportunity to discuss, exchange opinions and share their experiences on issues related to radiation processing and utilization of low energy electron accelerators for thin films/hydrogel.
- Crosslinking of thin film from sago starch polymer blend using the Curetron (200 keV, 20 mA) and crosslinking of hydrogel for wound dressing and CMC paste-like sheet using the medium energy (3.0 MeV, 30 mA) electron accelerator of MINT were successfully demonstrated. Workshop participants were very much impressed with Polymer Technology Laboratory and pilot scale facilities of MINT, which include polymer processing facility, flue gas facility and wire/tube handling system for irradiation services.

#### 2) Midterm Evaluation of Current Project

- A preliminary evaluation of the current project was carried out by the FNCA workshop participants based on the objectives of the project, which are as follows:
  - a) To develop new technology of using low energy electron accelerator irradiation system for liquid, thin film and gases
  - b) To develop and demonstrate its applications
- The workshop expressed their satisfaction on the benefits of FNCA projects to their own institution and country. To some countries, this project has resulted in the establishment of a national committee on the application of electron accelerator. This also has created awareness among the top management of the atomic energy commission.

- Efforts are being made by Vietnam, Thailand and Philippines who do not have electron accelerators to acquire the machine for R&D and commercial use in the near future. Fellows from these countries have conducted research on the applications of low energy electron accelerators at JAERI-Takasaki.
- The workshop also considered that the projects have been successfully developed and demonstrated the technology of irradiating liquid samples and thin hydrogel films using low energy electron accelerator of 250 keV and 200 keV respectively. The demonstration on electron processing of liquid sample was carried out in the 2<sup>nd</sup> workshop in December 2002 at JAERI-Takasaki and the demonstration on electron beam processing of thin hydrogel film was carried out in the 3<sup>rd</sup> workshop, August 2003 at MINT, Malaysia.
- Many countries expressed the importance of continuing the projects on electron beam processing of natural polymer and treatment of industrial wastewater.
- The workshop commended the activity on public/open seminar as an important activity to promote the technology to end-users. Public/open seminar would continue to be part of the FNCA workshop program.

#### **4. Future plan**

- The workshop agreed that projects based on natural polymer should be continued as one of the activities under the FNCA program on the application of electron accelerator. However, a specific application should be identified and all members are urged to provide the proposal in the next workshop.
- The participants were reminded that cost benefit analysis of radiation technology need to be looked at closely in making the proposal. In addition the future project should be market driven whereby direct linkage with end user is recommended.

#### **Workshop program**

##### **(1) 2004 Workshop in China on gas**

- 1) Report on topics of flue gas treatment
- 2) Demonstration test of EB system for flue gas
- 3) Report on the progress of each country for selected subject
- 4) Open Seminar

The workshop plan was discussed and decided that the next workshop will be held in September 2004 in China. The main topic

will be on EB treatment of flue gases. All member countries are requested to carry out the preliminary survey on the potential needs of EB treatment of gases in their countries.

(2) 2005 Workshop in Korea on wastewater

- 1) Discussion for detail program at 2004 workshop
- 2) Open Seminar

Many members expressed interest to have a project related to industrial wastewater treatment. However, members are encouraged to identify carefully the type of wastewater and to carry out the preliminary experiments in relation to irradiation dose requirement and the possible conventional-combination treatment to ensure the treatment process is economically viable.

**Discussion for future activity**

- 1) Preliminary discussion for the phase 2 project at 2004 workshop
- 2) Final evaluation for phase 1 project at 2005 workshop
- 3) Discussion for the phase 2 project at 2005 workshop

**5. Homepage**

- It was agreed that the FNCA Homepage should be utilized for activities of application of electron accelerator.
- The irradiation facilities of Electron Beam and Co-60 Gamma-rays are listed in the homepage. It is requested to update the data by member countries.