
Editorial

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Nuclear fuel cycle is an important area of research and development for the large rapid and sustained growth of nuclear energy. The R&D programmes are targeted towards the search for innovative technologies which enhance economy and safety and which ensure optimum utilisation of the world's nuclear fuel reserves. A factor in the public acceptance of nuclear energy is also the safe disposal of radioactive waste, ensuring that it does not create any adverse impact on the environment. It is not surprising therefore that there is intense R&D activity in a large number of countries in the areas related to the fuel cycle.

India has placed a large emphasis on the closed fuel cycle, as it believes that closing the fuel cycle is the only way to make nuclear energy economical and sustainable. It is clear that in the decades to come, nuclear energy would play a very important role in meeting India's energy requirements and, for this, evolving a robust, environment-friendly, closed nuclear fuel cycle is necessary. A host of technologies have to be developed on priority, in an appropriate time frame, to meet the objectives. New technologies for mining and ore processing, effective utilisation of uranium and thorium resources, handling of large quantities of plutonium, processing of high burn-up fuel with low cooling time, remote fabrication of fuels, etc., are some of the important challenges to be met.

It was therefore very appropriate that in the Golden Jubilee year of Atomic Energy in India, the Indian Nuclear Society chose the theme 'Nuclear Fuel Cycle Technologies: Closing the Fuel Cycle'. Proposal received a spontaneous support from the Board of Research in Nuclear Sciences (BRNS) of the Department of Atomic Energy. Aptly, Kalpakkam was chosen as the venue, housing as it does nuclear reactors with all three fissile materials – natural uranium oxide (Madras Atomic Power Station), plutonium rich uranium-plutonium mixed carbide (Fast Breeder Test Reactor-FBTR) and U-233 in the form of metal alloy (KAMINI reactor). The fuel cycle of PHWRs and fast reactors represent a continuum of challenges. The Kalpakkam complex also stands for the demonstration of India's capability to close the fuel cycle, in that the fissile materials for the fuel in FBTR and KAMINI are derived from indigenous irradiated fuels.

The Conference – INSAC-2003 attracted excellent participation from the Indian as well as the international nuclear community. Split into eight technical sessions, the conference covered a wide range of subjects related to the nuclear fuel cycle from mining, ore processing and fuel fabrication to fuel reprocessing and waste management and also some of the futuristic areas such as accelerator driven sub-critical systems. In addition to 23 invited talks, there were 131 contributed papers, from various units of the Department of Atomic Energy as well as other research institutes, presented as posters.

As a satellite programme of the INSAC-2003 conference, a conference on 'Materials, Robotics, Process instrumentation and Inspection technologies' was organised at Chennai during December 15–16, 2003. This conference was also organised by BRNS, along with the Kalpakkam chapter of Indian Nuclear Society and the Kalpakkam and Chennai chapters of the Indian Institute of Metals. A total number of 33 invited talks were delivered in oral sessions while 56 contributory papers were presented in poster sessions. Based on the technical content in the papers, the papers had been grouped into five sections:

- materials
- welding and manufacturing technology
- robotics
- process instrumentation
- inspection technology.

The papers covered both fundamental aspects as well as indigenous and interdisciplinary engineering efforts behind the development of these technologies.

This volume presents a selection of invited and contributed papers presented in the INSAC-2003 and MRPI-2003 conferences. We are specially grateful to Dr R Chidambaram, Principal Scientific Advisor to the Government of India and Homi Bhabha Chair Professor, Department of Atomic Energy, who was instrumental in designing and guiding the conference, as the President of Indian Nuclear Society and also in suggesting a special issue of this journal. We sincerely thank Dr. Anil Kakodkar, Chairman, Atomic Energy Commission, for his inspiring guidance and advice in conducting the conference. It is an appropriate occasion to express our gratitude and congratulations to the authors of the papers selected for this special issue. We record our sincere thanks to Dr. Andre Maisseu, Chief Editor of the *International Journal of Nuclear Energy Science and Technology* for his acceptance of our proposal for a special issue of the journal.

The Board of Research in Nuclear Sciences is bringing out a broader selection of the papers presented in the conferences as special volumes.