ELECTRON ACCELERATOR BASED SYSTEMS FOR AIR, WATER AND SOIL POLLUTION CONTROL

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Along with the increase in the population of the Earth and the development of industry, the emergence of large cities the number and quantities of environmental pollutants have increased dramatically. Currently, the so-called Artificial pollution, which, unlike natural ones, is caused by human activity has become a worldwide problem. The introduction of harmful substances into the air, water and soil, in addition to having a negative impact on the condition of nature, ecosystems, and the Earth's climate, is a direct threat to human health. Industry, power stations and transport are responsible for air pollution with particulate and acidic gases or gases causing the greenhouse effect. With the development of cities and industry, the source of pollution has become the growing amount of domestic, industrial and agricultural sewage. The high degree of water pollution with sewage has led to the exhaustion of their self-purification capacity. Industry and economy are responsible for the growing amount of solid waste, which, when deposited in landfills, releases poisonous substances into water and soil. Therefore, new regulations were introduced in the most countries concerning of any type pollutants emissions control and prevention. Important actions taken in order to counteract environmental pollution are recovery and recycling of waste as well.

The research on the possibility of using ionizing radiation in the treatment of the radiation of ionizing radiation has been undertaken a long time ago. However, the first applications, such as the treatment of drinking water from microbial contamination, the hygienization of excess sludge from biological wastewater treatment plants, etc., were based on the use of isotopic gamma sources. The powerful tools of ionizing radiation, electron accelerators, have been used for radiation processing of materials for more than half a century. However, the possibility of radiation applications for environmental pollution control was realized in the 1970s, when environmental protection agencies were established and standards for pollutant emission limits were set. The pioneer in these applications was the Japan Atomic Energy Research Institute, Takasaki [1]. Sueo Machi, past IAEA DDG, has initiated worldwide developments in the accelerator use in the field "Environmental protection by the use of EB accelerators is a new and important field of application. A commercial plant for the cleaning flue gases from a coalburning power plant is in operation in Poland, employing high power EB accelerators. In Korea, a commercial plant uses EB to clean wastewater from a dye factory." [2]. This was a breakthrough in a industrial applications of accelerators in worldwide scale [3]. The special input for application of the technology was the development of new high power electron accelerators which can be used for on-line processing of huge flow streams of liquid or gaseous pollutants. The accelerators were employed for off-gas and wastewater treatment and installed in a big throughput installation [4]. The further developments concern marine diesel off gases and ballast water treatment, and excess sludge hygenization [5]. New directions in environmental applications of accelerator-generated electron beams concern degradation of antibiotics and leftover drugs released in liquid effluents and slurry [6]. IAEA plays very important role in the enhancement of accelerator environmental applications [7]. However, the further developments in accelerator technology for these processes application since the machines must have high power, high electricity consumption efficiency, good reliability to work in harsh industrial conditions, in continuous operation for more than 8000 hours annually, and be available at reliable cost to make this technology competitive.

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