Electron Beam Treatment of Wastewater

In pursuit of objectives of National "Clean Ganga Mission" initiative

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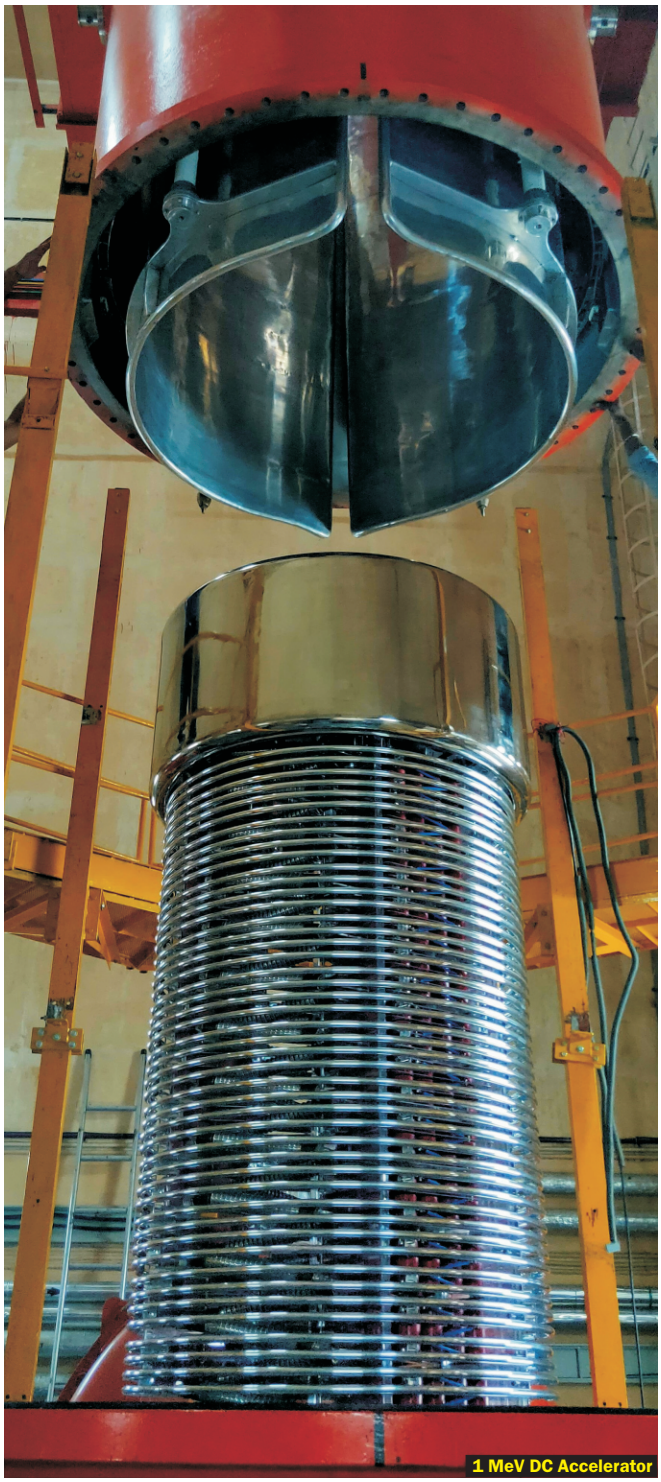
Electron Beam Accelerator Technology has potential applications in the treatment of effluents discharged from textile and tanning industry, municipal sewage and wastewater from hospitals among others. These industries are increasingly finding it difficult to limit the level of impurities in the effluent water to the permissible levels notified by the Central Pollution Control Board (CPCB), Govt. of India. However, in the long term, this issue could be addressed through adoption of EB accelerator technology.

When electron beam is incident on effluent water, it leads to radiolysis coupled with copious production of aqueous electrons, hydrogen and hydroxyl radicals.

$$H_2O \xrightarrow{EB} e^-_{aq},\ H^*,\ OH^*,\ HO_2^*,\ H_2O_2,\ H_2$$

These species react vigorously with the constituents of dye in the effluent water to break the complex molecules. As a result, they become more amenable to decomposition by the bacteria. In comparison to conventional microbial and chemical treatments methods, complete oxidation of non-biodegradable matter can be achieved through Electron Beam (EB) within milliseconds.

More importantly, the technology is considered to be user-friendly as well as safe to the environment. The technology was successfully demonstrated (ready for technology transfer and industrial incubation) by treating wastewater using simulated dye effluent wherein a significant reduction of chromaticity, COD and BOD levels have been achieved by applying radiation dose in the range of 5-16 kGy. The basic components of the system include a wastewater feeding system comprising a pump, through which effluent water from the aeration tank of the Effluent treatment Plant (ETP) is supplied to the front side of the beam exit port where the high energy electrons are bombarded from the EB machine. The effluent is circulated through a piping system to the aeration tank till the requisite Chemical Oxygen Demand [COD] ($\leq$ 250ppm) and Biochemical Oxygen Demand [BOD] ($\leq$ 30ppm) values are obtained. Finally, the treated water is discharged through the nozzle in the form of a water film of 4 mm thickness and 1500 mm width.


1 MeV DC Accelerator

The authors deeply acknowledge the support provided by the EBC team, APPD, BARC and Director, BTDG. Timely assistance provided by the technical staff and various groups in BARC during the development and operation of the Electron Beam accelerator for wastewater treatment is deeply acknowledged.

The authors are from APPD and Electron Beam Centre, Kharghar, which are part of Beam Technology Development Group, BARC.