Novel Electron Beam Technology for Environmental Remediation

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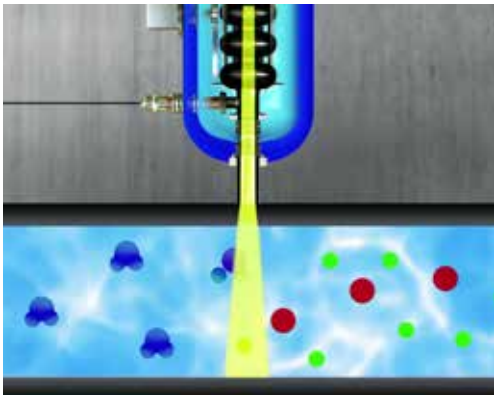
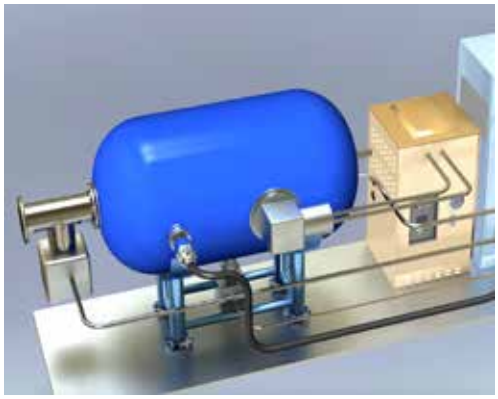
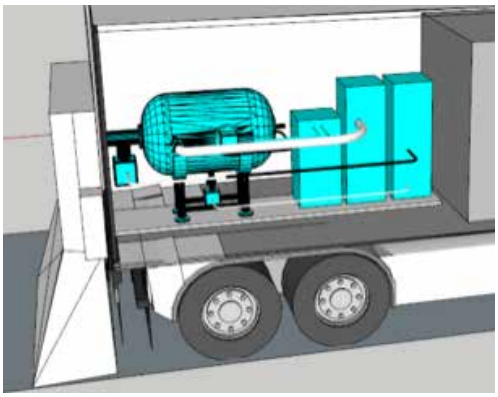
Treatment of Mixed Waste

The treatment of mixed waste presents numerous challenges for industries generating such waste as well as for anyone involved in site remediation. This is largely due to its classification as both radiological and hazardous waste. Electron beam treatment has proven to be an effective technology for removing hazardous organic compounds in aqueous solutions.

During the treatment process, high-energy electrons penetrate water and create highly oxidizing and reducing species that are very effective at breaking down many chemicals.
Next-generation electron beam (E-beam) technology has the potential to treat the complex waste streams of today and tomorrow.







Fermilab's technology will deliver a high-throughput, portable, scalable and cost-effective solution to treatment of a wide variety of chemical contaminants and pathogens. The compact electron-beam accelerator being developed at Fermilab can be deployed on a portable skid for in situ treatment.

Potential Solution

- Electron beams demonstrate decomposition of complex mixtures of hazardous organic chemicals including TCE, PCB, PFAS, MTBE, pharma and many more.
- Electron beams simplify the treatment and transport of mixed waste by destroying its hazardous component, leaving only the radioactive component.
- Conventional electron beam accelerators have not seen widespread adoption because of operating costs and inability to treat large volumes.
- Fermilab is developing a novel E-beam accelerator to address these issues. It will have lower operation costs over conventional E-beam technologies, treat larger volumes and be compact and portable.
- Fermilab is currently collaborating with multiple industry partners on remediating PCB-contaminated sediment sites and treating municipal, industrial and military waste waters.

Current Opportunity

- Proof of principle work in Fermilab's applications development and demonstration electron-beam accelerator, potentially using simulants.
- Determining power requirements needed to deliver the required dose at needed flow rates and testing the ability of Fermilab's compact accelerator to deliver on this specification.
- Modeling and designing E-beam/target interaction area.
- Calculating the operational power and expense needed to meet the objective and comparing to alternative benchmarks.
- Investigating overall E-beam footprint and capital costs.
- Building a field demonstration unit. Low power unit already being constructed.

For more information contact

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