

Electron Beams for Processing

The Nested High Voltage Generator (NHVG) is an ideal electron beam/ion beam technology for applications from 200keV to over 1MeV. The NHVG reduces the cost and size of high voltage DC accelerators with the advantage of solid-state drive, environmentally safe oil, solid insulation, and elimination of high-pressure gases. The devices embody a unique approach to the fault and insulation problems of high voltage systems. The NHVG can be configured for either DC or pulsed operation, with a wide range of capabilities:

200 keV to 1.5 MeV

5 kW average power at 1.5 MV

200 kW peak power at 250kV

Applications

These compact, inexpensive accelerators can be utilized for in-line processing as a complete solution, including the accelerator, scanning system, and material-handling equipment as required.

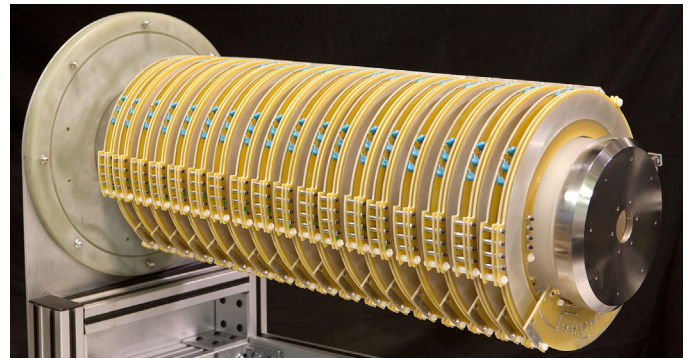
- Plastic Curing and Cross-Linking - The NHVG e-beam can be applied to plastic cross-linking and composite curing. At 20 kGy dose, the typical throughput of material is 2 m²/min for 1 kW at 450 kV, or 10 m²/min for 5 kW at 450 kV.
- Sterilization - The machines are well suited to in-line sterilization of disposable medical assemblies.
- Pollution - Both air and water borne pollutants can be treated using electron beams.
- X-Ray Inspection - The NHVG can be built with an X-Ray target yielding typical doses of 50 to 100 R/min at 1 m produced at 1 MeV. X-Ray imaging systems are also available.
- Electron Beam Research - Machines can be used for space effects studies and layered curing research.

The Nested Principle

NHVG technology has successfully extended the techniques of solid insulation by building successive, topologically “nested” insulated stages to voltages of up to 1.5 MeV. The radial thickness of these insulating layers is approximately 5 cm/MeV. The reduced diameter and use of solids and liquids simplifies “self-shielding” which is essential for in-line operation. Since the high voltage source is composed of many stages, each isolated from the other by a Faraday cage, fault currents are contained within that stage and do not cause successive overvoltage stresses and breakdown.

Typical Parameters for Electron Beam Machines

Parameter	NHV 300-10	NHV 800-12	NHV 1000-5	NHV 1500-5
Max Voltage (kV)	300	800	1000	1500
Max Current (mA)	10	12	5	5
Max Power (kW)	3	10	5	5
Useful Penetration in water or plastic (mm)	0.5	2	3	5
Number of power stages	7	16	22	33
Length (inches) accelerator only	38	48	98	140
Diameter (main)	14	16	18	20



Control Systems

The accelerators use “state of the art” control systems with extensive use of fiber optic communications to eliminate noise effects. The controls can be integrated into the customer’s workstation with the process variables, material handling, and self-diagnostics built in. Monitoring features can also be provided to a customer network via Ethernet.

Scanners and Custom Features

Beam scanner systems are also available to meet customer-processing requirements. Significant advances in beam scanning technology have been realized with linear beam scanning systems and associated magnets. For example, a 0.35 x 3.5 x 0.12 meters size scanner was built to scan a 1 MeV beam over 3.5 meters in length.

Ion Beams

Both tandem and single ended ion accelerators are available using NHVG technology. We have developed unique ion sources for long life and high reliability.