PCT
EBEAM AND INTEGRATION

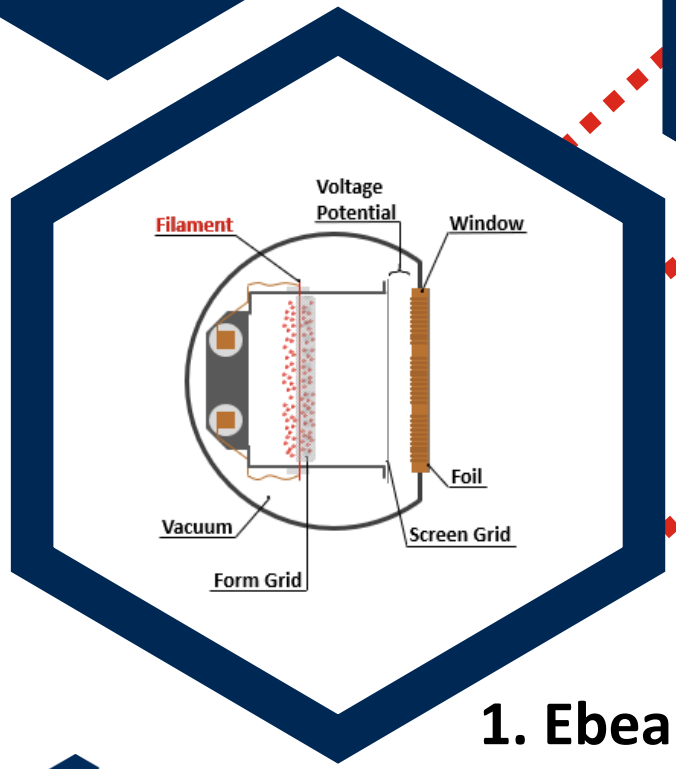
Ebeam in the Decorative Surfaces Market

January 26,2021

Outline

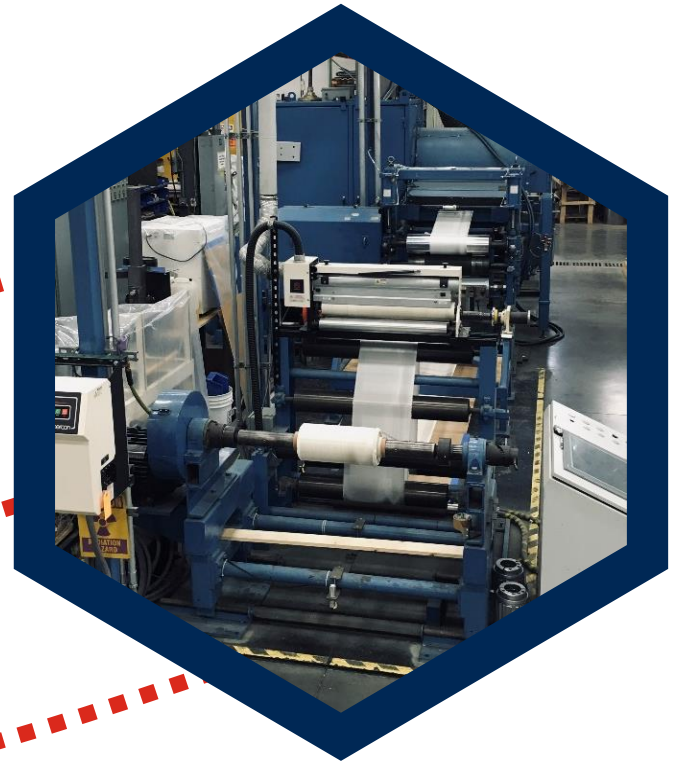
2. Ebeam Application Benefits

4. Application Development

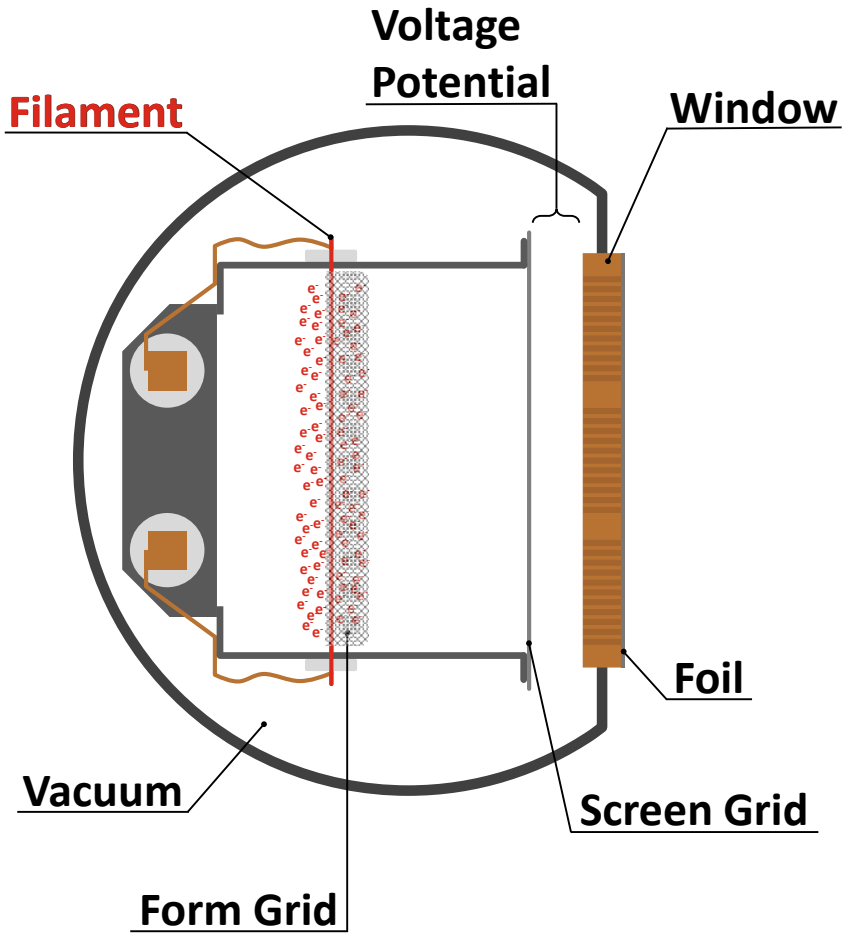


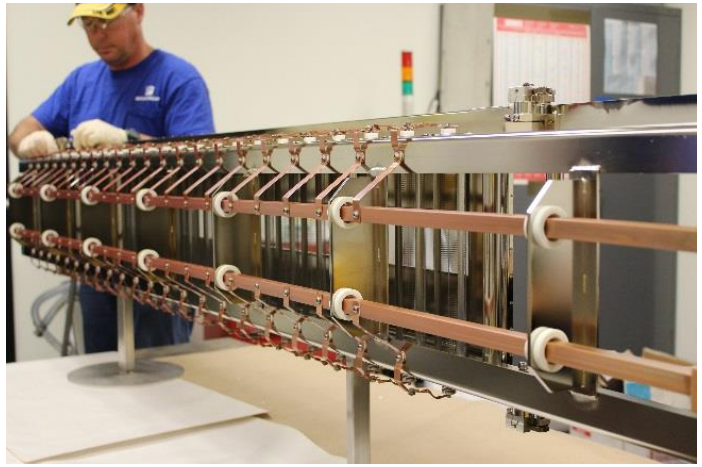
1. Ebeam Basics

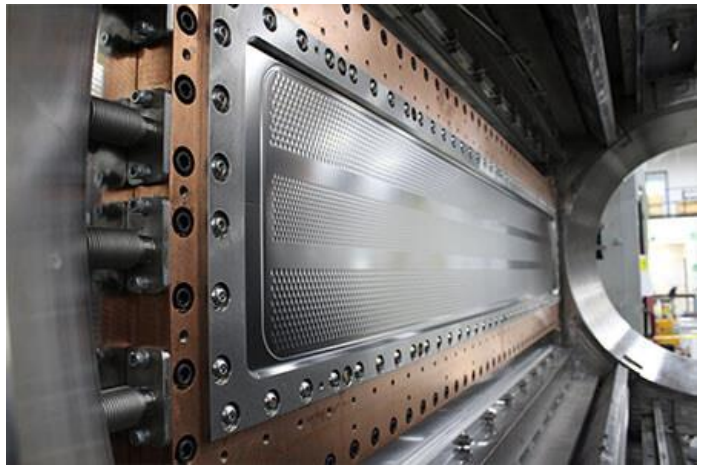
3. Equipment Design



An electron beam produces a curtain of accelerated electrons.







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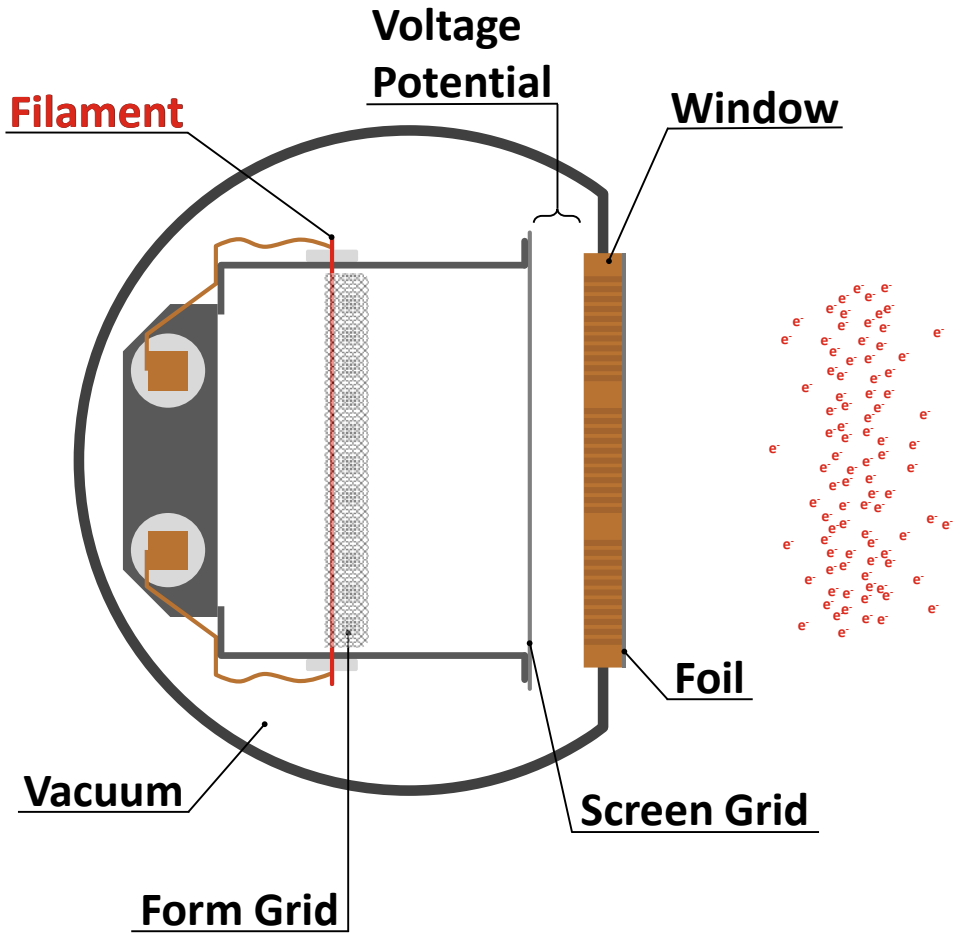
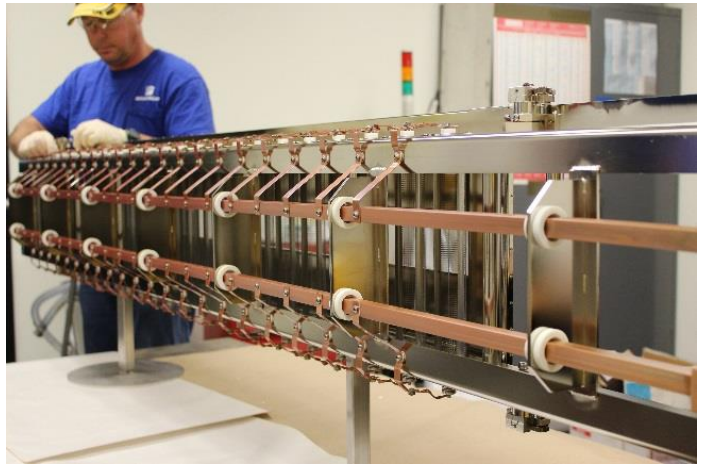
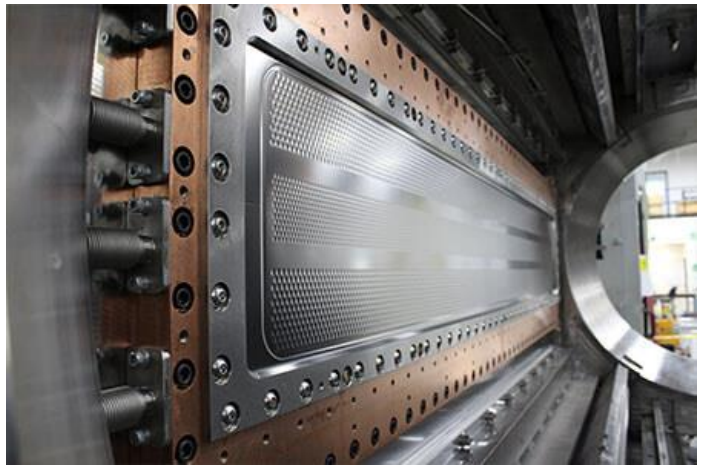
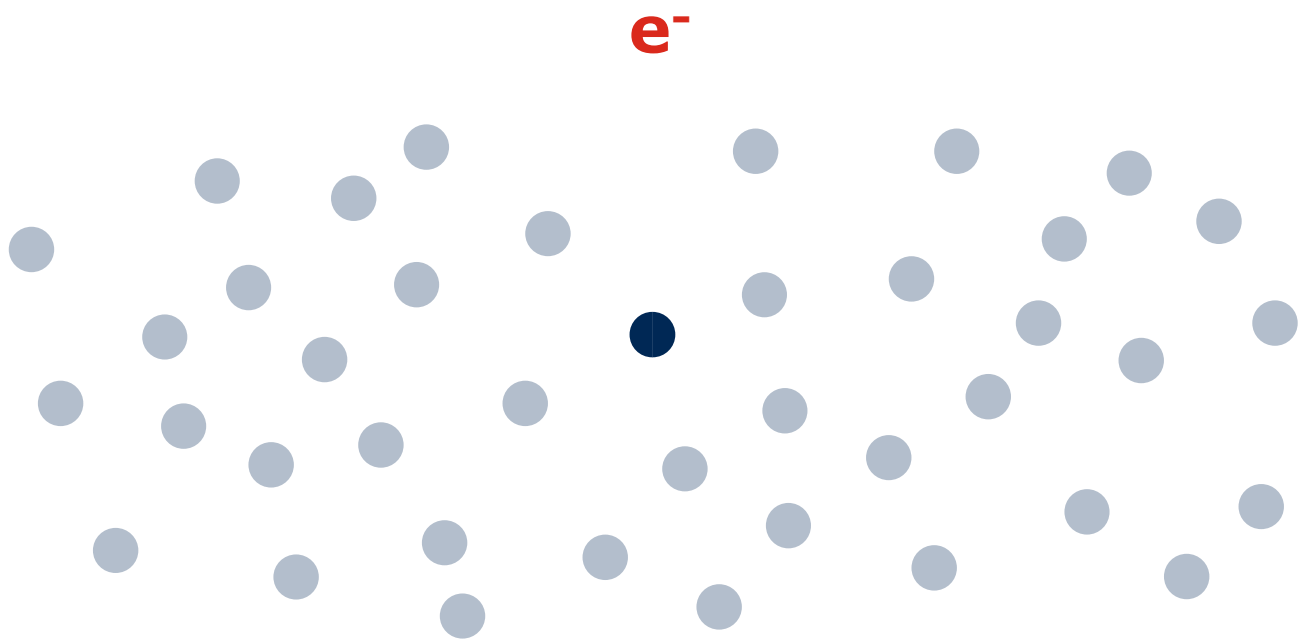






Ebeam uses accelerated electrons to break chemical bonds and initiate chemical reactions.

Ionization: $M \xrightarrow{e^-} 2R^{\cdot}$



Weiss, D., Dunn, D., Richter, K. B., and Adler, R. (2005) Pulsed Electron Beam Polymerization 1–11.

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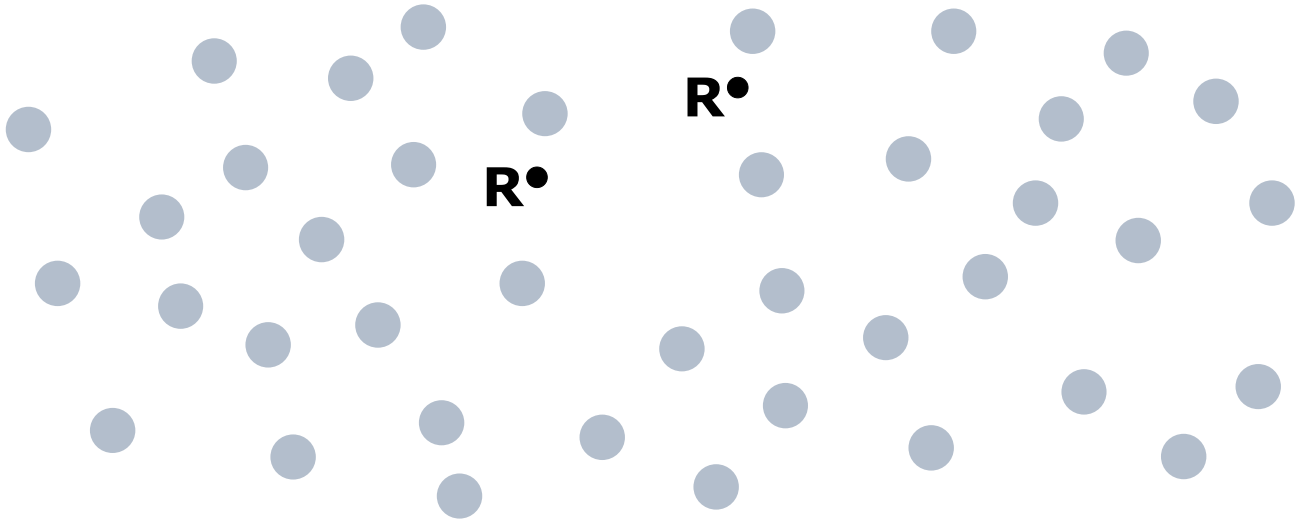

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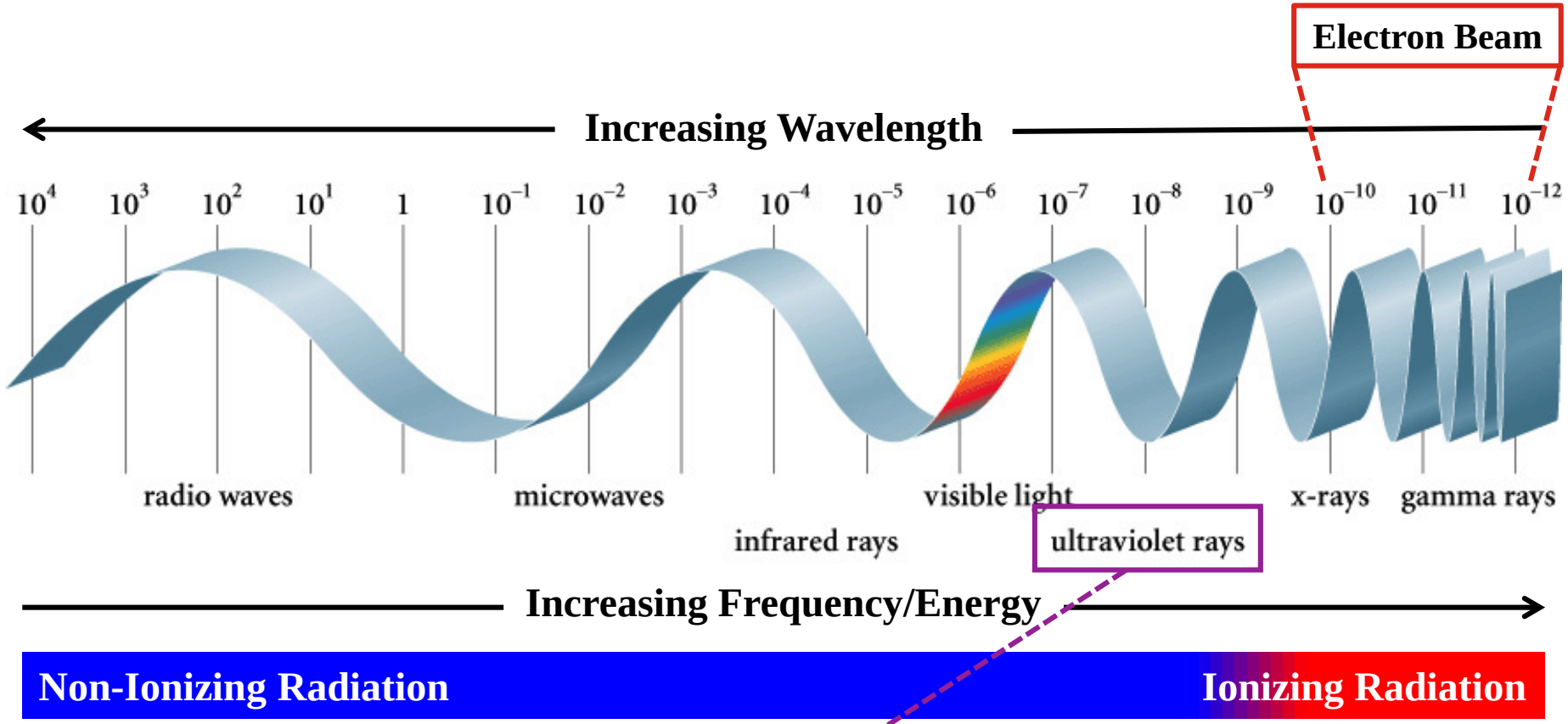
UV is largely non-ionizing radiation and requires a photoinitiator to initiate cure.



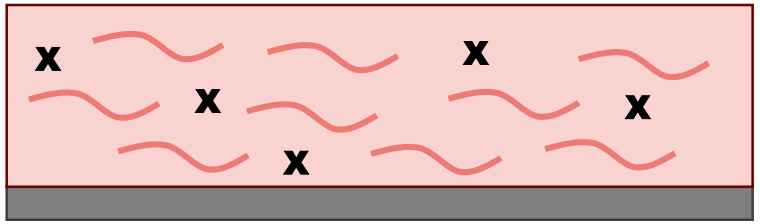
$$Photoinitiator \xrightarrow{h\nu} 2R^{\cdot}$$

Adapted from the American Heritage Student Science Dictionary

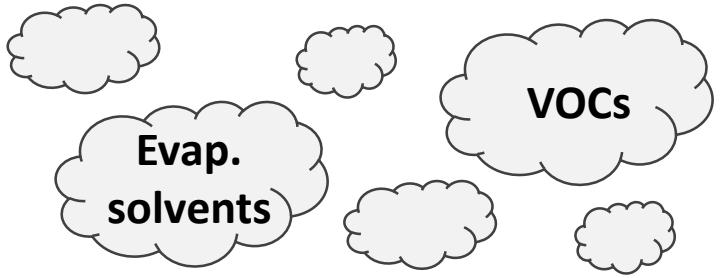
Conventional thermal-drying coatings release VOCs, where EB-curable coatings do not.

Thermal-drying Coatings

Polymer, crosslinker (hardener), and solvent



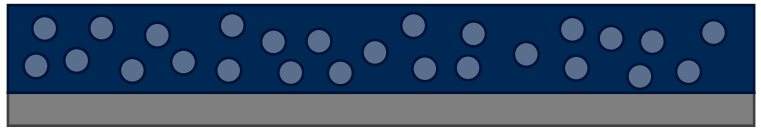
°C



Crosslinked coating

EB-curable Coatings

Pre-polymer (monomer & oligomer)



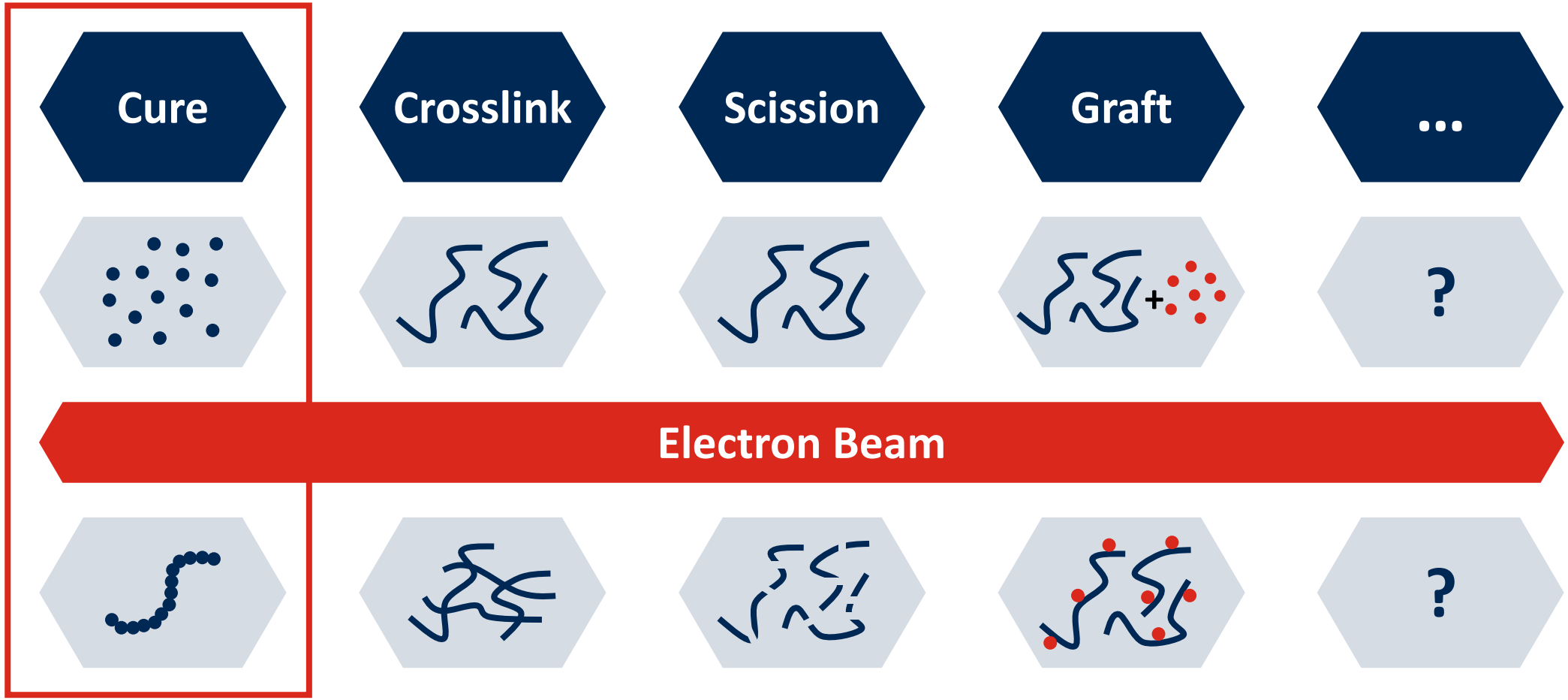
Liquid

e^-

Solid

Crosslinked coating

Ebeam uses accelerated electrons to break chemical bonds and initiate chemical reactions.



The effects of ebeam can be applied to numerous applications.

Flexible Food Packaging

Interior/Exterior Architectural Products

Vacuum Skin Packaging

Pressure-sensitive Adhesives

Tires

Coil Coating

Sterilization and Disinfestation

Heat Shrinkable Films and Sleeves

In an individual application, ebeam can be used to achieve numerous effects.

Inks

Film-property Enhancement

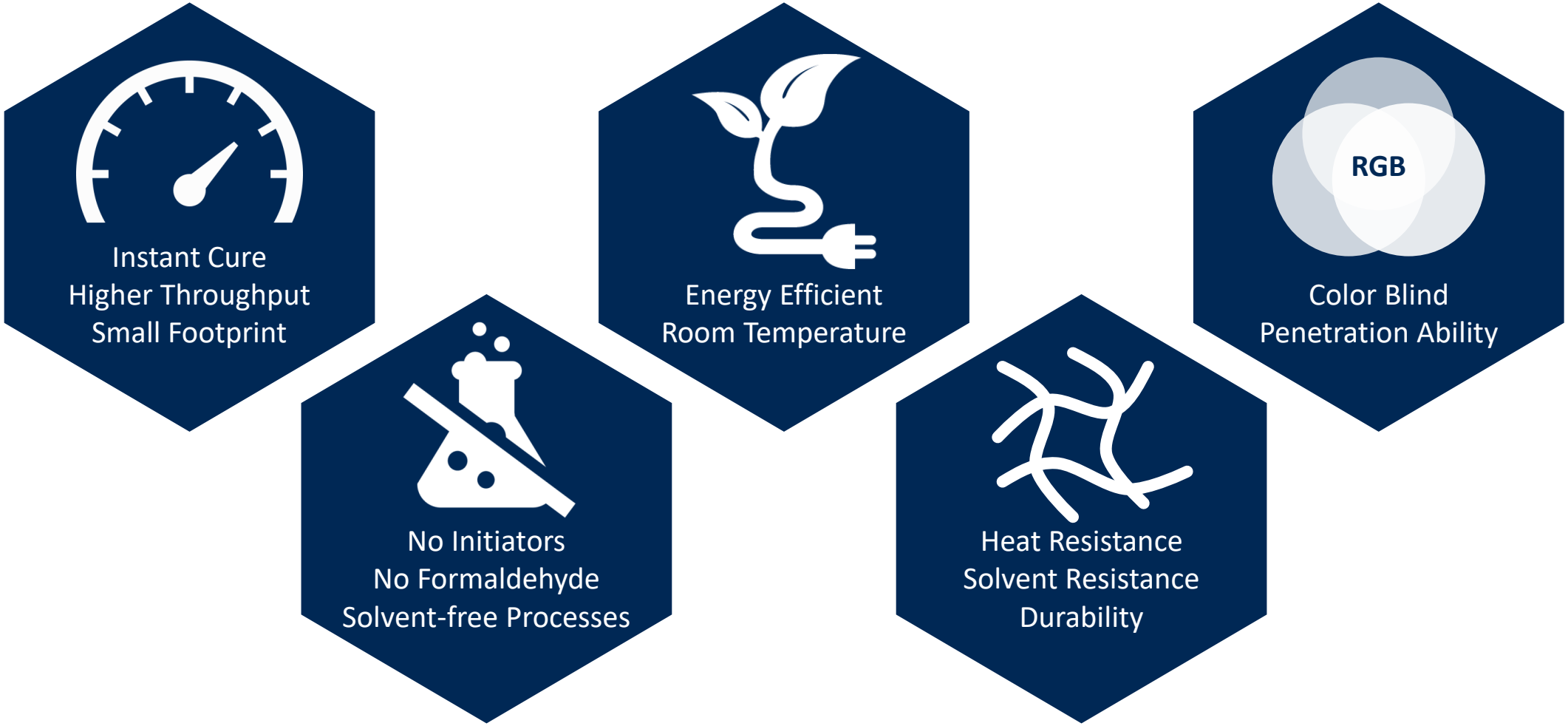
Specialty Coatings

Lamination

OPVs

Tactile Effects

Ebeam technology has many benefits compared with other methods.



The performance of EB coatings extends the product lifetime.

Gloss Level
(Comp. w. UV and Excimer)

Moisture and Weathering Resistance

COF Control

Stain Resistance

Scratch and Abrasion Resistance

PCT offers four different families of low-energy electron beams to accommodate customers' needs.

	INVICTUS	OMNIA	CORE	DYNAMIC
				
Energy	80 – 300 kV	80 – 150 kV	80 – 100 kV	80 – 200 kV
Width	1140 – 2290 mm	915 – 2743 mm	760 mm	200 or 400 mm
Speed	400 mpm	400 mpm	180 mpm	100 mpm

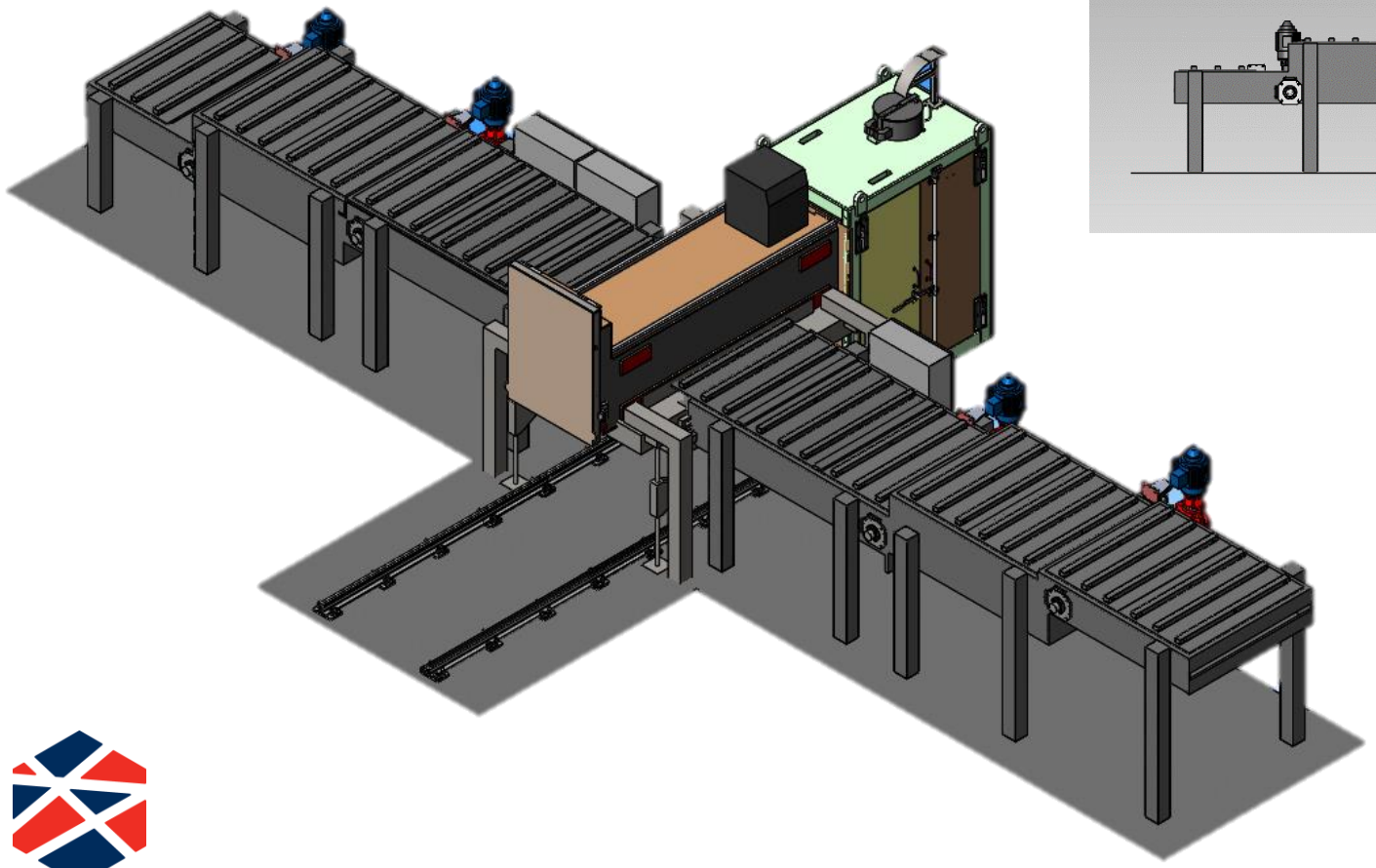
With ebeam…

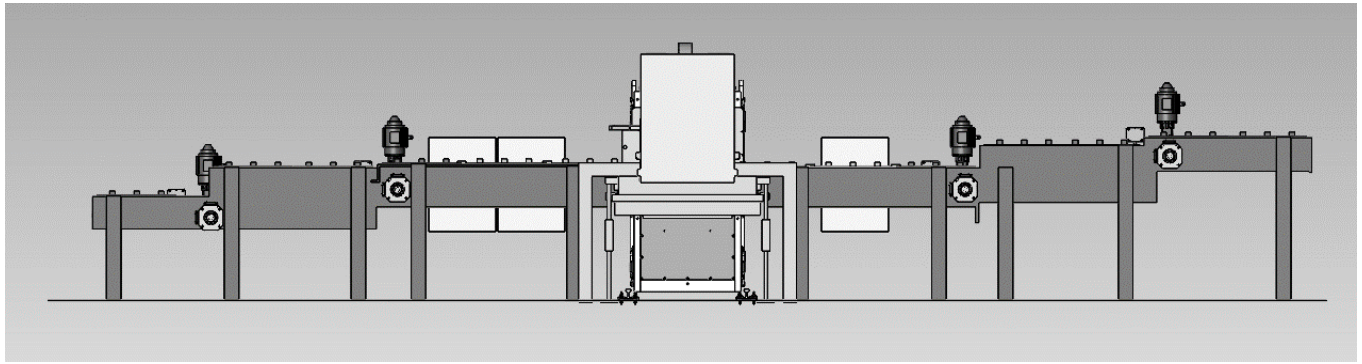
- Scalable design for wide webs
- Uniform dose
- Compatibility with multiple substrates
  - Plastic film
  - Paper
  - Wood
  - Metal

What are the benefits of having an integrated shield roll?

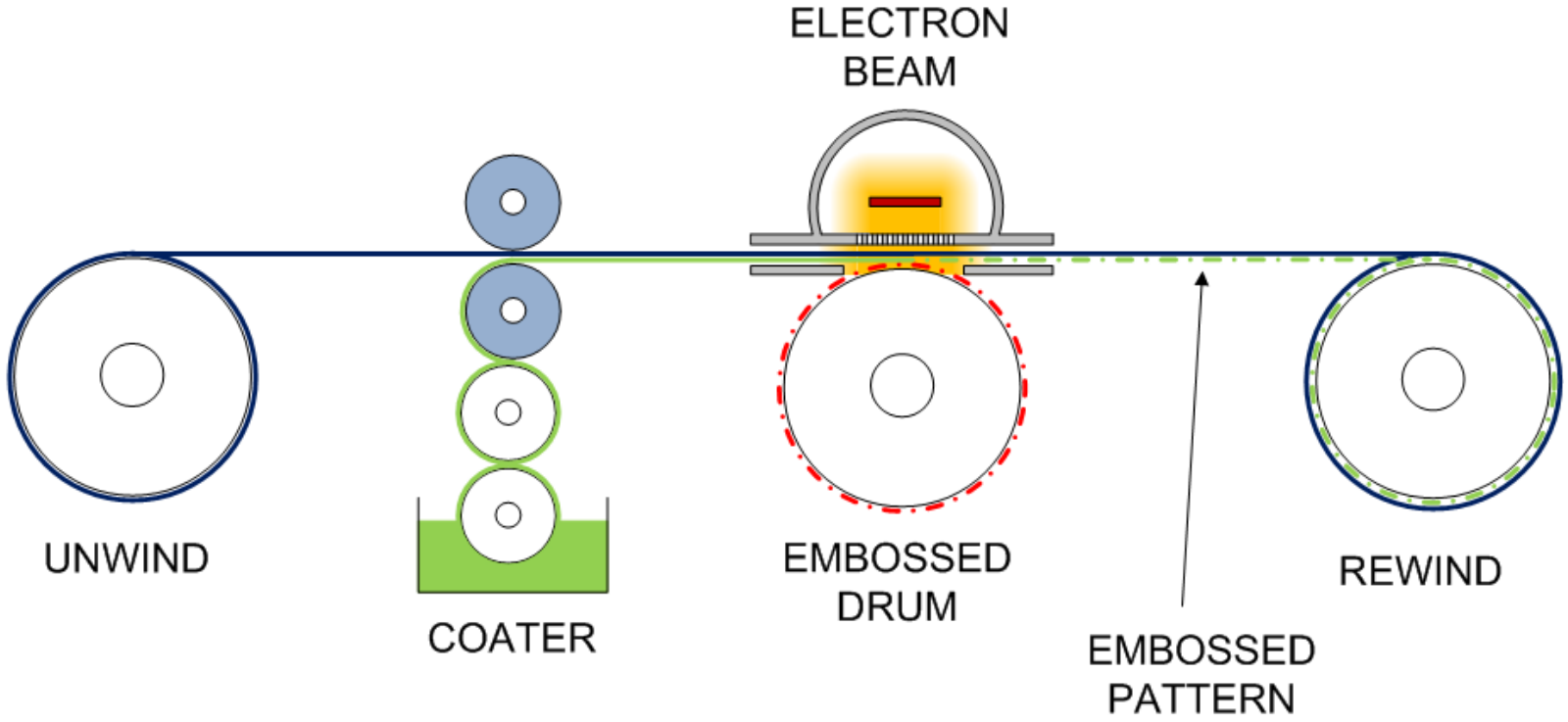
- Web control, stability, and access
- Access to the foil/window for maintenance
- Reduced nitrogen consumption
- Heat reduction for higher dose applications

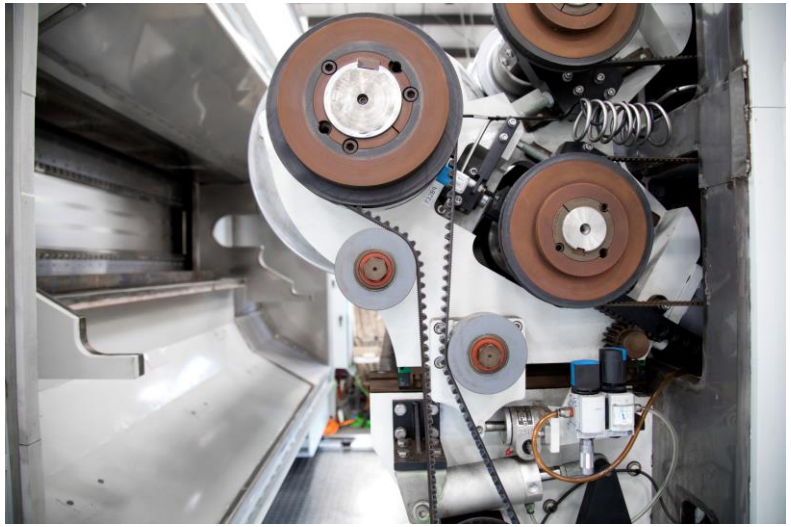
This ebeam system is designed to coat large rigid sheets and boards.





A tactile effect can be achieved by curing against an embossed drum.





Ebeam produces x-ray radiation; how is it safe?

S elf-shielded: **certified** not to exceed 0.1 mrem at 10 cm (4 in) from any surface.

A utomatic safety interlocks on every beam.

F ree of a radioactive source; no radiation is present when the beam is off.

E lectrons **don't** make material radioactive.

Ebeam produces x-ray radiation; how is it safe?

Self-shielded: **certified** not to exceed 0.1 mrem at 10 cm (4 in) from any surface.

vs.

Average Annual Dose from Common Sources (mrem)

Domestic plane travel (1 trip, 5 hrs)

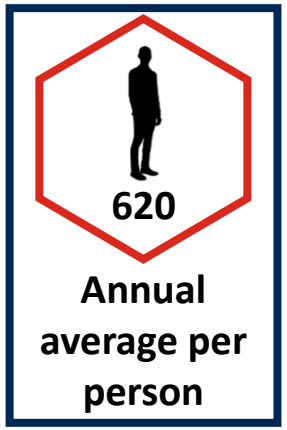
Smoking 1 pack a day

Food and water

Radon in the average U.S. home

Cosmic radiation in Denver, CO

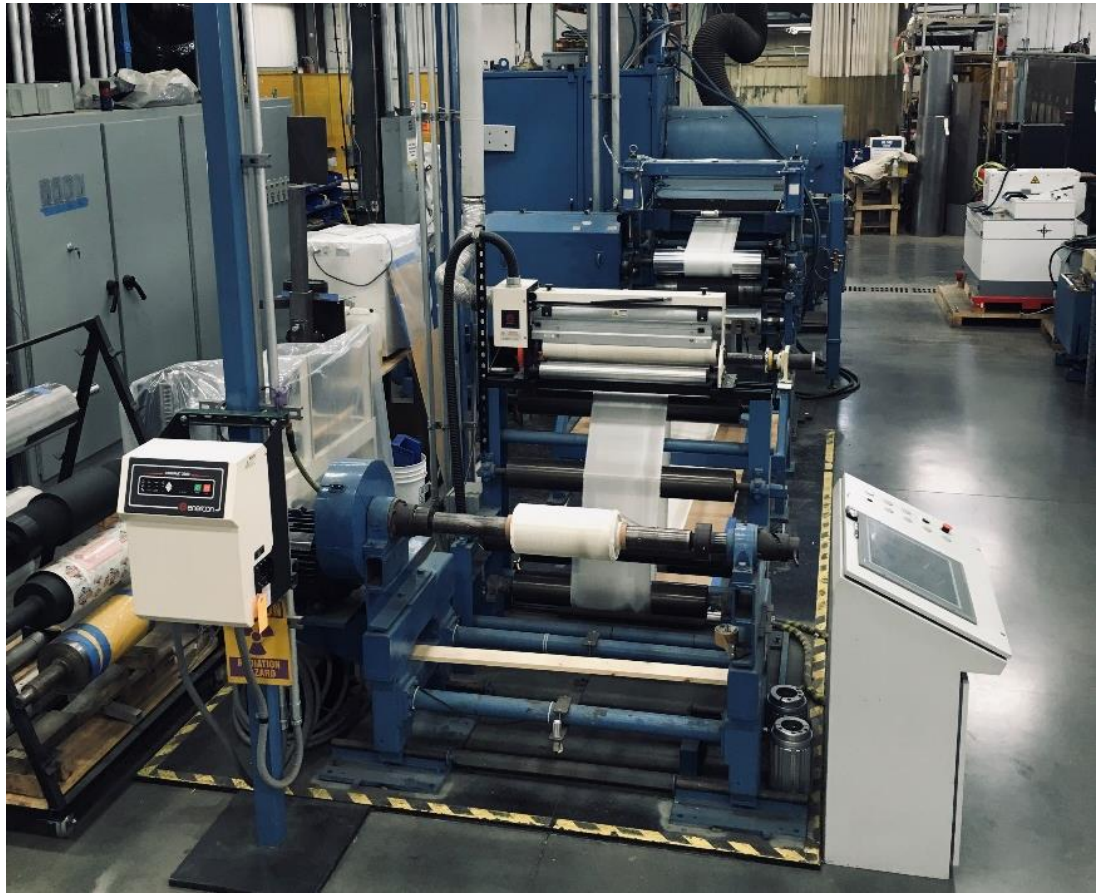
Whole body CT (1 scan)



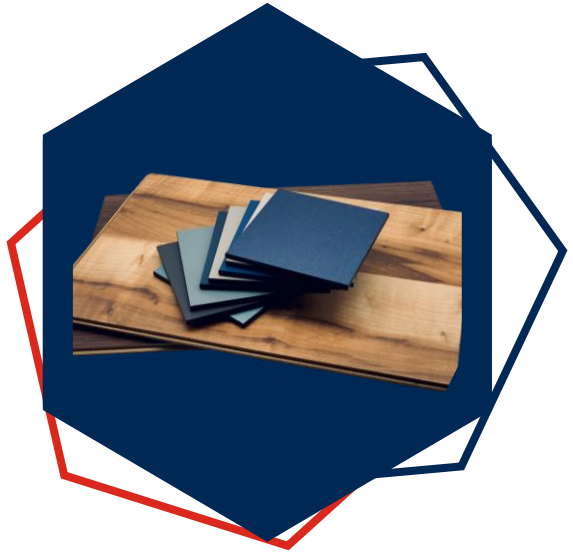
United States Nuclear Regulatory Commission, National Council on Radiation Protection and Measurements, report No. 160, International Commission on Radiological Protection, publication 103

Our pilot line allows customers the ability to realize the advantages of ebeam in their process.

- Adaptable to custom configurations
- Indirect gravure coater with corona treater
- Optional fiberglass web for sheet samples

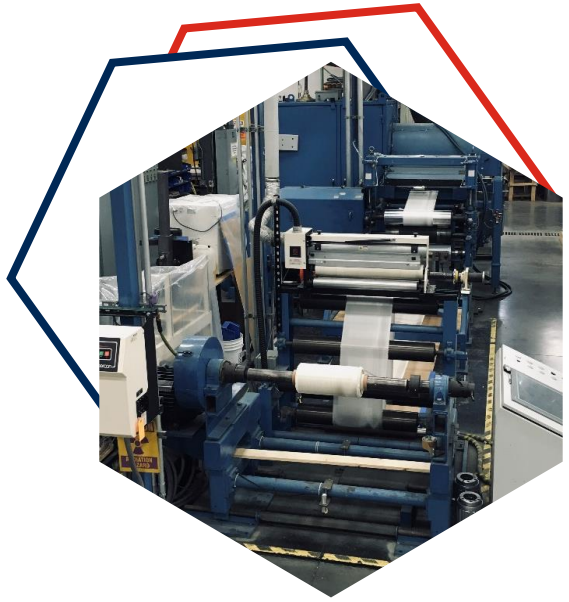


Summary



Ebeam technology produces sustainable, durable décor products without the use of formaldehyde or solvents.

Ebeam designs are customizable to a variety of substrates, widths, and product types to suit customer needs.



PCT can assist with application development.

Questions?

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President

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