

TECHNOLOGY OVERVIEW

There are several factors to consider when choosing the right technology for your product. Understanding the variables of each technology and its effect on different materials should be considered as early in the product design process as possible.

RADIATION



ELECTRON BEAM

E-Beam sterilization exposes products to high-energy electrons.

TECHNOLOGY VARIABLES

ORIENTATION TO BEAM
BEAM ENERGY
BEAM POWER
PRODUCT CONVEYANCE

PRODUCT CONSIDERATIONS

MATERIAL COMPATIBILITY
Compatible with most materials
DENSITY
Moderate to low penetration on dense products.

POSSIBLE EFFECTS

Lower possible materials effects than gamma and X-ray

EXPOSURE TIME

MINUTES
(time varies based on dose requirements)

ISO11137



GAMMA IRRADIATION

Gamma irradiation exposes products to a Cobalt 60 radiation field

TECHNOLOGY VARIABLES

TIME IN CELL
ISOTOPE LOAD
PRODUCT CONVEYANCE

PRODUCT CONSIDERATIONS

MATERIAL COMPATIBILITY
Compatible with most materials
DENSITY
Good penetration on dense products.

POSSIBLE EFFECTS

On certain materials, embrittlement, discoloration, change in viscosity due to irradiation

EXPOSURE TIME

HOURS
(time varies based on dose requirements)

ISO11137



X-RAY

X-ray irradiation uses ionizing energy from high-powered electron beam accelerators

TECHNOLOGY VARIABLES

PROCESSING SPEED
NUMBER OF PASSES
PRODUCT CONVEYANCE

PRODUCT CONSIDERATIONS

MATERIAL COMPATIBILITY
Compatible with most materials
DENSITY
Excellent penetration on dense products.

POSSIBLE EFFECTS

Similar to gamma, but less pronounced due to improved dose uniformity and processing time

EXPOSURE TIME

HOURS
(time varies based on dose requirements)

ISO11137

GAS



ETHYLENE OXIDE

Ethylene oxide sterilization uses a 3-part gas process which includes pre-conditioning, sterilization, and aeration

TECHNOLOGY VARIABLES

EXPOSURE TIME
TEMPERATURE
HUMIDITY
EO CONCENTRATION
100% EO OR POSITIVE PRESSURE PROCESS
CHAMBER SIZE
SINGLE CHAMBER OR MULTI-CHAMBER PROCESS

PRODUCT CONSIDERATIONS

MATERIAL COMPATIBILITY
Very few compatibility concerns; liquids generally not recommended
DENSITY
Packaging must be breathable
Impacts the concentration and exposure time
TEMPERATURE
EO produces significant heat and humidity
GAS PATHWAY
Gas must reach surfaces requiring sterilization

POSSIBLE EFFECTS

Due to accumulation of EO residuals products may require prolonged aeration

EXPOSURE TIME

HOURS TO DAYS
(depends on validation approach and time required for degassing)

ISO11135



VAPORIZED HYDROGEN PEROXIDE

VHP is a deep vacuum, low temperature gas sterilization process

TECHNOLOGY VARIABLES

EXPOSURE TIME
TEMPERATURE
HUMIDITY
PRESSURE (VACUUM)
VHP CONCENTRATION

PRODUCT CONSIDERATIONS

MATERIAL COMPATIBILITY
Compatible with most materials
Cellulose-based materials are not compatible.
GAS PATHWAY
Gas must reach surfaces requiring sterilization

POSSIBLE EFFECTS

VHP breaks down safely into water vapor and oxygen.
Low residual levels.
No known oxidation or discoloration effects.

EXPOSURE TIME

HOURS
(time varies based on dose requirements)



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