



Effect of Gamma Radiation Sterilization on the Tensile Strength of Polymer Cable Ties

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Cable ties are frequently used in single-use medical devices and pharmaceutical manufacturing equipment. To achieve sterilization this equipment is bagged for isolation and exposed to gamma radiation. If the radiation dosage is large enough polymer properties will be affected. These changes can include color variations and loss of flexibility and strength.

A series of cable ties were exposed to gamma radiation at a dosage level of 32.3 - 40.8 kGy. Testing was conducted by Sani-Tech West in conjunction with STERIS Isomedix Services. The cable ties were manufactured from polyethylene, Nylon 6,6 or PVDF copolymers.

The affects of radiation exposure were compared by tensile elongation to unexposed cable ties. Testing was done at the University of Utah Materials Characterization Lab. Five samples each of the exposed and unexposed cable ties were tested. The average results and standard deviations are shown in the following table:

Cable Tie Manufacturer	Material	Radiation	Tensile Strength (psi)
CHS 4"	Polyethylene	Yes	6061 ± 104
CHS 4"	Polyethylene	No	5910 ± 128
Panduit 4"	Nylon 6,6	Yes	5656 ± 274
Panduit 4"	Nylon 6,6	No	5696 ± 144
Nile 4"	Kynar® PVDF 2850	Yes	4737 ± 331
Nile 4"	Kynar® PVDF 2850	No	4753 ± 124
Nile 4"	PVDF Copolymer	Yes	4997 ± 127
Nile 4"	PVDF Copolymer	No	5230 ± 261
Nile 7"	Kynar® PVDF 3120	Yes	4688 ± 196
Nile 7"	Kynar® PVDF 3120	No	4789 ± 196

These results indicate that the dosage level required for sterilization by gamma radiation was not significant enough to change the tensile strength of the tested polymers. However, Sani-Tech West reported long-term cable tie failures in the irradiated non-fluorinated cable ties. Beyond this observation, the effects of long-term loss of tensile strength in irradiated samples have not been investigated further.

All of the cable tie designs are different with the exception of the Nile 4" ties. Since the tensile strength value is dependent on cable tie design any meaningful comparisons between the tensile strength of the different cable tie styles cannot be made

Strong-Ty™ cable ties are made in the USA by Nile Polymers from Kynar® PVDF. These cable ties are manufactured and packaged in a clean-room environment following an ISO 13485 procedure. In addition to their excellent chemical resistance, these cable ties exhibit minimal flame spread and smoke generation and meet the National Electrical Code NFPA-70A and UL94V-0 requirements for installation in building plenum. This material has also passed USP Class VI testing. The material properties and attention to manufacturing detail of the Strong-Ty™ cable ties are unmatched by any other available product.