

Polymer Science & Engineering

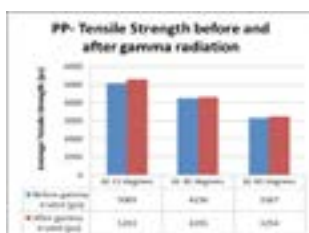
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Effect of external process (sterilization) on the plastic injection moulded parts

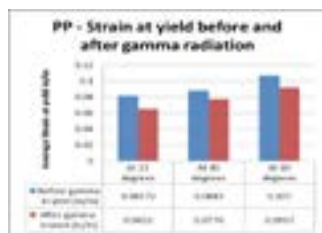
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External Processes like sterilization on plastics has become an important factor in industry. Sterilization is very common process in the medical device industry to ensure the safety of the devices. Product designer needs to be cognizant of the effect of sterilization in plastic Injection molded parts. An experimental method is conducted to find out the effect of the Mechanical properties such as tensile strength analysis and also Creep analysis on the Injection molded parts before and after sterilization (radiation). Injection molded specimen made up of PP (polypropylene) with Gamma radiation of 25 kGy(kilogray) dose is considered for study. Radiation interacts with polymers in two ways: chain scission, which results in reduced tensile strength and elongation; and crosslinking, which increases tensile strength but reduces elongation. Both reactions occur simultaneously, but one is usually dominant, depending upon the specific polymer and additives involved. The results of Creep analysis are used in finite element methods to solve the impact of creep between the parts under load over time. Manufacturers should be cognizant of the possible impact of radiation on mechanical properties such as tensile strength, elastic modulus, impact strength and elongation. Outcomes may influence performance and should be evaluated in advance by functional testing.

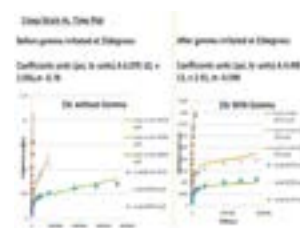
Discussion and Results: The samples used for this study were injection molded ASTM Type 1 specimens. These are molded as per the injection molding condition of the respective resins. 5 samples. ASTM D 638-210 Standard Test Method for Tensile properties of plastics were used for tensile testing.



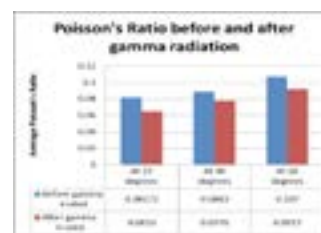
Shows that average Tensile Strength on the PP is **partially increasing**. It is observed that the same trend observed at 23, 40 and 60 degrees.



Shows that average strain at yield on the PP is **partially decreasing**. It is observed that the same trend observed at 23, 40 and 60 degrees



Shows shows the creep **strain decrease** between before and after gamma radiation at 23 C. The above curves are plotted at 15%, 30% and 45% of yield strength of PP.



Shows that average Poisson's Ratio on the PP is **partially decreasing**. It is observed that the same trend observed at 23, 40 and 60 degrees

Conclusion: Effects of sterilization (radiation) plays an important role on the plastic injection molded parts. Results shows that Tensile strength and Modulus of Elasticity is Partially increasing at all 3 given 3 temperatures 23, 40 and 60 degree C. And Strain at yield and Creep strain at given time is showing decreasing trend. These findings are very much useful to the Product Design. Manufacturers should be cognizant of the possible impact of radiation on mechanical properties and the outcomes may influence performance and should be evaluated in advance by functional testing.

Biography

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