

Compressive Strength and Shelf Life of Teflon Pellets

Application Report

Introduction

A manufacturer of ammunition pellets used in a variety of firearms uses an Instron® electromechanical test system to evaluate the compressive strength of the pellets and the type of deformation they exhibit under load. Further, the shelf life of these pellets must also be quantified in order to guarantee performance over time. It has recently been reported that a type of Teflon pellet may be more sensitive to specific storage conditions, with decreasing compressive strength values reported over increasing increments of time. A recently manufactured sample of Teflon pellets was delivered to the Instron demonstration laboratory for evaluation. The purpose of this test was to compare these results with that acquired on a similar sample, stored over six months, and tested at the customer site.

Test Configuration

EM system: 5566

Fixtures: 6 in compression platen at the base and 2 in compression platen at crosshead

Load cell: 5 kN (1125 lbf)

Specimen geometry: Cylindrical

Specimen dimensions: Diameter 0.25 in, height 0.30 in

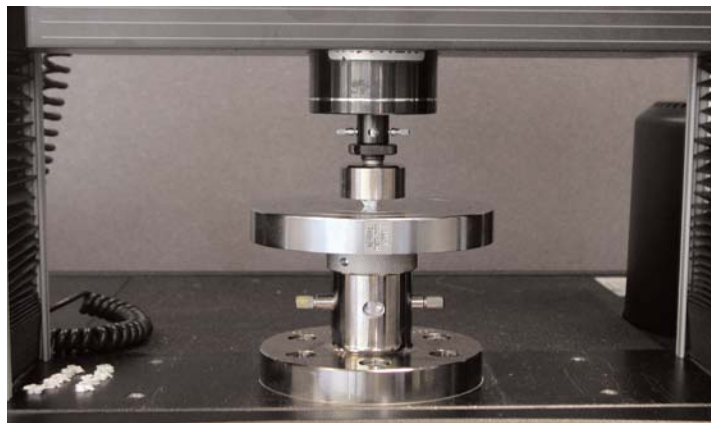
Software: Bluehill®

Test speed: 0.125 in/min

Each cylindrical specimen was positioned at the center of the lower compression platen such that the long axis of the specimen was aligned with the load string. A smaller diameter platen at the crosshead allowed for easier specimen centering and viewing of the specimen during the test. After a preload of 0.1 lbf was applied, data collection was started. A total of eight specimens were tested and compressive load values were recorded. The test ended when the specimen was completely crushed.

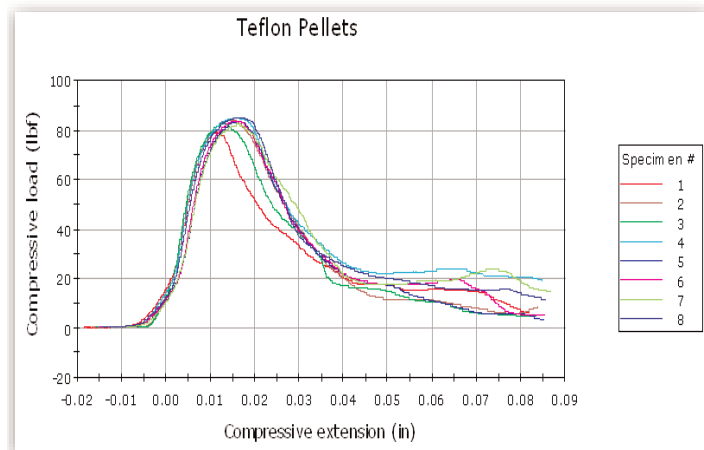
Conclusion

The results from this series of compression tests show relatively consistent maximum compressive load values. The mean maximum compressive load for the sample was 85.987 lbf with a standard deviation of 2.068. This value is significantly higher than the value reported for specimens that were stored for six months and tested at the customer facility. These tests reveal that there may be time-dependant properties of the Teflon material that affects its mechanical behavior. Storage conditions may also be a factor that that should be investigated. Previous experiments have shown that humidity and temperature may also affect the mechanical properties of specific materials over time. In conclusion, the Instron equipment was able to successfully perform these compression tests and the configuration used would be recommended for future applications.



▲ **Figure 1:**
Specimen centered between compression platens before the start of the test.

Results



▲ **Figure 2:**
Compressive load vs. compressive extension for eight Teflon pellets tested.

Specimen #	Maximum Compressive Load (lbf)
3	78.842
4	84.208
5	82.018
6	84.991
7	83.2
8	83.534
9	81.923
10	85.182
Mean	82.987
Standard Deviation	2.068

▲ **Figure 3:**
Maximum compressive load results for eight specimens.