**Project Background**

The filter products that W.L. Gore produces consist of a combination of a backing material and expanded polytetrafluoroethylene (ePTFE) membrane. Bond integrity testing is an important step in the quality assurance of this manufactured product because it quantifies that the laminate bond is up to industry standards.

**Problem Statement**

To design and validate a process to quantify the bond strength between components of a membrane-backer laminate.

**Benchmarking**

- **Water Pressure Removal**
  - Not effective; Grips fail before membrane

- **180° Peel Test → ASTM Standard**
  - Time consuming procedure

**Design Specs**

Need new process to meet the following desires not met by current quality assurance testing methods:

- **Value Reflecting Bond Strength**
- **Operator Steps**
- **Operator Variability**
- **Cycle Time**
- **Other**

**Final Concept**

The chosen concept uses an automated Texture Analyzer to "muscle" the membrane away from the backer by applying force in the z-direction.

A stud of which the end is covered with pressure sensitive adhesive is attached to the crosshead of the forcing machine. The machine then applies a compressive force to the sample for a specified dwell time. It then retracts from the sample separating the membrane from the backer and records the maximum force required; the maximum force corresponds to the bond strength of the sample.

**Operational Procedure**

1. **Cut Samples**
   - Take two right, center and left samples each from the material.
2. **Adhere Samples to Plate**
   - Adhere all 6 samples to single testing plate.
3. **Secure Plate in Lockdown Fixture**
   - Align plate and rotate screw dials fully to lock the plate down.
4. **Prepare Stud**
   - Place adhesive on stud and attach stud to arm.
5. **Begin Automated Test**
   - Click "begin a test" and then wait to collect data.
6. **Remove Stud and Slide Plate Down**
   - The plate will be advanced by one testing unit each time.
7. **Repeat Steps 4 through 6**
   - Repeat above steps until all samples have been tested.
8. **Reset Testing Apparatus**
   - Remove the stud and plate from device. The samples and adhesive must be removed from the plate. The adhesive on the stud must also be removed.

**Validation**

Our validation consists of two parts. One is analyzing variability of the test by performing an Evaluation of the Measurement Process (EMP) study. The other is a correlation study to determine the relationship between our test method and the benchmark.

**EMP Study**

- Distinguishes source of variability
- Determines usefulness of measurement

**Correlation Study**

- Distinguishes level of Resolution
- Determines Relationship (linear, exponential, etc.)

**Project Transition**

- Adhesive Research
- Membrane or Adhesive Yielding
- Statistical Study on Bond Ranges