Instron® TechNotes **Getting the most up-to-date information on materials testing**

In This Issue

ISSUE 30

Application Story

3M Ensures Quality Under Different Test Conditions

Imagine you have a paperclip in your hand and you bend it in half – what happens? Nothing; it bends but it doesn't break. However, if you continually bend the paperclip back and forth on the same point of contact, it will eventually break. Just like with a paperclip, lab operators may be testing specimens that behave differently under a cyclic test versus a single, one-direction test. So when making a material selection for a particular application, what may appear as the right choice for the job one day, may fail when put to the test on another. In addition, different methods of physical evaluation can provide results that seem puzzling in comparison to one another.

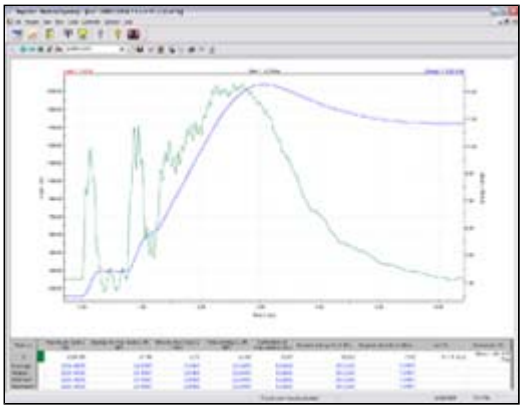
3M was evaluating four adhesives and initially selected adhesive A for an automotive application because it exhibited the toughest strength characteristics when tested using a basic, static 3-point bend method. However, when a batch of adhesive joints failed prematurely, Richard Andrews, Product Development Specialist at 3M, questioned whether the chosen adhesive was too brittle to have an acceptable fatigue life.

"We decided it was necessary to look more closely at the adhesive properties of our specimens," Richard Andrews said. "Instron was chosen as the company with the most experience in fatigue testing. It was important to know how the adhesive specimens would behave when subjected to a flexural fatigue test."

The adhesives were incorporated into a bonded specimen style design and re-tested using the **RR Moore system**. Each adhesive was subject to a flexural cyclic stress applied by the system until failure. Andrew's team determined that although adhesive A had proven to be superior when tested using the static 3-point bend method, adhesive C was the clear choice in terms of toughness and durability for its intended dynamic use.

Tech Tip

Why Should I Instrument My Impact Tests?



The majority of impact tests have the same goal in mind – establishing the amount of energy it takes to break a material. When conducting an impact test without a sensor on the striker, you limit the information that can be gathered. Since only the weight of the mass and drop height are known, you are merely able to calculate the impact energy. Since the falling weight will either stop dead on the test specimen or destroy it completely in passing through, the only results that can be obtained are of a pass/fail criteria based upon visual determination.

By adding a load-sensing tup, you can continuously record the load on the specimen as a function of time and/or specimen deflection prior to fracture. The best systems record load vs. time or deformation for the entire period of the impact event. This gives a better representation of an impact than a single calculated value. Instrumented drop weight and pendulum testing is considered the best testing method available. By performing multiple tests at various rates, a complete impact profile can be developed for a polymer. This approach can be useful in simulating functional impact resistance and running material comparisons. There is enough flexibility to simulate real-life conditions and to perform audit inspections on parts or molded samples. By adding instrumentation to impact tests the all-important energy absorbed value is established much quicker.

Tech Tip

Capturing Testing in Action

We find that many of our customers are faced with questions like "How did this specimen fail?" and "Why does one result look different than the others?" They often need to verify that the test was conducted and that it was conducted properly. The answer to many of these questions is to use a camera to record the specimen during testing. **Video recording** provides R&D engineers, lab managers, university professors, and students' point-by-point playback of the specimen throughout the test. This source of invaluable information captures failure analysis and gives a better understanding of materials science.

Contact us for more details on our TestCam Software Module.

What do you think? Tell us!

Ask the Expert

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