TechNotes

Getting the most up-to-date information on materials testing

2013

A YEAR IN REVIEW

INSTRON®

Our Applications Labs Around the World

Connect with us

Dear Readers,

We've created this Year in Review issue to highlight all the exciting moments of 2013. We want to keep you up to date on all aspects of Instron® – from our community relations to our acquisitions to available webinars and new products. There was never a dull moment or a period of time when we weren't aiming to meet the expectations and needs of our customers.

Every experience you have with Instron is invaluable to us as a company. Specifically within TechNotes, I work with our application engineers and product managers to bring you the most relevant and industry-specific news that will assist with your testing applications. Instron professionals are some of the best in the industry and hold seats on many of the ASTM and ISO committees. It's my goal to share with you their knowledge and experience in order to better support your testing applications. So keep the feedback and questions coming! I welcome any chance I have to speak with you on ways to better communicate just exactly what you'd like to hear.

Thank you for your continued support as we move forward into 2014 and I look forward to future communications with you!

Best regards,

Denise Czerpak

TechNotes Editor

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> The Instron 100 kN testing rig is the most impressive of our machines … it is also the biggest and heaviest! We have tested everything from large carbon fibre tubes in flexural to tiny carbon laminates in shear, and hundreds of carbon rings at up to 60 kN … the Instron has taken it all in its stride.
>
> *Derek Ness*
> *Applied Polymer Developments/Redcomposites*

The Drive for Lightweight Cars

Due to new emission standards, the US car industry will need to average 34.5 mpg by 2016. And by 2025, that average soars to 54.5 mpg. In order to meet the new requirements, manufacturers will have to implement a number of changes including new engines, technologies, and materials. Lightweight materials are one of the most important avenues to pursue because for every 10% reduction in weight, fuel efficiency is increased by 6 – 7%.

Composites

Carbon fiber composites are as strong as steel while weighing more than 75% less. The materials are the lightest to use and also the stiffest, and because of its superior mechanical characteristics, cars built using carbon fibers are some of the lightest, fastest, and most fuel-efficient vehicles on the road.

Composites absorb a large amount of energy before failure, which can make the new, lighter vehicles just as safe as their heavier counterparts. The only drawback in using composites to manufacture a car, is composite materials are three times more expensive to make, meaning adoption will be slow until the price comes down. Despite the high cost of composites, this material has been used in cars for more than 30 years and is now being used for the first mass-produced composite vehicles.

Carbon fiber was first used in high-performance vehicles, such as the McLaren MP4/1, the first Formula One car to feature a carbon fiber chassis. The low weight and increased strength helped make the car one of the lightest, stiffest, and fastest to grace the track in 1981. The use of composites also allowed the engineers to design a safety cell for the driver that would remain intact in the event of a crash, making previously fatal crashes survivable.

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Today, carbon fiber can be found in many consumer vehicles from high-end manufacturers. However, these vehicles are either produced at a low volume (such as the 400 unit Bugatti Veyron) or manufacturers only use a small amount of carbon fiber in the overall build of the car.

Next year will mark a new milestone in automotive carbon fiber as BMW will begin selling the i3, the first mass-produced car with a significant amount of carbon fiber. While previous cars used carbon fiber to save weight and go faster, the new BMW i3 will use carbon fiber to save weight and go farther. The all-electric car will tip the scales at 2,700 pounds, including the large battery needed to give it a range of 80-100 miles. These new cars may be the first of their kind, but they won't be the last.

Instron® Welcomes TGT

In May 2013, Instron acquired TGT to become part of the Instron division of ITW's Test and Measurement business. In partnership, Instron TGT is excited to offer an instrumentation platform that is uniquely designed to cater to all aspects of tissue engineering. The broad range of applications include:

- Condition and engineer developing tissues
- Characterize tissue engineering components
- Reveal fundamental mechanisms of cell function
- Direct stem cell differentiation
- Provide an in vitro testbed for drug and cell therapy development

Introduction to Tissue Engineering and Regenerative Medicine (TERM)

Replacing body parts is one of mankind's earliest aims, as patients and healers have attempted to cope with disabilities. Tissue Engineering and Regenerative Medicine are dedicated to creating new tissue engineered medical devices that replace and/or enhance tissue function that has been impaired by disease, injury, or age. Because these are expansive fields that incorporate a myriad of disciplines, defi nitions for each term can be confusing.

What is Tissue Engineering?

Tissue engineering is the combination of cells, scaffolds (material on which to grow the cells), and an appropriate biological, chemical, and mechanical environment to grow or build 3D tissues that are similar to native tissue. Researchers in this fi eld are interested in characterizing the native tissue and environment, identifying the appropriate recipe to grow new tissue, and evaluating the results of tissue engineering efforts. Tissue engineered products can be used as benchtop models of in vivo environments and to study disease and the effects of new therapies (pharmaceuticals) or in regenerative medicine applications.

What is Regenerative Medicine?

Regenerative medicine is the application of these tissue engineered medical products as a clinical therapy. This field includes not only the tissue engineered medical device, but also the patients, health care providers, and associated clinical therapies necessary to integrate these services and products to improve health care options.

Why Use Mechanical Stimulation in Tissue Engineering?

Research has shown that stimulating cells and tissues during development in vitro results in tissue that is more similar to native tissue. This is because tissues are normally exposed to a variety of biomechanical signals in vivo. For example, skeletal tissue, such as a muscle, tendon, and ligament cultured under cyclic strain, results in a stronger tissue with aligned fibers. Tissue engineered bone is enhanced by hydrostatic pressure and shear conditions, while tissue engineered cartilage is enhanced by dynamic compression.

The Instron TGT DynaGen Bioreactor Series assists researchers in studying and developing the production of functional tissues for regenerative medicine. Mechanical stimulation for successful pre-conditioning and developmental support requires that bioreactors provide a controlled environment during mechanical stimulation and stimulates multiple samples with identical or individual waveforms. Additionally, it needs to deliver repeatable and reliable displacements and loads to mimic in vivo developmental conditions and activities of daily living, as well as adjusts stimulation conditions based on changes in the developing tissue.

Featured in AZoM's "insights from industry"

Ian McEnteggart
Composites Market Manager, discusses the important processes involved in modern composites testing and how this is opening up new avenues of application for composites.

Marco Bronzoni
CEAST Product Manager and Market Manager, talks about rheology systems and thermoplastic testing.

New Product Announcements

AutoX750 Automatic Contact Extensometer

When testing the mechanical properties of a specimen, being able to accurately and repeatedly measure the strain the specimen sees is crucial. Many testing standards require that a separate device be used to ensure the most accurate strain data possible. The AutoX750 features closed-loop strain control that complies with ISO 6892-1 Method A and ASTM E8 Method B, as well as meeting the requirements of ISO 9513, ASTM E83, and ISO 527-1 (2011).

Automatic extensometers allow the user to simply place the specimen into the grips and hit "start". You don't have to worry about attaching the extensometer and removing it once the test is done; it's done for you. Automatic extensometers can save time, increase repeatability, and reduce operator influence on results.

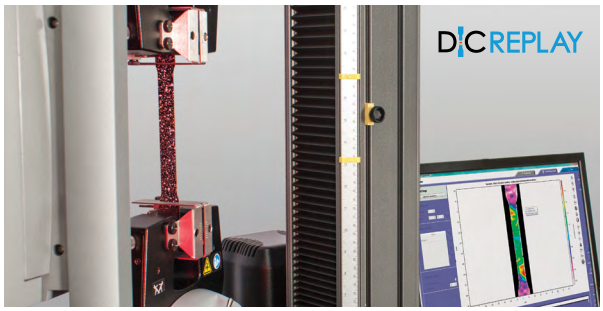
Limiting Specimen Self-Heating

The Specimen Self-Heating Control (SSHC) add-on to WaveMatrix™ allows a test to run at the maximum frequency possible while keeping the specimen temperature constant. It saves time, cost, and energy in the QC lab, as well as in the development and optimization of composite formulations.

What is Digital Image Correlation (DIC) and How Can It Help Me?

Digital Image Correlation (DIC) is an analytical technique that compares images of a specimen's surface during testing to generate full-field strain maps. This technology gives you more information than a traditional point-to-point extensometer or a strain gauge and allows you to see the complete story of the material's behavior beyond the stress strain curve.

see the complete story of the material's behavior



Scientists and engineers have found dozens of useful applications for DIC including detecting cracks invisible to the naked eye, visualizing localized necking and discontinuous yielding, comparing differences in material behavior between two separate formulations, and analyzing strain on parts or components where a traditional extensometer is not feasible.

In our lab, we recently performed a test to ASTM standard D5766 for the open-hole tensile strength of polymer matrix composites and used DIC to see exactly where the strain was occurring. Using DIC, we were able to visualize where the strain on the specimen was concentrated and how it propagated through the material.

David Fry
Metals Market Manager, discusses the need for metals testing and the required equipment.

Parasar Kodati
Software Product Manager, talks about TrendTracker™ and the importance of the right testing software for the job.

Jim Richey
Director of Tissue Engineering Business, talks to AZoM about the importance of materials testing in the medical sector and recent developments in tissue engineering.

Live Webinars with Instron® Experts

Our experts spoke on various issues that effect your testing applications: changes in standards, new product capabilities, and software to improve the analysis of test results. If you weren't able to attend one of our webinars this year, there will be more opportunites in 2014 — stay tuned for additional information.

Plastics-Focused Webinar

Hosted by Rich Goshgarian, this webinar focused on recent changes to common testing standards, common misinterpretations and clarifications of these standards and different factors that may influence results. These may help labs understand the causes of variability and how to eliminate them, as well as how to make the most accurate measurements.

Regarding changes to standards ... ISO 527-1,2 was addressed and we discussed changes such as the new definition of tensile strength, a new additional method for calculating nominal strain, the introduction of Method B and how it allows for the option of running two speeds within one test, and the increase in gauge length from 50 to 75 mm and how this means a new device could be required for compliance. Changes to ISO 178 were also covered and how operators now need to use an extensometer and the update to Method B that allows for two speeds in one test (similar to ISO 527-2).

Lastly, Rich talked about Common Misinterpretations, when to report percent elongation or nominal strain, and when to remove an extensometer (if applicable).

Metals-Focused Webinar

Hosted by Dave Fry, this webinar focused on changes within standards specific to metals, how they affect testing, and various ways to ensure your lab is in compliance with the latest standards.

Regarding changes to standards, Dave discussed ISO 6892-1:2009 and the addition of Strain Rate method (Method A), and how Method A (strain rate) and Method B (stress rate) were separated.

Additionally, he covered how ASTM E8 and ASTM E8M-11 were combined into one standard (including both imperial and metric units), testing speeds were clarified, and tolerance for strain rate testing were added.

> experts spoke on various issues that effect your testing applications

The "Data Analysis for Everyone" Webinar

Presented by Parasar Kodati, this webinar highlighted our newest solution for data management – TrendTracker™. Parasar discussed topics including: how to archive your data in a robust and searchable format; how to use the user interface to analyze data by sorting, filtering, and grouping; how the right people have easy access to it when they need it; and TrendTracker's various deployment configurations.

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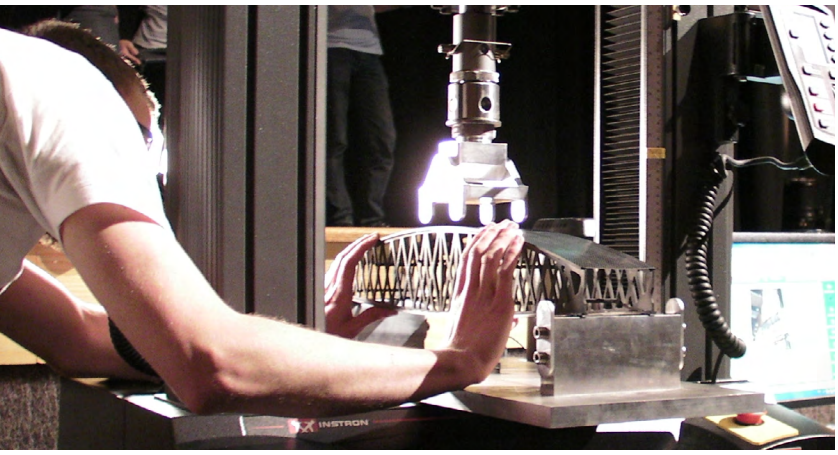

Now we will be able to state that we have our own Instron Tester

Today there are more and more people fishing in tournaments, and because we manufacture a lot of line that is International Game Fish Association (IGFA) certified, we're often asked for breaking strength certification, since most tournaments require this. A lot of fishermen ask if we use an Instron tester and in the past we have had to say no since we sent our line to an independent lab for testing. Now we will be able to state that we have our own Instron tester and our able to do all of our own testing.

Bernie Phaneuf
Pres. Woodstock Line Co.

Community Connections

Instron® is focused on making a difference in the everyday lives of not only our customers, but also those that live in our community. We find it important to give back by helping our neighbors when assistance is needed through various "Days of Caring".

2013 Accomplishments

- Supported 10 families through the United Way of Tri-County's Feed-A-Family for Fifty program
- Sponsored 75 children through the Hope for the Holidays drive
- Contributed 276 hours of community service to the YMCA of Hopkinton equating to $2800 of charitable funds (with ITWs volunteer match)
- Various clothes drives

SAMPE France Chapter's Annual Bridge Contest

Since 2007, Instron has been the sole provider of an electromechanical testing system for the SAMPE France Chapter's annual bridge contest. Held during the technical meeting organized for professionals within the composites industry, the contest is comprised of teams from various French universities. This year, the winning bridge was designed by Ecole Centrale of Nantes!

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