



*For a Total Solution to all of your
Materials Testing Needs*

University of Michigan uses ADMET eXpert Test Frame with MTESTWindows for Biomedical Research

The University of Michigan in Ann Arbor, under the direction of David Kohn, PhD, Professor of Biomedical Engineering, conducts research into the mechanical properties of hard tissue (bones) to study structural integrity and fractures. It does this by analyzing the bones of laboratory mice in order to predict damage accumulation in bone as a function of mechanical history. The research includes fatigue testing and testing bones to failure in a mechanical test frame. The research was originally done with an in-house developed test frame that was difficult to calibrate and use and lacked live feedback of force and displacement. After receiving grant money, two research assistants, pre-doctoral candidates Nadder Sahar and Joseph Wallace, sought a test frame that would precisely control the process and capture test data. They turned to ADMET Inc. and purchased an eXpert 4501-M test frame equipped with ADMET's MTESTWindows™ materials testing system.

The University of Michigan laboratory conducts research focused on biomechanics, biomaterials and interfacial phenomena related to hard tissue (bone) and hard tissue replacement. This includes studies of mechanical properties and structure-function relations in hard tissue; response of tissue to mechanical stimuli and functional adaptation of tissue in response to biomaterials.

Explained Nadder Sahar, "We put mice through an exercise protocol on a treadmill to see what the effect will be on mechanical properties. We use a materials test machine to get mechanical properties and evaluate the effectiveness of the exercise protocol."

Previously, the University of Michigan laboratory used a testing machine that was built in-house to do its flexural testing. This testing machine, which was two years in development, was not meeting the laboratory's needs.

Commented Joseph Wallace, "The home grown system was not adequate. It was only able to acquire data from the force and displacement

channels. There was no live feed so I couldn't see what was going on."

Wallace turned to the Web and found ADMET, as well as a few of the other leading materials testing system suppliers. The University evaluated several materials testing systems for their application. ADMET was the most responsive and the cost was less than one half of the price for comparable products from other materials testing companies.

ADMET provides best value

The researchers found that the ADMET eXpert 4501-M, a top actuated, single column, low force universal testing machine, offered the functionality and precise control required for their testing application.

After piloting the installation, ADMET's PC-based MTESTWindows™ Materials Testing System was added to both control the test frame and gather results.

The eXpert 4501-M features 20-bit resolution on the load, as well as position and strain analog

SOLUTION OVERVIEW

Industry: Research

ADMET Products: eXpert and MTESTWindows

Application: Four-point bend testing bones

Customer: University of Michigan

input channels and a fast acting servo-update loop for precise control. It also offers maximum flexibility in programming test procedures with monotonic, segmented or cyclic servo control profiles under load, position or strain control and an extensive selection of analyses for tension, compression, bend and adhesive tests.

Failure and fatigue tests

There are two types of test applications conducted in the lab. The first application is a destructive test in which the bone is flexed in a four-point bend fixture to failure. The eXpert accurately controls the deflection rate of the mouse bone and collects the load data. It then generates a flexural stress versus flexural strain curve.

The second testing application entails a cyclic control profile in which the test specimen is placed in the four-point fixture and the displacement is cycled between two defined values at 2HZ frequency for several hours. The eXpert 4501-M acquires and stores the load and deflection data for the entire test.

ADMET's software engineering group developed a new flexural stress and strain analysis specifically for the lab's four-point bend fixture. The analysis allows the user to enter the moment of inertia, neutral axis distance, contact point distance and total span as variables for each test.

ADMET has since made the new analysis standard on MTESTWindows.

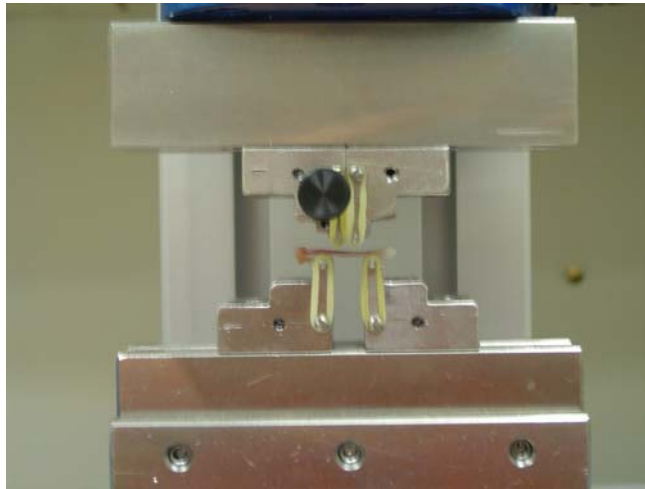
The system is flexible yet precise. Said Sahar, "For fatigue tests we scan the bones to get geometric properties and then figure out the load that we need to get the proper stress. We then set MTEST to load to the appropriate force to normalize the stress."

MTESTWindows collects modulus of elasticity, yield point, ultimate stress, ultimate force, total displacement and other measurements. It saves raw test data and results so multiple tests can be easily compared and then outputs the results to Excel spreadsheets and to MATLAB for further computation and analysis.

The eXpert system with MTESTWindows is easy to set up and calibrate with load cells and extensometers. Sahar and Wallace set up the system, calibrated it and began using it without any training. The manual on the installation CD and ADMET phone

support were all that was needed.

An investment of \$11,000 for the software and test frame gave the University a state-of-the-art materials test system that allows them to perform precise, repeatable tests and capture live data from their custom four-point fixture. The ADMET systems will be an integral part of the final published test results when the program is completed.



For More Information

For more information about ADMET products or services, please call us at 800-667-3220 in the US or Canada, email sales@admet.com or visit our Web site at <http://www.admet.com>.

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