Issue 55

In This Issue

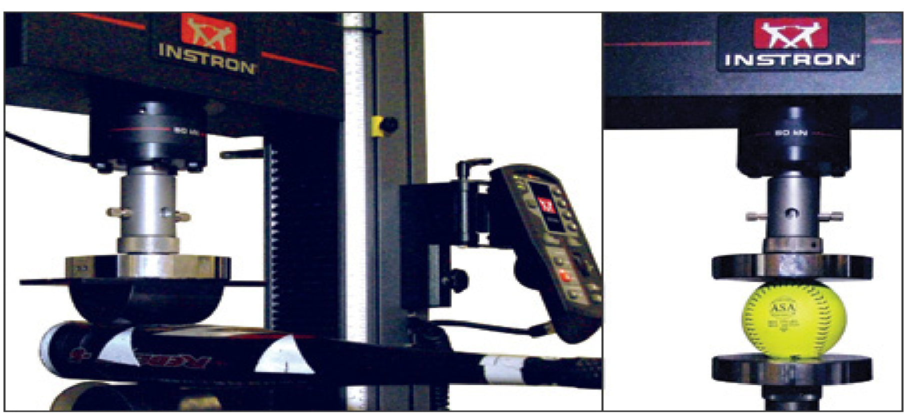
Ah, Summer – The Ping of the Bat

Baseball: America's favorite pastime. With summer here at last, baseball fans everywhere are relaxing in their favorite ballparks listening to the crack of wooden bats on leather-bound balls... or perhaps the ping of the aluminum or composite bat.

Technology has enabled the sporting goods industry to design and manufacture ever better performing equipment. We now have high performance aluminum and composite baseball and softball bats. While these technological advances can improve a player's performance, there is concern in many sports organizations on how this technology is affecting the sport overall. Testing facilities such as the Sports Science Laboratory of Washington State University are busy testing bats and balls for accreditation and certification purposes and for determining the performance of each new technological advance.

Until the 1970s, all bats were made of wood, and although solid wooden bats are still required for Major League Baseball, amateur baseball was introduced to aluminum bats to improve durability. More recently, composite bats have become popular. Most aluminum and composite bats have a hollow barrel that flexes on impact with the ball and then springs back, a phenomenon called the trampoline effect.

A simple way to explain the trampoline effect is to contrast the result of jumping up and down on a hard floor to that of jumping on a trampoline. On a trampoline, even with very little energy from your body, you still get a significant bounce because the trampoline is flexing with the impact and then springing back to its original shape, launching you higher into the air. In baseball, the result of this effect is that many aluminum and composite bats can hit the ball farther and faster than wooden bats, which can skew the game in favor of those using aluminum and composite bats.



Images courtesy of the Sports Science Laboratory of Washington State University

In the late 1990s, test methods were developed to regulate bat performance. By 2000, the National Collegiate Athletic Association (NCAA), an association that organizes the athletic programs of colleges and universities, and the National High School Federation (NHSF) had adopted bat performance standards based on the Ball Exit Speed Ratio (BESR). The BESR is the ratio of the difference in hit- ball speed and swing speed divided by the combined speeds of the bat and the ball before the hit.

The NCAA now requires all non-wood bats to meet the Bat/Ball Coefficient of Restitution (BBCOR) standard, a much stricter standard than the BESR standard. Rather than measuring the speed of the ball after it is batted, BBCOR measures the trampoline effect between the bat and the ball. The new standard ensures that performances by non-wood bats are more comparable to those of wood bats. The main users of these standards are bat manufacturers who want to measure the performance of their products and test labs, such as the Sports Science Laboratory of Washington State University, that certify balls and bats for the various regulating associations and for the sports equipment manufacturers.

Further research carried out under the direction of the NCAA found that the performance of some composite bats improved over time. With time and use, the composite bats were shown to have a ball exit speed 5 mph faster than their original certification speed. The NCAA has developed an accelerated break-in test protocol (ABI). All composite bats must pass the ABI test protocol to be NCAA certified. The accelerated break-in procedure attempts to show how a composite bat will perform during its potential useful life in the field. This test procedure can be used with the NCAA, BESR, or BBCOR tests to quantify the effect that bat usage has on performance and can be used in the certification and compliance testing of composite barrel bats.

The baseball does not escape the close scrutiny of sports standards. When a bat hits a ball, the ball compresses by nearly a third at high pitch velocities. Ball compression is a measure of a ball's hardness. ASTM standard F1888 measures the force required to displace a ball 0.25 inches in 15 seconds between flat platens. The ball is compressed twice, once along each axis of the two-piece cover. The compression value for a ball is calculated from the average of these two readings.

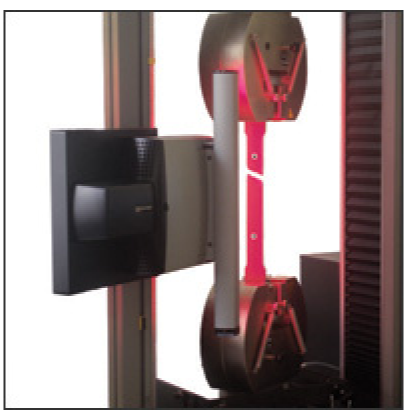
A further ASTM standard, F2845, Test Method for Measuring the Dynamic Stiffness (DS) and Cylindrical Coefficient of Restitution (CCOR) of Baseballs and Softballs measures the stiffness and elasticity of baseballs and softballs relative to cylindrical collisions. Dynamic stiffness is a measure of a ball's hardness, which helps determine the distance an impacted ball travels; harder balls fly farther. The cylindrical coefficient of restitution, or bounciness, measures the rebound of the ball following its impact with a bat or another cylindrical object. Bouncier balls also fly further.

So the next time you visit a ball park, sitting in the sun with a beer and a hotdog, you probably won't give a moment's thought to the BESR, the BBCOR, or the ABI. But rest assured, athletic associations and sports equipment test labs are working hard to make sure that you have a great day.

Hang Loose? Not While Testing.

Are you using pneumatic grips? Be careful not to let the hose line just hang loose from your upper pneumatic grip. The hose can exert a pull on the grip, which is attached to the load cell, when the crosshead moves up during a test – and show up as erroneous load.

If you have an Instron 3300, 5500, or 5900 testing system, attach the hose to clips on the T-slot columns. Make sure there is enough play to ensure that it does not tug on the upper grip during a test. On older Instron test frames, you can attach the hose to the moving crosshead using duct tape.



Q. I'm testing colored plastic specimens, and I'm having trouble getting my video extensometer to consistently locate the specimen marks. Can you help?

A. This is probably due to the lower contrast between the specimen color and the mark color. Try a range of different colors for the marks to find the best contrast. We have found that a very effective solution for marking colored specimens is to use two marks, one inside the other. For example, make a large white mark with a small black mark, or vice versa. This helps the video extensometer to identify the marks more consistently.

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