

## AUSTRALIAN AND AMERICAN EXPERIENCE

### WITH RAPIDCON

Frederick M. Shofner

Schaffner Technologies Inc.

Knoxville, TN

Michael D. Watson

Cotton Incorporated

Raleigh, NC

Robert S. Baird

Queensland Cotton, Pty, Brisbane,

Queensland, Australia

### Abstract

Slow, passive and rapid, active conditioning concepts and developments are reviewed. RapidCon, a new rapid conditioning machine for HVI samples, is described. Observations based upon the initial year of experiences are given.

### Introduction

It is known that the state of samples undergoing material property testing can affect test results. Rigorous sample preparation steps, which determine the sample state, are critical to obtaining precise and accurate test results. For HVI samples, environmental conditions in which these preparation steps take place are major factors in determining the testing precision and accuracies of the HVI readings of cotton quality. For most of this century, fiber, yarn and fabric tests, and preparations therefor, have been conducted in "standard conditions" of 65% RH, 70° Fahrenheit (21° Celsius). These conditions are sometimes referred to as ASTM conditions. What matters most, for good test results, is not just conditions in the laboratory but conditions within the samples and within the testing zones of the instruments at the time of testing. The various ASTM methods for fiber, yarn, or fabric samples include the requirement that the samples to be tested are to be stored or conditioned for 72 hours prior to testing in the standard environment. This storage time presumably allows the samples to "reach equilibrium." It is noted that the samples so conditioned are passively equilibrating and that equilibrium usually refers to sample moisture content. Moisture content is only one fiber property measurement whose equilibrium value is of interest. For HVI, others include tenacity and length, for fibers, and such material properties are much more important for selling, buying and using the fibers than moisture content. (However, we emphatically note that moisture content affects other fiber material properties, and is therefore an important, control variable.)

Whereas equilibration times of 72 hours yield consistent test results, as established for over 75 years, such periods are

unacceptably long in today's intensely competitive and information-hungry market place. Even 48 hours, which the USDA deemed adequate when they introduced HVI, or 24 hours, which is commonly practiced in HVI classing operations, are unacceptable. Isn't it ironic that we have an instrumentation system that can provide data within less than a minute but you have to wait 48 hours to get the data?

Recognizing the severe conflict between promptly available results versus good results (meaning precise and accurate results), the USDA folks began their investigations in the early 90's into actively and rapidly conditioning cotton samples. These investigations were remarkably successful. Well-conditioned laboratory air, actively drawn through the HVI samples, proved to be equivalent to 48 hours of passive conditioning, for which diffusional mass and heat transfer mechanisms prevail. Rapid conditioning is now employed in most of the 14 USDA classing offices. We would like to acknowledge the excellent work done by James Knowlton, Darryl Earnest, and Roger Alldredge of USDA/AMS. Vice President Albert Gore complimented them on this and other work with the "Hammer Award" that they received last year.

Co-Author Mike Watson, began his efforts at Cotton Incorporated on rapid conditioning 3 years ago to confirm and extend the USDA work. STI became involved with CI in February 1996 and STI and Queensland Cotton initiated their joint work in June 1996. We now summarize RapidCon operation and our experiences with it.

### Results and Discussion

The USDA and CI work created a market opportunity. Whereas the USDA operates 20 to 60 HVI test instruments, what about the folks that have 1 to perhaps 4 HVI's? What about the folks who do not have the expensive environmental conditioning equipment to produce what we have come to call the "well-conditioned laboratory?" Without going into any more marketing logic, just let me say that RapidCon addresses the needs of Customers who have 1 to 4 HVI's and marginal (or no!) air conditioning. We decided on a batch process design and targeted 15 minutes as the nominal conditioning cycle time. This is the first paper on this new processing equipment whose designs and performance have been confidential until today.

RapidCon operation is as follows: The operator places the trays of samples on the RapidCon stages, hits the cycle switch, and the machine takes over. Fourteen minutes later (typically), it has finished its cycle and the green light will begin flashing. Allowing one minute to unload and load sample trays gives the nominally 15 minute cycle.

### Summary

We conclude with some observations based on the Australian and U.S. experience of the past year.

1. Our experience generally confirms the USDA conclusion that nominally 15 minutes of active conditioning are equivalent to 48 hours of passive conditioning.
2. The batch process works well for small laboratories with 1 - 4 HVIs.
3. As an approximate rule of thumb, one 3-stage RapidCon can service two current-generation HVIs testing about 150 samples per hour each.
4. The RapidCon conditioning zone needs to be operated as an almost-sealed environmental chamber.
5. The degree to which test result equilibria are reached in the conditioning time interval depends on the test parameter (moisture content, tenacity, length, . . . ), initial sample state, variety and sample size. Emphatically, this statement applies to active or passive conditioning.

6. The 15 minute conditioning is only nominal. Each Customer should establish his/her own cycle.

7. Investigations are under way to evaluate variable conditioning times and variable environmental parameters within the conditioning cycles. Both moistening and demisting cycles are being considered.

8. An extended capabilities RapidCon, called RapidAir, is being introduced to condition laboratory space and particularly, an "oasis zone" around the HVIs. Once the samples are conditioned in the essentially closed environmental chamber, they remain in the well-controlled oasis zone until they are tested.

As a final point of interest, in the 1997 ginning season, RapidCons will condition 83 % of the Australian crop. For reference, 79 % of the U.S. crop is rapidly conditioned by the USDA/AMS.