TOWARD A GOLD STANDARD FOR NEP CALIBRATION

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Abstract

This paper discusses observations made during the development of instrumentation under development to measure nep size and count in cotton fiber samples.

Results and Discussion

There follow certain observations made in the course of our developments of the RapidTester-N:

1. The data product, neps/gram, is fundamentally and sensitively dependent on nep threshold "size," above which size nep entities are counted and below which they are ignored. For typical nep size distributions, a 10% decrease in the sizing threshold can lead to 50% increases in readings of neps/gram.

2. The current practice of adjusting an unknown size threshold to force or calibrate an instrument to read "known" values of neps/gram on one sample type can lead to seriously inconsistent results on another type for which the size distribution is significantly different.

3. Thanks to heightened sensitivity to and reductions in nep generation in ginning and to progress in nep removal by better and better carding and combing machine design and maintenance, the types of size distribution are more and more different.

4. Large between sample and between instrument variabilities in nep/gram readings are partly explained by the previous points.

5. There is no industry consensus relating nep counts/gram and counting threshold size.

6. The fundamental matter of nep definition needs to be revisited, particularly with respect to size.

These and other observations and developments convinced us that, beyond larger sample size and faster testing rate, an improved nep measurement method is needed, one for which the calibrations are more rigorously based on nep size. We have accordingly deferred the broad introduction of RT-N until we can better fill this need, now estimated to be mid-1999.

We shall call this new calibration method the "Gold Standard" if it proves to essentially eliminate the need for cotton calibration materials having "known" nep/gram values but unknown size distributions. Indeed, for emphasis, a major objective is essential elimination of cotton as a calibration material.

Another objective is to improve the robustness of instrument operation, especially including field nep calibrations, so that reliable, on-line, round-the-clock measurements can be made in gins. RT-Ns will be part of Lubbock Electric's "Process Watch" gin monitoring system; several beta sites will be in operation in 1999.

In order to achieve solutions to some of these basic measurement problems, in addition to designing a method which processes samples at two orders of magnitude higher rate, it became necessary to examine in depth a more ideal instrument concept with special focus on nep size and calibrations therefor, and which calibration method we call the "Gold Standard."

It can be appreciated that all measurement methods for neps/gram, instrumental or manual, relate fundamentally to the absolute distributions of nep "size" observed in the sample presented for measurement. Figure 1 shows the major qualitative features of two very different absolute nep size distributions (i.e., not normalized probability density distributions) for card mat and card sliver.

An ideal method would simply count and size those nep entities whose "size" is above some threshold T. This size threshold T is related to some presumably fixed minimum size, below which there are few processing quality concerns, and/or below which nep entities cannot be detected reliably by the method, and/or which has been agreed by all industry participants (i.e., buyers and sellers of cotton and cotton processing machinery) affected by the data. There is no consensus on size threshold T.

Calibration of any such ideal, absolute method reduces simply to assuring correct response to the expected range of nep sizes. Introduction of samples having "known" neps/gram values would be irrelevant in principle.

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