OpTest Equipment Inc.

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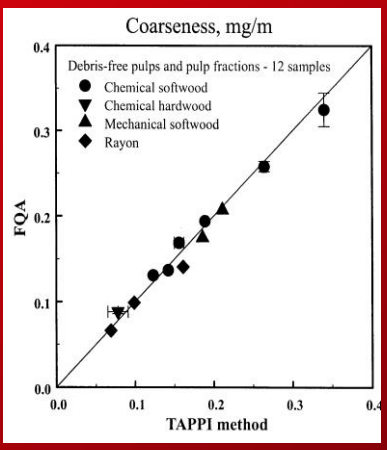
# FQA-360 Software Options

## COARSENESS, FIBER WALL THICKNESS AND HARDWOOD/SOFTWOOD RATIO MIXTURE SOFTWARE

***Coarseness:*** This option allows the FQA-360, and HiRes FQA, to accurately measure the mean fiber coarseness of a pulp sample.

The mean fiber coarseness is defined as:
*coarseness = (OD sample mass) / (total fiber length)*




Published results [Olson et al, Tappi J. (Oct. 1999)] found that the FQA agreed significantly with standard microscopy.

Coarseness accuracy with the FQA is ensured because the entire sample is drawn from the beaker eliminating errors from poor mixing or fiber flow fractionation.

The FQA-360 Coarseness measurement meets all the requirements and specifications of ISO Standard 23713.

**Hwd/Swd Ratio**: The software prompts the user to enter the average fiber length, $L_w$, and coarseness, C, of the parent species. It uses these values to estimate the fraction, F, of the softwood, *sw*, and hardwood, *hw*: in a pulp blend using the equations:

$$F_{sw} = C_{sw}(L_{wm} - L_{wh}) / [\, C_{sw}(L_{wm} - L_{wh}) + C_{hw}(L_{ws} - L_{wm})]$$
$$F_{hw}=1-F_{sw}$$

**Fiber Wall Thickness**: The average Fiber Wall Thickness (FWT) is calculated using the values of fiber width and the measured specimen coarseness.

The FWT histograms and distributions, as a function of fiber length and width, may also be available.

## SHIVE ANALYSIS SOFTWARE

The combined cross-sectional area of the 3 fluid layers in the FQA cytometric flow cell is 33 mm². Consequently, large cellulose structures, such as shives, can be analyzed.

A published report (Joss et al, Appita J, 2006) found that 3 morphological parameters are required to properly describe a shive: Effective Length, Shive Area and Branch Index. The FQA-360 measures all 3 of these parameters.

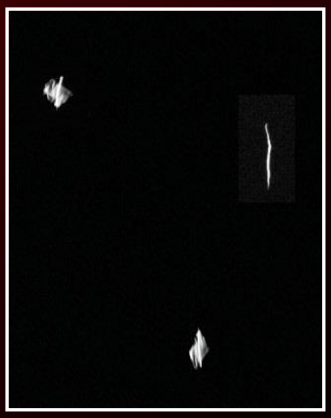
A 9mm shive detected by the FQA-360

Two shives may have the same effective length and area. By measuring the Branch index, it is possible to distinguish shives that are dense and compact from highly branched shives. Usually branched shives pose fewer problems for sheet runnability.

The optional Shive Analysis runs concurrent with the FQA-360 fiber measurements. The Shive Analysis results include the means, variances and distribution histograms for:
Effective Length, Shive Area, and Branch Index.

## VESSEL ELEMENT ANALYSIS SOFTWARE

The Vessel Element Analysis runs concurrent with routine FQA-360 testing. The results include the means, variances and distribution histograms for: The Effective Length, Effective Width, L/W aspect ratio and Area.



Vessel elements detected by the FQA-360

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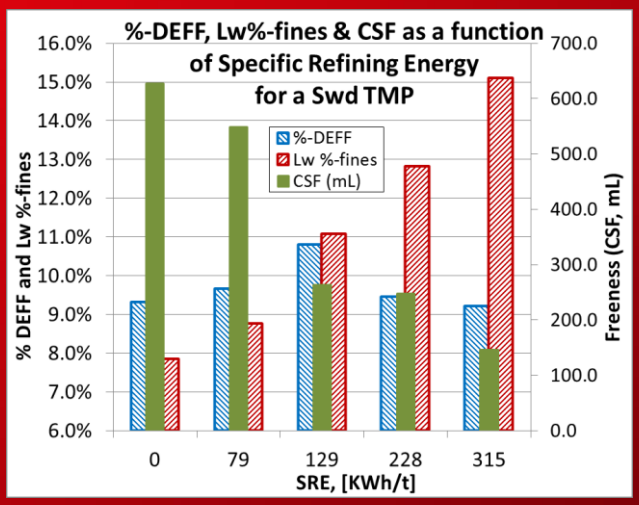
## *EXTERNAL FIBER FIBRILLATION SOFTWARE*

The FQA-360 measures the Degree of External Fiber Fibrillation (%-DEFF) with at least 2 times greater sensitivity than other optical techniques.




This is achieved with the use of circular polarized light which provides a fiber image contrast that is an order of magnitude greater than non-polarized light techniques.

The %-DEFF is the %-difference between the perimeter of the “smooth” fiber and the exterior perimeter of the fibrils. A higher value relates to a more fibrillated cellulose fiber.