

FOVEA CALCULATION APP

ACHIEVING, COMPARING AND VALIDATING ACCURATE RESULTS (VERSION 1.3)

This document provides comprehensive information on the iFOVEA Calculation App, including its measurement functionality, quality control procedures, measurement tolerances, comparison results, log stack requirements, acceptance criteria, and industry recognition.

FUNCTION

The **stacked volume (stere cubic metre)** calculation is comparable to the manual sectional measurement method, but uses significantly smaller measurement sections:

- When log count detection is enabled, sections are determined at intervals of approximately 0.02 m.
- When log count detection is not enabled, sections are determined at intervals of at least 0.5 m.

The area enclosed by the green polygon outline is used for the calculation.

The fovea **solid wood volume (m³ under bark)** determination is based on a full-surface cross-caliper measurement of all log end faces, including bark deduction, with each log being measured individually.

To minimize errors and prevent the determination of an excessively large diameter, the fovea software verifies each log against adjacent logs during the measurement process.

For all calculations, the software counts the image pixels and relates them to the maximum width of the log pile (comparable to the scale of a map). The log pile width is determined manually using a measuring tape.

MEASUREMENT/CALCULATION

To reference and calibrate the image, the maximum width of the log pile must be measured with a measuring tape to an **accuracy of one centimetre**. The measured width is then entered into the calculation app.



Fig. 1: Calculation as industrial roundwood (pulpwood)



Fig. 2: Calculation with individual log detection



Fig. 3: Log count detection using full-surface end-face cross-caliper measurement

The width measurement may deviate by a maximum of 0.5%. Under normal conditions—and provided the log pile has been stacked in accordance with the prescribed stacking requirements—the calculation is performed using the front face of the log pile. Optionally, the rear face of the log pile may also be included in the calculation.

In Figures 1 and 2, a white rectangle is displayed, indicating the maximum width and height of the measurement area. The measurement points must align precisely (to within one centimetre) with the left and right white boundary lines. If this is not the case—for example, if part of an adjacent log pile is visible in the image and included within the rectangle—the volume calculation will be inaccurate.

VERIFICATION OF THE CALCULATION

To verify the results and ensure an accurate volume calculation, the following points must be carefully checked:

- Is the image free of defects, and is the timber clearly visible?
- Is the log length (stack depth) correct?
- Has the log pile width been measured correctly?
- Does the white rectangle align with the measurement points corresponding to the manually measured maximum log pile width?
- Has the green polygon outline been drawn correctly?

The primary focus of the verification process is the visual inspection of the image, as all relevant factors—except for the measured width and depth—can be checked directly from the image. At the log pile itself, the maximum log pile width can be verified on site.

TOLERANCES

Experienced users typically achieve a standard deviation of 2.5% per log pile when measuring sawlogs. Across multiple log piles, the standard deviation is approximately 0.9%. For softwood industrial roundwood, the deviation increases by approximately 1%. For hardwood industrial roundwood, the standard deviation may be as high as 6% per log pile and approximately 2% across multiple log piles. Experienced users should be appropriately trained and should calculate volumes for more than 5,000 m³ of timber per year.

Our app is used worldwide with the same measurement technology, ensuring that users receive the same standardized measurement procedure worldwide.

As with all volume determination methods, errors in the application of the procedure can lead to biased or inaccurate results. It is therefore essential that all applicable regulations and guidelines—particularly the log stacking requirements (log pile regulations)—are strictly observed.

COMPARATIVE RESULTS

As described under “Function”, the iFOVEA Calculation App produces two results:

- Gross stacked volume (stere cubic metres / gross stacked volume)
- fovea solid wood volume (m³ under bark), determined by means of a full-surface cross-caliper measurement of all log end faces with bark deduction

The net stacked volume and the solid wood volume according to HKS are derived using conversion factors.

COMPARISON OF MANUAL SECTIONAL MEASUREMENT AND GROSS STACKED VOLUME

To compare the manual sectional measurement method with the gross stacked volume determined by fovea, sections must be established manually at 0.5 m intervals, and all additional requirements applicable to the manual sectional measurement method must be followed precisely.

When the procedure is carried out correctly and sections are measured at 0.5 m intervals, the results for an individual log pile typically vary by approximately 3.5% standard deviation. When comparing a larger number of log piles, the standard deviation decreases, resulting in a higher level of overall accuracy.

COMPARISON OF HARVESTER MEASUREMENT, MILL MEASUREMENT AND FOVEA SOLID WOOD VOLUME (FM)

A well-calibrated harvester measurement system and the results produced by the fovea Calculation App generally show very close agreement for softwood timber. Both our own analyses and evaluations conducted by forestry administrations indicate that the average deviation between harvester measurements and fovea solid wood volume (FM) is in the range of approximately 1%.

Mill measurements generally result in 1–2% higher volume figures. This effect is particularly noticeable with pine. The most likely reason for this



difference is the use of a fixed (standardized) bark deduction factor.

END-FACE SAMPLING METHOD

In comparisons conducted by fovea, the end-face sampling method has shown the greatest deviation from mill measurements, harvester measurements, and the results generated by the fovea app. In practice, log piles are often too small to allow for a statistically meaningful sampling procedure. To obtain comparable results, we recommend performing a full end-face scaling measurement (100% calipering of all log ends) instead of a sample-based approach. Furthermore, there are numerous regional variations of the end-face sampling method (e.g., horizontal, vertical, and other sampling approaches), as well as different implementation procedures. These variations can significantly influence the results, making direct comparisons difficult or, in some cases, impossible.

SUMMARY OF THE COMPARISONS

Although some of the national and international comparison tests showed larger deviations, these were generally attributable to the use of different bark deduction factors, conversion factors, and volume conversion methods, or to discrepancies of more than 5% in log count when compared with mill measurements.

The economic value is not determined solely by the calculated volume. It is also significantly influenced by factors such as: overlength allowances (excess length), forestry rounding rules, bark deductions, shake or settling allowances (stack settlement factors) and, most importantly, quality grading classifications and losses in piece count (log count shrinkage). In this regard, the fovea Calculation App currently offers unique capabilities for ensuring long-term transparency and traceability throughout the timber measurement and valuation process.

Thanks to color image documentation, every calculation remains transparent and can be reviewed at any time. In cases involving blue stain, quality grading, or timber downgrading, the images can serve as supporting evidence.

The fovea Calculation App is one of the fastest timber measurement solutions available and offers significant advantages in logistics, quality management, and reporting.

LOG PILE REQUIREMENTS

The requirements for log pile construction (stacking of logs) are derived from established forestry practices, recognized forest timber measurement methods, settlement and accounting procedures, and current regulations, such as the RVR Framework Agreement for the Trade of Roundwood in Germany (RVR – Rahmenvereinbarung für den Rohholzhandel in Deutschland) and the "Sampling Method for Roundwood Measurement" (49/11997) issued by the Forest Research Institute of Baden-Württemberg (Forstliche Versuchs- und Forschungsanstalt Baden-Württemberg). Certain provisions have been supplemented specifically for photo-optical measurement methods. The current log pile requirements are published at: www.palos.eu/fovea.

ACCEPTANCE AND RECOGNITION

The results generated by the fovea Calculation App are comparable to those obtained using the manual sectional measurement method. Both methods rely on manual measurements, software-based volume calculations, and digital storage of the results. A key advantage of the fovea Calculation App is its long-term traceability: all calculations are documented and can be reviewed and verified at any time using the corresponding color image records. This provides a transparent and reliable basis for subsequent checks and audits.

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