

Valmet Paper Lab

- Smoothness Oken measurement

The Smoothness Oken testing method, based on a Japan TAPPI standard, was developed in Japan by Oji Paper Kenkyusho (R&D). In this method, pressure drop over a restrictor is measured and the smoothness result is then reported as millimeters water (mm H₂O).

Smoothness Oken is a two sided measurement. The module has measuring heads with multiple concentric circles, and rubber backings against which the measurement head is pressed during measurement. The size of the Valmet Paper Lab module is 3 cells, and it contains top and bottom side smoothness measurements as well as porosity. The measuring time is only 35 seconds.

In the Smoothness Oken module, the contact area with the paper sample is about 150 times larger than in the PPS method (Paper Print Surf). This ensures that occasional disturbances in paper, such as single fibers or rougher pigment particles, will have a smaller effect on the results.

The PPS smoothness test has been a good indicator of printability for gravure printing papers. Today, however, ever smoother paper grades can be produced, and the PPS measurement does not have a wide enough measuring range: the sensitivity of this method decreases essentially at smoothnesses below 0.75 mm.

Different paper grades were tested in order to compare the performance of Oken and PPS smoothness modules, particularly for very smooth papers. The correlation was very high: -0.99. The Oken module was also able to measure papers that were well outside the PPS measuring range (Fig. 1).

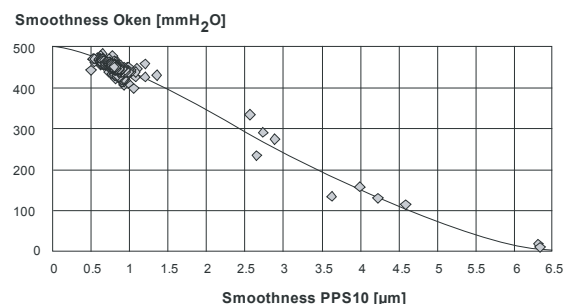
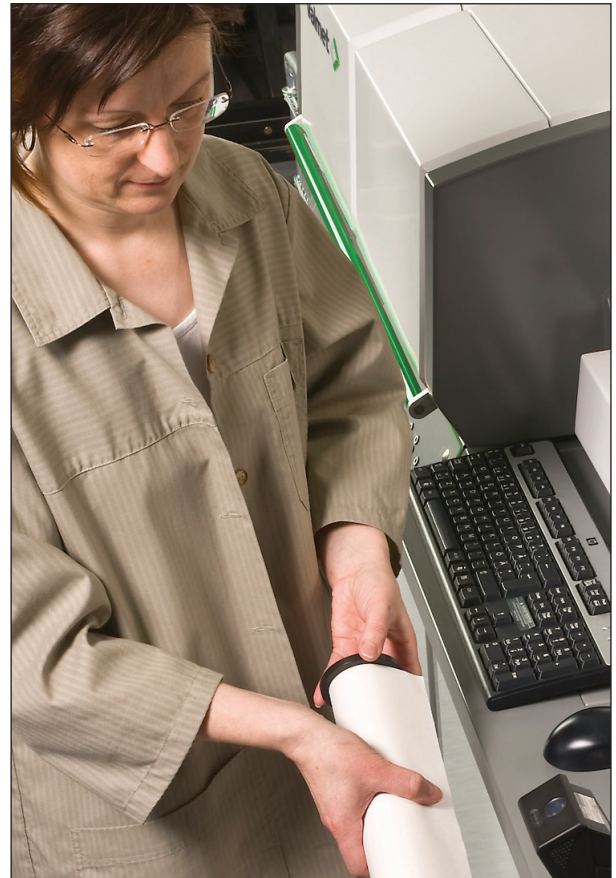


Figure 1 – Smoothness PPS vs. Smoothness Oken.

The wide measuring range of the Smoothness Oken module opens whole new worlds in evaluating the printability of gravure paper grades. Its measuring range is 0–500 mm H₂O, where a higher value means smoother paper.

Correlation to other Smoothness methods

The Smoothness Oken has a good correlation with other smoothness measurement methods. If necessary, the Oken smoothness results can be applied to calculate smoothness in other units. Some test results are shown in Figures 2 and 3.

Porosity Oken vs. Porosity Bendtsen

Porosity measurement is also included in the Smoothness Oken module.

Its porosity measuring area has a diameter of 28.7 mm (1 1/8”), the same as Porosity Gurley. The porosity measuring range is 0–500 mm H₂O, higher values indicating lower porosity. Porosity is measured within 35 seconds, together with smoothness.

The Porosity Oken measurement was compared to a Porosity Bendtsen module. Trial results from a paper mill are shown in Figure 4.

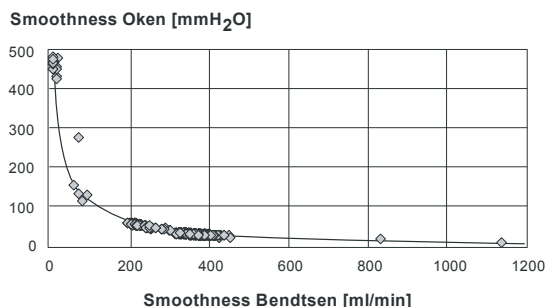


Figure 2 – Smoothness Bendtsen vs. Smoothness Oken.

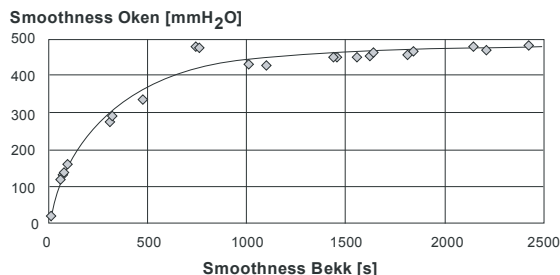


Figure 3 – Smoothness Bekk vs. Smoothness Oken.

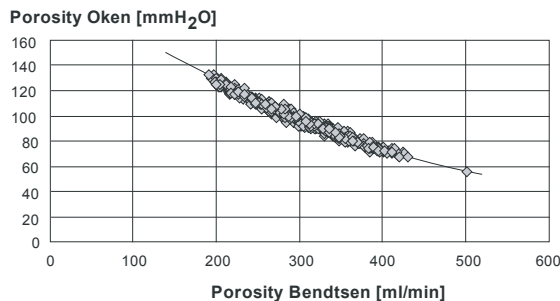


Figure 4 – Porosity Bendtsen vs. Oken method.