

Valmet Technical Paper Series

Valmet Breast Roll Shaker 120 improves sheet properties

Executive Summary

Valmet Breast Roll Shaker 120, Valmet's latest self-balancing breast roll shaker, improves the sheet forming process. Valmet Breast Roll Shaker shakes the breast roll cross-directionally and breaks up fiber flocs by creating shear forces on the web. This system improves sheet formation, and strength and visual properties.

Valmet Breast Roll Shaker is very easy to use: simply set the frequency and stroke length then press the start button on the control panel. Valmet Breast Roll Shaker is designed for easy upkeep with few parts needing maintenance. Valmet Breast Roll Shaker has a very compact design and all equipment is integrated into one unit.

Valmet Breast Roll Shaker has proven itself on uncoated and coated woodfree, kraftliner, sack paper, liquid packaging board, recycled linerboard and multi-layer grades. Results on board machines show an average formation improvement of 15%. A North American reference has seen a 20% improvement in formation with a corresponding 11% gain in bottom side smoothness.

Valmet Breast Roll Shaker breast roll shaker improves formation

Valmet Breast Roll Shaker is Valmet's solution for improving the sheet forming process. Valmet Breast Roll Shaker shakes the breast roll cross-directionally and breaks up fiber flocs and enhances fiber orientation by creating shear forces on the web as shown in **Figure 1**. This system improves sheet formation as well as strength and visual properties. The MD/CD tensile ratio is lowered, closer to 1:1, making the sheet more square with a better minimum strength.

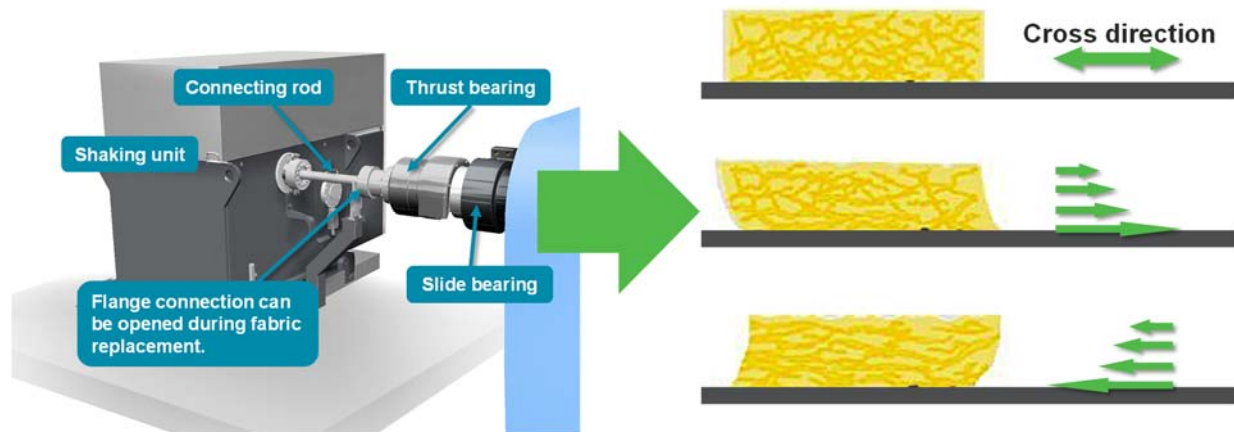


Figure 1. Valmet Breast Roll Shaker 120 shakes the breast roll in the cross direction and breaks flocs by creating shear forces to the web.

Valmet Breast Roll Shaker shakes the breast roll with the help of a rotating eccentric mass pair. The eccentric mass pair is connected to a slide which in turn is connected to the breast roll. The frequency and amplitude of shaking can be individually adjusted. There are no reaction forces transmitted to the foundation. All reaction movements are internal, with parts sliding on a hydraulic oil film.

Improved formation and low power consumption

Valmet's self-balanced breast roll shaker provides important benefits that will improve formation. And good formation allows the mill to optimize their furnish.

- Permits the use of lower quality furnish
- Optimization of the amount of filler
- Optimization of refining rate (less refining)
- Basis weight for multi-ply machines may be decreased for raw material savings in the top layer

Other benefits provided by Valmet Breast Roll Shaker include:

- Improved strength properties
- Better printability and smoother surface

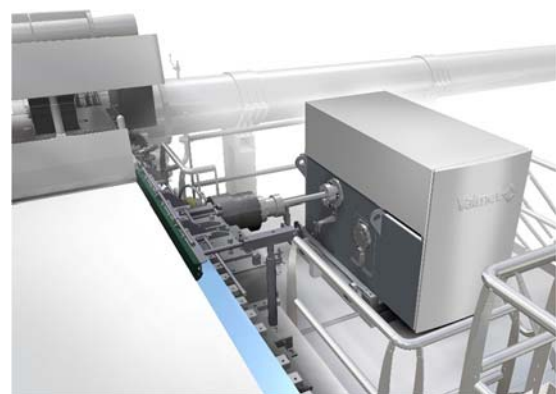


Figure 2. Valmet Breast Roll Shaker 120 improves formation and strength properties while allowing furnish optimization.

- Improved, even formation also provides:
 - less calendering needed, no bulk lost
 - even retention and enhanced dewatering
- Lower MD/CD tensile ratio
- Better runnability in press and dryer sections, especially in edge areas
- Plug and play installation
- Low power consumption, only one electric drive

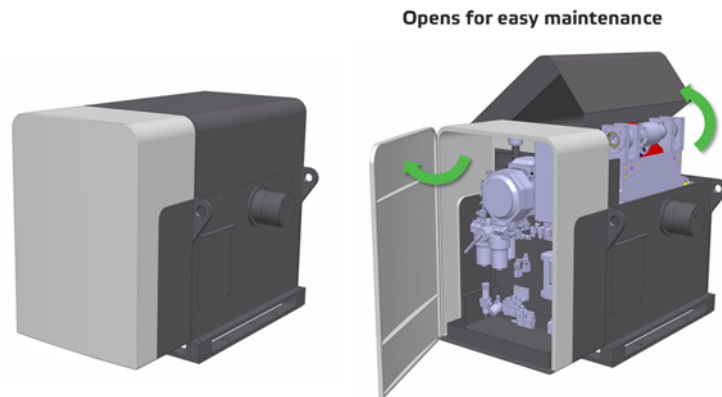


Figure 3. The new Valmet Breast Roll Shaker 120 is easier to maintain with fewer parts.

Valmet Breast Roll Shaker 120 new features

Fewer parts and higher shaking force

The original Valmet Breast Roll Shaker 60 used 4 rotors to exert a 60 kN (13,488 lbf) shaking force. The new Valmet Breast Roll Shaker 120 features a 120 kN (26,980 lbf) shaking force using only 2 rotors. The rotors load through a clutch which is much lower than in the previous Valmet Breast Roll Shaker model. This enables steel breast rolls for narrow machines with width up to 7 m (276 in), for a lower total delivery cost. For wider machines, composite breast rolls are required. The new model Valmet Breast Roll Shaker 120 has fewer parts and a higher shaking force due to larger eccentric masses.

Easier to maintain

Valmet Breast Roll Shaker 120 also provides a longer stroke of 35 mm (1.4 in) compared to the previous 30 mm (1.18 in). Valmet Breast Roll Shaker 120 is easier to assemble and maintain (Figure 3) than the previous Valmet Breast Roll Shaker model, as well as smaller (Figure 4). The maximum stroke is significantly improved, as can be seen in Figure 5, which compares the original Valmet Breast Roll Shaker to the new Valmet Breast Roll Shaker 120. Carriage

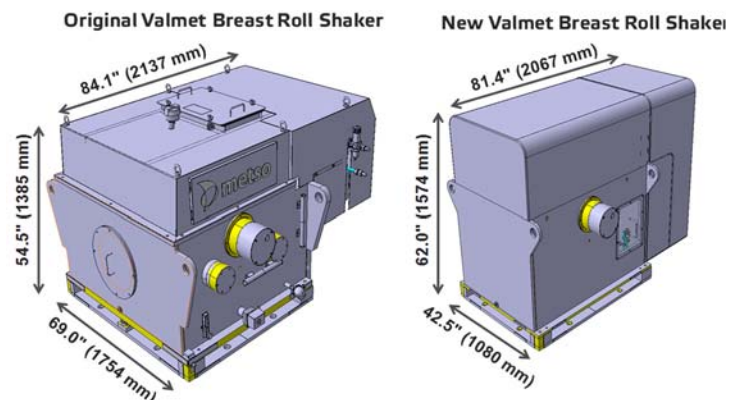


Figure 4. The new Valmet Breast Roll Shaker 120 is smaller.

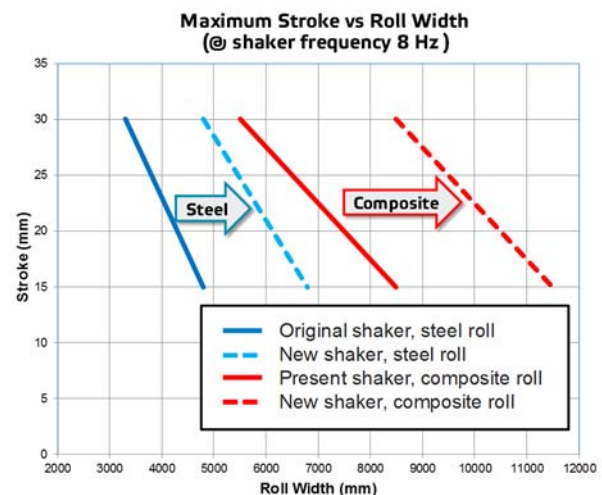


Figure 5. Valmet Breast Roll Shaker 120 provides a longer stroke for a better formation operating window, whether with a steel or a composite breast roll.

movement is reliable and accurate with linear rails. The couplings are easy to replace; this is advantageous as the couplings are recommended to be replaced every two years. There is no need to lift the shake unit out during normal maintenance procedures.

Compact unit with simplified design

The new Valmet Breast Roll Shaker 120 has a compact design comprising an inner frame unit with an integrated torque cylinder. It is one complete assembly with gears, torque cylinder, eccentric mass and shafts. With less space requirements and fewer parts needed, Valmet Breast Roll Shaker 120 may be installed in most machine environments.

Easy to use and reliable controls

The operator only needs to set the frequency and stroke length and press the start button on the control panel. The control system with PLC is "plug and play," based on either Allen-Bradley, Valmet DNA or Siemens controls (**Figure 6**). (NOTE: In North America all deliveries are made with Allen-Bradley controls, unless the mill prefers Valmet DNA.) Stroke frequency is adjusted via electric motor operating speed. Stroke length is adjusted through internal phase shift control of the mass pairs.

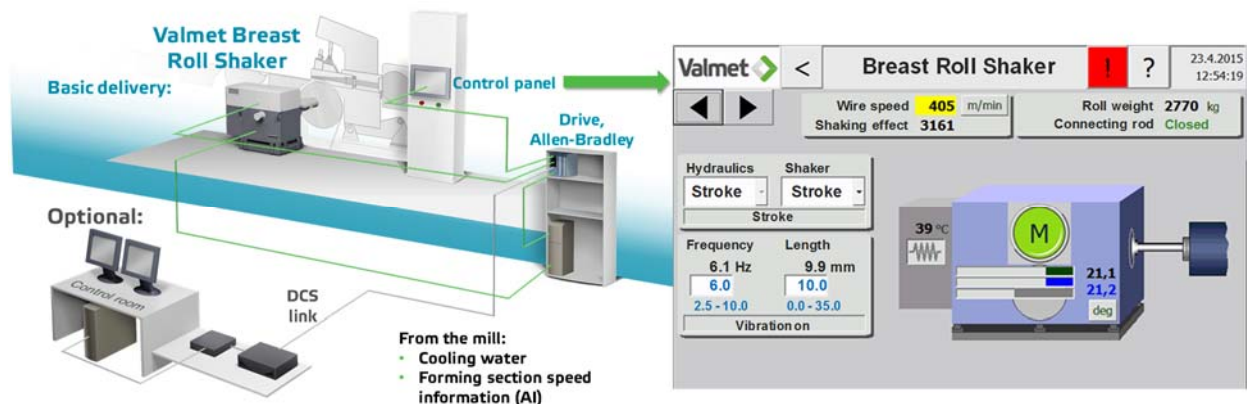


Figure 6. The control system may be Allen-Bradley, Siemens or Valmet DNA.

Valmet Breast Roll Shaker 120 performance

Figures 7, 8 and 9 demonstrate reduced floc size when using Valmet Breast Roll Shaker on OCC furnish 210 g/m². The bars in **Figure 8 (next page)** represent the number of flocs in that particular size range. Obviously, a smaller floc size is better since it lowers the average. For example, in the OCC chart the bars look erratic while the shaker is on; however the portion of large flocs is greatly reduced (from 42.9% to 20.0%). This results in the average floc size being 3.5 mm (0.14 in) with Valmet Breast Roll Shaker on vs. 6.7 mm (0.26 in) with Valmet Breast Roll Shaker off.

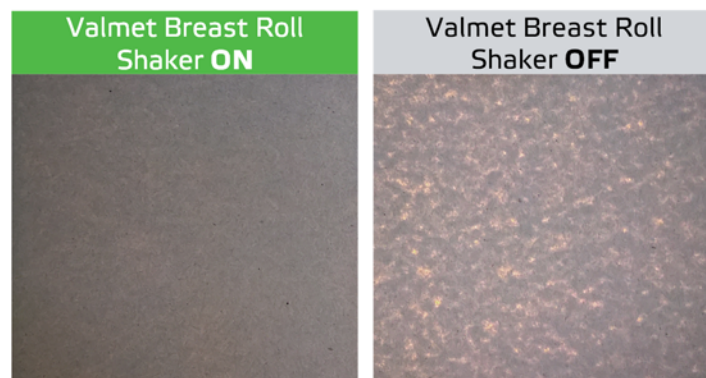


Figure 7. Valmet Breast Roll Shaker clearly produces better formation, as seen in the visual appearance of this OCC furnish 210 g/m² sheet.

Similar results have been proven on other grades including woodfree coated paper, fluting, WFC base paper, folding box board, white top liner and white lined chipboard. These can be seen in **Table 1 (next page)**.

A higher shake number is preferable. Operating at the largest shake number is not necessarily the best, but having the capability gives the possibility to try different combinations for the particular process and machine.

Valmet's latest testing has shown that a long stroke and fairly slow frequency may have the best result. The Valmet Breast Roll Shaker 120 stroke reaches 35 mm (1.4 in), the largest stroke available.

A lighter breast roll allows a higher shake number. While any size and weight breast roll may be used, a larger/heavier roll will limit the stroke, which is counterproductive for improving formation.

Valmet Breast Roll Shaker 120 is the best available technology

Valmet is not the only manufacturer to offer a breast roll shaking device, however Valmet's Valmet Breast Roll Shaker 120 is the most effective currently offered.

Valmet's longer stroke gives a better ability to optimize quality. The Valmet Breast Roll Shaker 120 uses a single standard electric motor rather than two special drives, which reduces the spares cost. Valmet controls frequency with a single commercially available controller rather than two special controllers, for a more flexible, less expensive, more reliable and simpler solution.

The Valmet Breast Roll Shaker 120 uses a hydraulic actuator as the actuator to control phase rather than two drives, which is a simpler more reliable solution; and phase control is via position measured proportional valve controlled method rather than complicated electric controls.

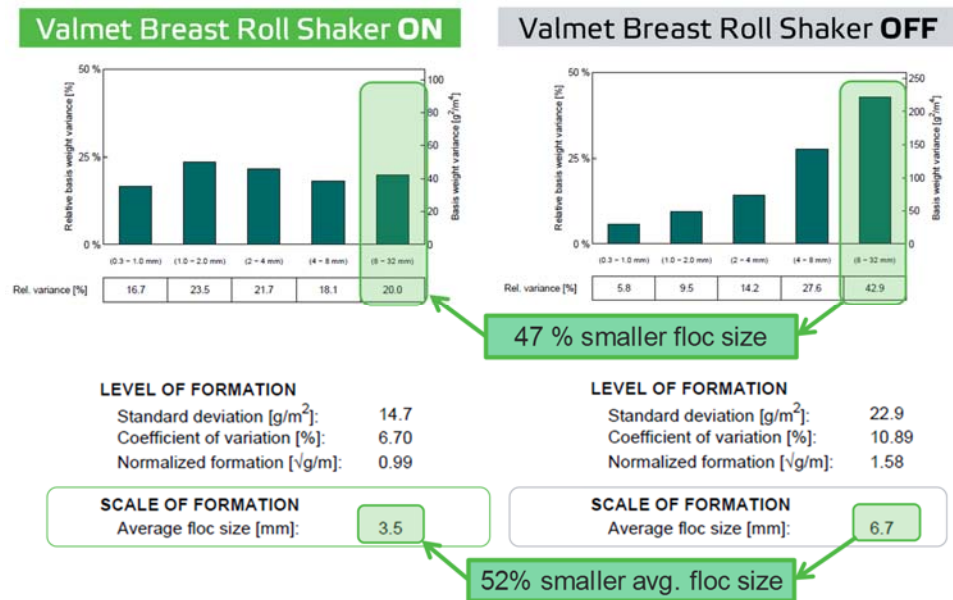


Figure 8. The level and scale of formation with Valmet Breast Roll Shaker 120 is significantly improved on OCC furnish 210 g/m^2 .

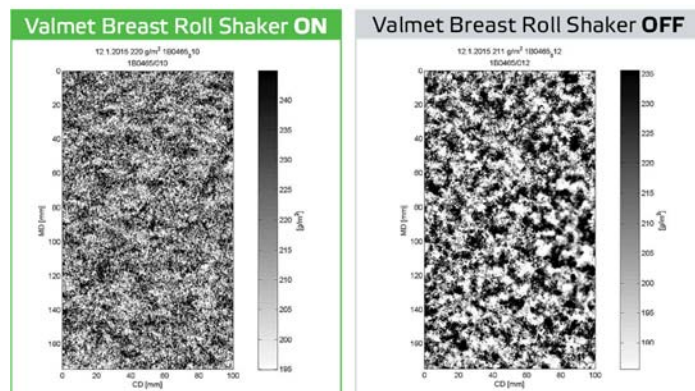


Figure 9. Radiography analysis of the OCC confirms the visual appearance shown in Figure 7.

In the case of an electric power failure, Valmet's Valmet Breast Roll Shaker 120 is equipped with a hydraulic pressure accumulator which forces the actuator to immediately zero the phase angle, protecting equipment and personnel. The competition requires a separate UPS system to avoid external damage in the event of a power failure. After a power failure

occurs, the Valmet system uses an automatic fixed setting for the rotating weights, as compared to the competition's device which requires zeroing of the rotating mass phase using a bubble level.

Valmet offers three control system hardware choices: Siemens, Valmet DNA or Allen-Bradley. Spherical roller bearings require a minimum speed and have maximum axial movement close to the maximum stroke. Instead, Valmet uses only the sliding bearing design without speed limitations and which allows roll movement ± 10 mm (0.39 in) compared to the stroke. Valmet's new Valmet Breast Roll Shaker 120 is currently the best available technology for breast roll shaking on the market.

Summary

In conclusion, Valmet Breast Roll Shaker improves the sheet forming process by shaking the breast roll cross-directionally and breaking up fiber flocs by creating shear forces on the web. The system improves sheet formation, and strength and visual properties. Valmet Breast Roll Shaker is very easy to use and maintain, with a compact integrated design. It is proven technology with many references across several grades. Results on board machines show an average formation improvement of 15%. A North American reference has seen a 20% improvement in formation with a corresponding 11% gain in bottom side smoothness.

This white paper combines technical information obtained from Valmet personnel and published Valmet articles and papers.

Valmet provides competitive technologies and services to the pulp, energy and paper industries. Valmet's pulp, paper and power professionals specialize in processes, machinery, equipment, services, paper machine clothing and filter fabrics. Our offering and experience cover the entire process life cycle including new production lines, rebuilds and services.

We are committed to moving our customers' performance forward.

Grade & basis weight (g/m ²)	Without Valmet Breast Roll Shaker		With Valmet Breast Roll Shaker		Reduction in floc size with Valmet Breast Roll Shaker
	Relative variance (8-32 mm floc size)	Scale of Formation average floc size (mm)	Relative variance (8-32 mm floc size)	Scale of Formation average floc size (mm)	
OCC 210	42.9 %	6.7	20.0 %	3.5	47 %
WFC 130	24.0 %	3.3	10.3 %	2.6	21 %
Fluting 120	28.3 %	3.8	18.5 %	2.9	24 %
Fluting 210	35.1 %	5.3	15.6 %	2.7	49 %
WFC 150	38.3 %	6.4	21.5 %	2.9	55 %
FBB 290	18.8 %	3.3	16.4 %	2.8	15 %
WTL 350	23.2 %	3.4	14.2 %	2.6	24 %
WLC 350	25.7 %	3.3	18.0 %	2.8	14 %
WLC 250	29.7 %	3.0	17.6 %	2.2	27%

Table 1. Example results of improved surface properties when using Valmet Breast Roll