

Runtech introduces new EP AMB Turbo Blower: High efficiency meets high reliability

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INTRODUCTION:

Runtech Systems has expanded its EP Turbo Blower portfolio with a new model featuring Active Magnetic Bearing (AMB) technology, marking a significant step forward in vacuum system reliability, energy efficiency, and tolerance to harsh papermaking environments. The new AMB-enabled design aligns with the industry's growing need for equipment that minimizes maintenance demands, withstands contamination, and operates efficiently across rapidly changing machine conditions.

For years, Runtech's vacuum system philosophy has shifted the industry away from fixed vacuum levels and oversized installations. Instead of adding more vacuum, Runtech applies vacuum precisely where needed through variable speed EP Turbo Blowers, optimized doctoring, and save all systems, supported by EcoFlow online dewatering measurements. This integrated approach stabilizes runnability, prevents energy waste, and reduces drying costs by ensuring that vacuum responds dynamically to the process rather than relying on static setpoints.

This adaptive philosophy is increasingly important as papermaking processes become more challenging. Machine speed, basis weight, and felt condition vary continuously, yet many mills still operate with vacuum systems sized 40–60% above actual requirements. New machines are commonly over-dimensioned, and fixed vacuum settings often lock mills into inefficient operating modes for most of the felt lifecycle. At the same time, many mills face rising maintenance costs and reduced manpower availability. These trends have created strong demand for equipment that can run reliably with less attention while still delivering high performance.

"Working closely with our customers helps understand their pain points and we wanted to address them. With Active Magnetic Bearings, the rotor is levitated in a magnetic field and supported without any physical contact. This operation is frictionless and eliminates the need for oil lubrication and removing the risk of oil leakage. The absence of wear surfaces significantly reduces maintenance requirements, which is particularly valuable for mills operating with limited technical staff," says Aleksi Salmi, Engineering Manager, Runtech Systems. The oil free design also aligns with the broader industry shift toward energy-efficient and operator-friendly, environmentally sustainable technologies.

A New Dynamic with Active Magnetic Bearings

Rotating machinery, such as turbines, electric motors and compressors, need to be well balanced to minimize unbalance in a rotating part to avoid vibration. Unbalance is a deviation between the center of the mass and the geometric center of the rotating shaft. This unbalance induces cyclic centrifugal forces that lead vibration and in a worst-case bearing failure.

"A major advantage of AMB technology is its ability to handle unbalance forces caused by contamination and material carryover. Even with effective pre-separation and drop-separation systems, small amounts of solids inevitably enter the blower and can accumulate on the impeller over time. In normal fixed bearing/rotor systems, this buildup leads to increased vibration, which will reduce bearing lifetime and in that way is harmful in the long run," Aleksi explains.

Example of fixed bearing /rotor system

- Rotating speed 9,600 rpm
- 14.6 grams on tip of the impeller will create 5 kN (500kg) force. According to R&D testing done with Runtech's EP Turbo Blower, 5kN is enough to cause vibration RMS values to be over 3.5 mm/s which is still in the area on unrestricted operation according to ISO/DIS 20816-3.

Image 1: TRunEcoEP1000.jpg: RunEco EP1000 Turbo Blower with Active Magnetic Bearings.





Image 2: Runtech open impeller.tif: The open (shroudless) impeller design was developed to meet two critical needs: lower maintenance requirements and reduced energy consumption per ton..

“The tolerance against the build-up can be increased but it means re-thinking the bearing system to make it non-fixed. This is how we ended up developing AMB turbo blowers. As rotor position is controllable in AMB system, both static and dynamic positions can be controlled. In AMB system rotor can be rotated around center point of mass. So geometrically rotor orbits, resulting in no vibration and capability to handle high unbalance force. Limiting factor is orbit size.”

Example of AMB–rotor system

- Rotating speed 9,600 rpm
- 5 kN unbalance force can be compensated with 15.5 μm orbit
- In this example, alarm limit for orbit is 80 μm so there is much more window to operate still
- Correlation between unbalance and orbit size is linear.

This way turbo blower can be flexible not only for the changing conditions of paper making process but also tolerant for its side effects like dirt and other harsh conditions.

Figure 1 shows unbalance magnitude values in micrometers from one year time period from EP1000 AMB Turbo Blower.

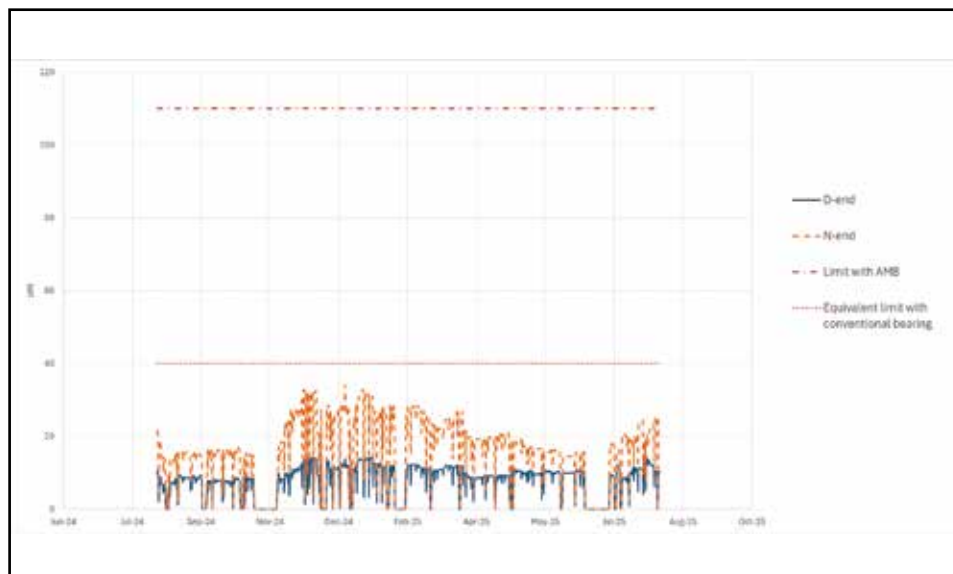


Figure 1: Unbalance magnitude values in micrometers from one year time period from EP1000 AMB turbo blower.

Beyond the mechanical benefits, the AMB system incorporates built in position sensors and an advanced digital controller, opening new opportunities for condition monitoring and predictive maintenance. Because the bearings continuously measure rotor position and magnetic forces, the blower becomes a source of diagnostic data rather than a passive component. This capability complements Runtech's broader focus on measurement-led vacuum control and supports mills in further optimizing performance.

“Based on our field experience, conventional high-precision ball bearings can typically tolerate vibration levels equivalent to roughly 40 μm of unbalance magnitude. When vibration exceeds this threshold for extended periods, the resulting loads can accelerate wear and eventually damage the bearings. Situation changes fundamentally with AMB turbo blowers,” says Aleksi and explains why: “Because the rotor position is actively controlled, the system can operate with much higher unbalance forces, meaning higher unbalance magnitudes, without affecting performance or reducing lifetime. The primary limits to allowable unbalance are the clearance of the safety bearings, usually around 200–300 μm , and the linearity and force capacity of the AMB actuators. Even within these constraints, the maximum permissible orbit in an AMB system is significantly greater than what a conventional ball-bearing unit can tolerate. In the EP1000, for example, the allowed unbalance magnitude reaches 110 μm , enabling stable operation even under substantial contamination or material build-up.”

Adjustable vacuum aligns capacity to real operating needs

EP technology utilizes variable-speed turbo blowers as an efficient alternative to conventional vacuum systems in paper machines, delivering significant energy reductions typically between 30% and 70%. Because the blowers operate without water, water handling and treatment infrastructure, such as cooling towers, associated with traditional systems, is eliminated. Their variable-speed capability provides precise control of vacuum levels, allowing the system to respond directly to changing process conditions and maintain high operational efficiency.

The EP Turbo Blowers use high-speed motors controlled by frequency converters, enabling accurate adjustment of rotational speed and vacuum output. This level of control is particularly valuable in new installations where actual vacuum demand often becomes clear only during early production. By adjusting speed together with throttling, the system avoids common sources of inefficiency and minimizes air losses.

Mechanically, the EP design is intentionally simple. The impeller is mounted directly on the motor shaft, requiring only two bearings and contributing to higher reliability and easier installation. With the addition of Active Magnetic Bearings, the system removes all mechanical contact between moving parts, reducing maintenance needs. These features support long-term stability and help lower overall lifecycle costs.

Papermaking environments are dynamic, and machine speed, basis weight, and felt condition fluctuate throughout production.

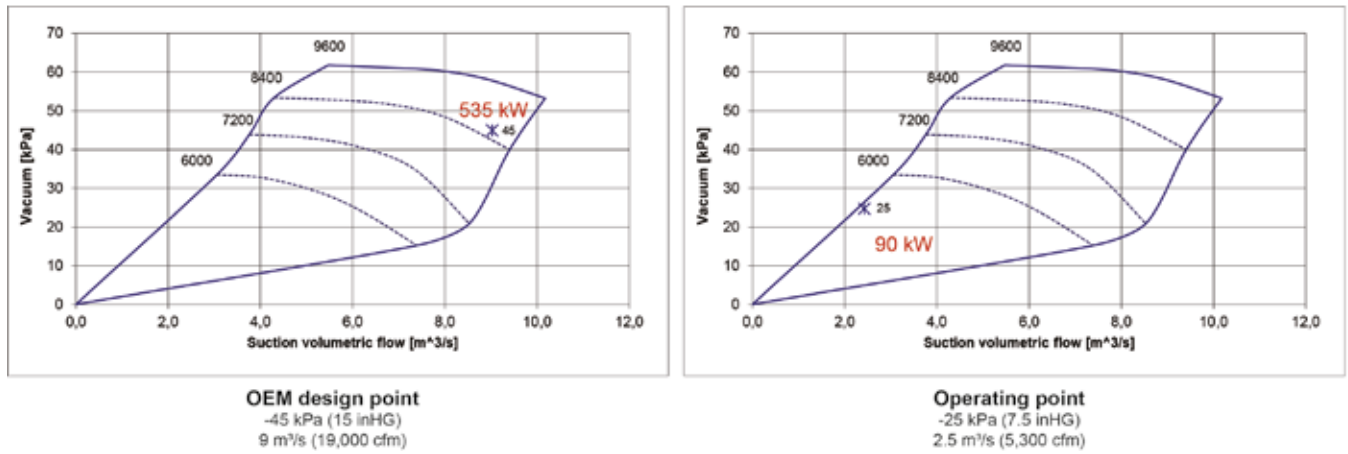


Figure 2: Difference between OEM design point and operating point in a press rebuild in Germany.

Fixed vacuum settings quickly become inefficient under such variability. New machines typically have vacuum systems with large safety margins, often resulting in 40–60% excess capacity during normal operation. Other vacuum technologies lack the adaptability needed to compensate for this mismatch. As a result, many mills face unnecessary energy consumption and operational losses.

“Experience from rebuild projects shows that significant energy reductions, even exceeding 50% or more than 10 GWh annually, can be achieved by resizing and optimizing vacuum systems after start-up. Defining vacuum specifications carefully during procurement is therefore essential to avoid over-dimensioned systems that sacrifice long-term efficiency for short-term procurement convenience,” says Hannu Kääriä, Sales Director, Runtech Systems.

Dry vacuum systems with adjustable capacity are better aligned with real operating needs. Vacuum demand varies according to water removal requirements in flatboxes and Uhle boxes, measured with dewatering instruments, as well as runnability requirements in pick-up and press suction rolls. While higher vacuum levels may be necessary for pick-up, they can often be reduced once stable operation is reached. Press suction rolls are commonly set at -65 kPa, although lower levels in the -40 to -45 kPa range are often sufficient, especially on machines operating below 1,000 m/min. (Figure 2 above.)

Vacuum requirements shift throughout the felt lifecycle

The ability to adjust capacity according to actual conditions is therefore critical. In press section rebuilds, many systems have been optimized to run effectively at much lower capacities than originally specified. During a felt's lifecycle, airflows change substantially. When the felt is new, it requires the full design capacity, but during 90% of its service time, the necessary airflow falls to only 40–60% of the specified values. Double-width tissue machines illustrate this clearly: although vacuum systems are often designed for a wide range of contingencies, the actual requirements under stable conditions may be considerably lower. When the blower has a wide operating window, vacuum levels can be tuned precisely to optimize performance and energy use. (Figure 3 below)

“Upgrading vacuum systems is one of the most impactful steps mills can take to reduce energy, water use and emissions.”

Figure 3: Flexibility is needed to operate tissue machine efficiently.

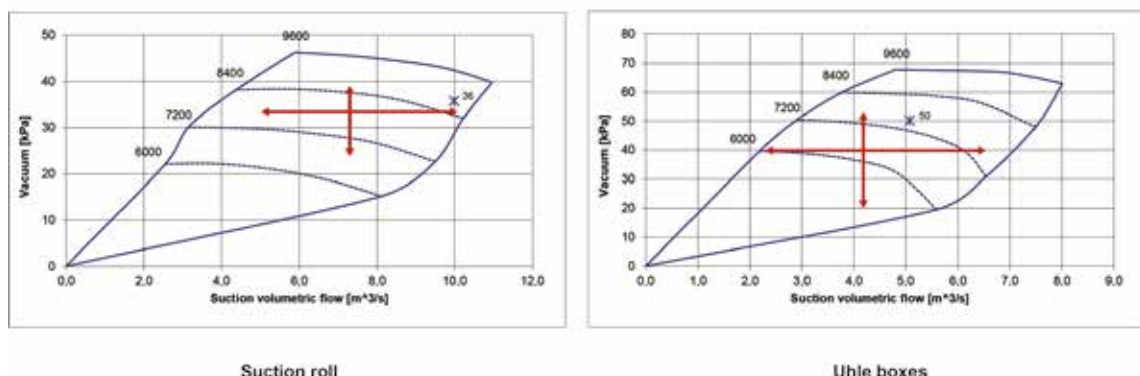




Figure 4: Air flow and energy consumption variance during a felt lifecycle.

Measurement-led control brings additional benefits

As felt permeability decreases over time, required airflows also shift, as shown by typical airflow curves throughout the felt lifecycle. The break-in period lasts only 8 hours to two days, after which the system operates for the majority of the felt's life at significantly reduced airflow levels. Integrating dewatering measurement technologies into vacuum system upgrades brings benefits beyond energy reduction. Mills can simplify vacuum control, enhance moisture removal, reduce water use, improve felt conditioning, extend felt life, increase production output, and more efficiently recover heat from exhaust air.

Service and support for long-term performance

"Vacuum systems are often one of the largest single electrical energy consumers on a paper machine. In many mills, vacuum levels are set too high, wasting energy without improving dewatering. Our audits can benchmark actual vacuum demand against paper grade, felt condition, and machine speed. They help the customer to find the low hanging fruits to improve the situation, whether it is upgrading dewatering elements or adding measurements. Regular and well-planned maintenance is also a factor affecting on reliable operation," says Hannu Kääriä.

Runtech's service philosophy is built on deep application know-how and a focus on keeping vacuum systems operating at their most efficient point. Through the RunCare program, mills gain access to experts who understand the full vacuum process from blower dynamics to dewatering performance and who can tune equipment to match real operating conditions. Whether a mill prefers scheduled inspections, extended service coverage, or a long-term maintenance agreement, RunCare provides a structured approach that helps control costs, maintain efficiency, and prevent unexpected downtime.

Mills that manage their own maintenance can secure just-in-time parts availability through the RunCare Parts Agreement. Regular maintenance not only preserves turbo blower performance but also keeps the entire vacuum system operating at optimal settings, supporting efficient papermaking and helping mills avoid the rising costs associated with neglected systems.

Optimized performance with open impeller design

"Another recent customer-driven improvement is open impeller. As paper machines run wider grade ranges, handle more contaminants and operate within broader production windows, the demands placed on vacuum system components have increased significantly. This new open, shroudless impeller design reduces maintenance needs and improves energy efficiency per produced ton", says Aleks Salmi.

Open impellers accumulate far less dirt, remain accessible for cleaning without removal and maintain a flatter efficiency curve across varying operating points. This results in more airflow and vacuum for the same power input, extending cleaning intervals, lowering energy consumption and delivering greater reliability with reduced operating costs.

Image 3: EcoFlow multi dewatering measurement: The EcoFlow dewatering measurement system helps maximize sheet dryness after the press section, improve machine runnability, and enhance energy efficiency. With real-time feedback on dewatering performance, papermakers can optimize the forming and press sections for better results.

Efficiency, reliability and flexibility for papermaking

Papermaking environments are defined by constantly shifting operating conditions, and turbo blowers must perform reliably despite contamination, vibration, and process variability. These realities often expose the limitations of traditional vacuum systems, which are frequently over-dimensioned and unable to adapt to changing demand, resulting in unnecessary energy use and inefficiency. The introduction of Active Magnetic Bearing technology to EP Turbo Blower platform directly addresses these challenges. AMBs support the rotor without physical contact, reducing mechanical wear while significantly improving tolerance to unbalance and carryover. Because the rotor position can be actively controlled, the blower operates with low vibration and remains stable even in harsh conditions.

Vacuum demand also varies throughout the felt lifecycle, with actual conditions typically requiring only 40–60% of the design capacity. Variable-speed EP Turbo Blowers match these changes precisely through high-speed motors and frequency converters, avoiding throttling losses and improving responsiveness. When combined with dewatering measurements, the system adjusts vacuum levels in real time, enhancing moisture removal, supporting better felt conditioning, and improving overall system performance.

The result is a vacuum solution that is not only flexible enough to follow the dynamics of the papermaking process, but also robust enough to tolerate contamination and other side effects of daily operation. By uniting AMB technology with a dry, variable-speed turbo blower platform, Runttech provides a highly efficient, low-maintenance, and operator-friendly alternative to traditional vacuum systems. These advancements support the industry's shift toward more sustainable, reliable, and economically efficient production.

BAT guidance supports modern vacuum technologies

The European Commission's BAT Reference Document highlights the strong environmental and operational advantages of modern, energy-efficient vacuum systems. Dry, variable-speed blowers can reduce electrical power use by 20–45% while eliminating sealing water, and their automatic speed control adapts to changes in speed, grammage and felt age to improve runnability. BAT also notes important cross-media benefits, including significant water savings and the ability to recover heat from exhaust air. These systems help mills meet Industrial Emissions Directive requirements by lowering greenhouse gas emissions and improving water management. The BREF findings reinforce that upgrading dewatering and vacuum systems is essential for achieving sustainable, efficient and reliable papermaking.

