

# Maximizing Efficiency through Vacuum Optimization

By optimizing vacuum usage, strategically measuring water flow, and implementing EP Turbo Blowers, mills can reduce energy consumption by 30-70%. Furthermore, exhaust heat recovery, regular maintenance, and tailored dewatering solutions help achieve remarkable energy savings, ultimately benefiting both the environment and operational efficiency.

Runtech Systems developed the EcoFlow dewatering measurement system in the 1980s as a tool to better understand forming and press section dewatering. Measuring water flow accurately is essential for optimizing vacuum levels. Many paper mills tend to use excessively high vacuum levels due to missing or inaccurate water flow data. EcoFlow dewatering meters are designed to address this challenge by measuring water flow across mechanical restrictions, unaffected by entrained air or foaming.

Accurate online water flow measurement empowers you to fine-tune vacuum levels, ensuring they are neither excessive nor wasteful.

For substantial energy savings, it's essential to use vacuum only where it's most critical. By deploying vacuum strategically, you can enhance your nip dewatering strategy and reduce overall energy consumption.



## Nip Dewatering for Enhanced Efficiency

The most efficient and economical method of water removal in the press section is nip dewatering. When upgrading the vacuum system may bring the biggest energy savings, optimized dewatering with doctoring and save-all provides often very good results with a small investment effort, and is an important step in optimizing the efficiency of the paper machine.

Nip dewatering, combined with doctoring, significantly improves energy efficiency and machine performance. A well-designed and operated dewatering and doctoring system is crucial for both energy consumption and paper quality. Runtech's EcoFlow, save-alls, and double doctors offer a tailored approach to meet these needs. Combining dewatering improvement with vacuum system rebuild can bring the biggest benefits, especially if the mill is still using conventional vacuum pumps.

Well-designed and well-built save-alls with integrated doctoring are essential to get the full benefits from increased dewatering and ensure efficient water

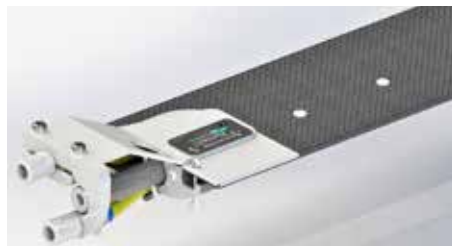
discharge with perfect rewet prevention. Correctly designed Save-Alls are capable of handling 100% nip dewatering without rewetting. Runtech save-alls are specially designed for AirBlades and EcoFlow dewatering measurement systems. They deliver reliable operation in all press and wire section positions and press section rebuild packages.

Optimized doctoring leads to increased dryness after the press section. Savings in dryer section steam usage are notable. Runtech's offering includes CompoAdapt, a hose loaded blade holder providing easy maintenance and trouble-free operation, and CompoDoc carbon fiber doctor beams with excellent doctoring performance.

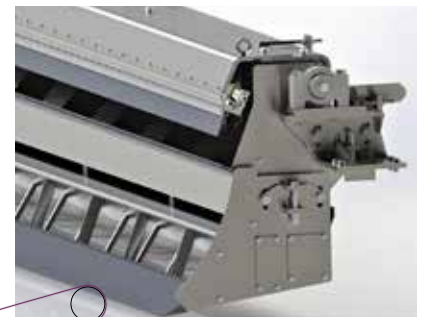
Double doctors provide optimal doctoring for suction couch and press rolls. AirBlades are air assisted doctor blades for the press rolls that enable high nip dewatering even with low machine speeds, help with roll cleanliness problems, improve moisture profiles and have a positive effect on machine speed.



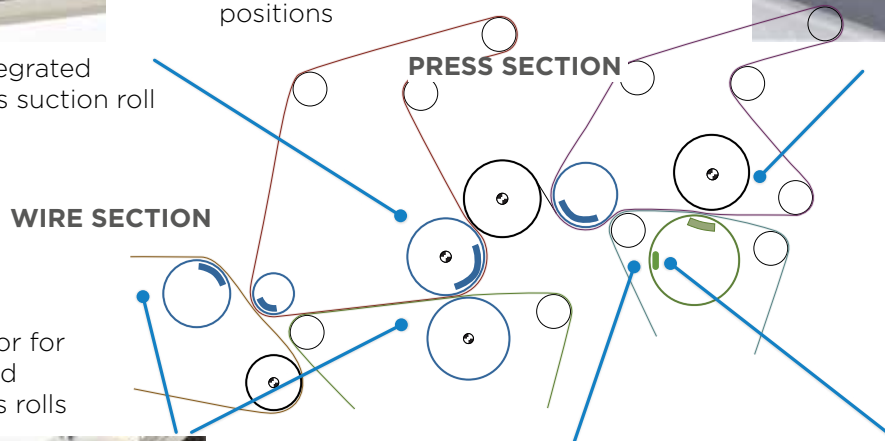
Save-all with integrated doctors for press suction roll



CompoAdapt composite hose loaded blade holder for all doctoring positions



Save-all with integrated doctors and vacuum-assisted water removing system for top press roll

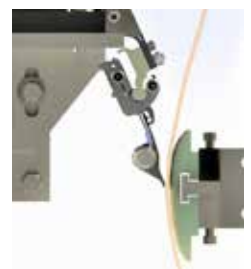


Double doctor for couch roll and bottom press rolls

Inner support for belt roll doctoring



Light and small size CompoDoc composite doctor beam for limited space



## Changing Conditions Call for a Flexible Vacuum System

After digging deeper into the impact on dewatering, we realized that the vacuum system needs to be flexible, as paper machine conditions change all the time. For example, the machine speed can easily vary from 200 to 1,100 m/min depending on changes over time to basis weight, furnish and felt condition. New felt is also different compared to the old felt and this means it is not optimal to have the same amount of vacuum (kPa and/or air flow) in different conditions. Our over 30-year experience in the field has taught us the importance of measuring water removal and controlling vacuum levels.

Traditional vacuum technologies proved unsuitable when the target was to optimize vacuum levels, minimize energy consumption and adapt to changing conditions. New paper machines especially have always presented a major challenge. Machine suppliers tend to play on the safe side and provide highly oversized vacuum specifications. If a machine is delivered with unsuitable vacuum equipment, the end customer has to live with it. Runtech has rebuilt 3- to 4-year-old vacuum systems, resulting in energy savings of over 50% or over 10 GWh/year. Unless you specify the vacuum system for your machine supplier, that provider will often deliver the lowest-cost option in terms of the purchase price without considering the lifecycle costs.



### EcoFlow - online dewatering measurement

A window to the process

- Optimize dewatering
- Optimize vacuum energy consumption
- Maximize felt life
- Monitor and develop felt type
- Minimize the start-up time of a new felt
- Improve the machine runnability
- Reduce the amount of breaks



## The Power of EP Turbo Blowers

Switching to EP Turbo Blowers is a game-changer in energy efficiency. In numerous rebuild projects, energy savings of 40-70% have been achieved when compared to traditional vacuum systems. Energy efficiency, a key feature of the solution, comes from both turbo technology itself, and the ability to measure water removal and adjust the vacuum to the optimal level.

The main components of RunEco vacuum system include EP Turbo Blower, EcoDrop Water Separator and EcoFlow Dewatering Measurement. They are specifically developed to take into account the challenges and demands related to the dewatering and runnability of paper machines. EP Turbo Blowers are designed to operate efficiently across a wide range of vacuum levels and air flows, allowing paper mills to optimize vacuum levels. High speed motors,

driven by frequency converters, allow a typical EP Turbo Blower to provide vacuum levels between 30 and 70 kPa. A wide range of impeller designs allows highly efficient levels across the operating range.

We emphasize the importance of carefully analyzing vacuum connections, levels, and system operation. RunEco vacuum system, comprising several smaller-size turbo blowers depending on the machine width, offers superior design and operational advantages. In tissue machines, depending on design and width, the most efficient operation sometimes requires one or even two turbo blowers. Additionally, Runtech is the sole provider of both dry and liquid ring pump technology, forming a combination of both technologies – a hybrid system that allows us to cater to diverse customer demands, needs, and budgets.

The EP Turbo Blower’s water-free design not only reduces water and chemical consumption within the vacuum system, but also eliminates the need for water-related equipment like cooling towers and circulating pumps. Furthermore, the RunEco system offers several benefits, including impellers fitted on motor shafts without the need for a gearbox, fast

and straightforward maintenance, energy recovery through a heat exchanger on the exhaust line, a compact and lightweight design that is easy to install in rebuild projects, the ability to install it step by step with minimal shutdown time, and an easy back-up connection to ensure operational safety.

## Exhaust Heat Recovery for Cost Reduction

The EP Turbo Blower generates a substantial amount of exhaust heat, ranging from 100°C to 180°C. Recovering this heat enables you to reduce steam consumption in your paper machine. Given that steam production is a costly process in papermaking, by utilizing recovered heat to warm shower waters or dryer hoods, you can achieve substantial cost savings. This approach is not only economically advantageous but also aligns with sustainability goals as it reduces the need for primary energy sources.



## Results with RunEco Vacuum System

“Our previous vacuum system was oversized, inefficient and had reached the end of its life. The new Runtech system has reduced our power consumption by over 700kW and we are pleased with the performance of the machine. The dewatering measurements (EcoFlow) are a great new feature, which will enable us to further optimize the operation. Despite the challenging travel restrictions Runtech were cooperative during the commissioning phase and ensured the project was delivered successfully,” says **Matthew Bain**, Project Manager, **Essity AustralAsia**.

The delivery included a speed controlled EP600 Turbo Blower with ABB frequency converter, low vacuum blower for wire section vacuums, EcoDrop water separator and EcoFlow dewatering measurement for press suction roll save-all and felt uhle box. Their PM3 electricity consumption per tonne of paper has dropped by 20% with the new RunEco vacuum system. An additional benefit is the increased control, such as the feedback on dewatering flow rates from the SPR Save-all Tray and Uhle Box that enable vacuum levels to be optimized and prolonged felt life.

Old system	kW
Fixed speed blower	
Total	1,000

New system	kW
EP Blower	
EP600-T1	
Total	300

**-700 kW - 70%**



**DS Smith** has implemented RunEco technology in six of its mills so far, with two more coming on line still in 2024.

The Kemsley mill replaced an existing vacuum system on its PM6 with four Runtech Turbos, reaching an exceptional 50% energy savings. With three Runtech Turbos on PM3, the savings were even higher – over 65%. Additionally, Production Manager **Stuart Ruck** reported that the new vacuum systems allow them to optimize the felt start ups, shortening the PU felts startup period to eight hours, resulting in extra production.

“Kemsley is a very progressive mill and, as a project team, we are delighted to partner with Runtech on this project that has helped transform the mill’s power usage and carbon emissions and make operational equipment more efficient and reliable,” says **Chris Harding**, Project Engineering Manager, DS Smith.

Site	Year Online	% Energy reduction realized
A	2016	55%
B	2016	50%
C	2021	65%
D	2023	33%
E	2023	36%
F	2023	50%

*Three sites with fully-optimized systems installed 2016-2021, have reduced electricity consumption in paper machine vacuum systems by an average of 57%; sites brought online 2023 already seeing ~40% reduction, will increase further as systems are optimized.*



## Unlocking Your Machine’s Potential

Every paper machine is unique, and vacuum demand varies based on paper grade, felts, and machine speeds. A tailored solution with flexible and variable capacity can help balance supply and demand, leading to optimized dewatering and minimized power consumption. Regular audits and dewatering studies can pinpoint areas for improvement and help you achieve your operational and process goals.

To date, we have sold over 1,000 Turbo Blowers globally. Given the average energy saving of 45%, this translates to energy savings of 2.6 TWh and a reduction of 781,000 tons of CO<sub>2</sub> a year.

We are committed to helping you maximize energy savings, improve efficiency, and reduce your environmental impact. Discover the potential of your machine and join us in the journey towards a more sustainable and cost-effective paper production industry.



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