

Rethinking rotating equipment strategy in pulp and paper

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INTRODUCTION:

Pulp and paper producers operate in an environment defined by structural cost pressure. Energy, fibre and chemical input costs are high and volatile, while environmental compliance obligations continue to expand. At the same time, many organisations are committed to measurable carbon-reduction pathways and resource efficiency targets.

Reliability is no longer a maintenance metric – it is a strategic lever

In that context, reliability is no longer simply an engineering objective. It is a lever for cost control, sustainability performance, and competitive resilience. Rather than viewing bearings, lubrication and condition monitoring as discrete maintenance topics, leading operators are reframing rotating equipment as an integrated performance system.

SKF has served customers in the paper industry for more than 100 years. In that time, our offering has expanded from the supply of high-quality bearings to encompass a comprehensive range of lubrication systems, condition monitoring technologies, tools, training programs, technical support, and innovative lifecycle management approaches.

Operating at mechanical limits

Paper machines are capital-intensive, high-speed systems. Their rotating elements operate under extreme mechanical and environmental stress. At the wet end, moisture, fibre contamination and chemical exposure accelerate lubricant degradation and surface damage. At the dry end, elevated temperatures and rapid thermal cycling introduce fatigue and fracture risks.

Component specification is therefore critical. For example, specialist bearing designs that use case-hardened rather than through-hardened inner rings in high-temperature zones reduce the risk of fracture during rapid reheating cycles. Installation accuracy is equally important: large bearings demand controlled mounting procedures and appropriate tooling to avoid introducing premature failure mechanisms at the outset.



Image 1: (Left) Circular solution centre assembly.

Image 2: (Below) Circular solution centre lift.



Image 3: (Left) Circular solution centre inspect bearing.



Image 4: CoMo solutions.

Lubrication as a performance system

Lubrication problems remain one of the dominant causes of premature bearing damage. Modern mills increasingly rely on automated systems to improve reliability while cutting the time and labour cost devoted to lubrication tasks. Lubrication schemes for a paper plant typically involve a combination of oil lubrication for rollers and certain other critical bearings, and grease lubrication for the rest of the plant.

Automated grease systems meter defined quantities to each lubrication point at programmed intervals. On large machines this may involve hundreds or even thousands of points. Automation prevents over-greasing, limits contamination risk and reduces waste volumes. Self-monitoring capability is equally important. Blockages or supply interruptions can be flagged early, preventing silent failure progression.

Oil systems represent both a technical and environmental challenge. Reservoirs may hold thousands of litres, tying up capital and generating significant waste during periodic oil changes. Advanced oil lubrication systems include several features designed to prolong the longevity and minimize the consumption of lubricating oil. These include air driven desiccant dryers to limit water absorption and automated mechanisms to settle and remove free water from tanks.

Image 5: Infinium bearing.



The SKF Flowline oil supply system uses a centrifugal design that accelerates the settling of water and contaminants. By reducing the time required for contaminants to separate before oil re-enters the lubrication circuit, reservoir size can be reduced by up to 50 percent. This translates directly into lower oil volumes, reduced cost, and lower environmental impact.

SKF RecondOil Double Separation Technology (DST) aims to eliminate the cost and time burden of oil changes altogether. RecondOil systems use a patented combination of chemical and mechanical filtration that removes nanometre-scale particles without damaging oils or their additives.

This approach can extend oil life almost indefinitely, reducing lubricant consumption by 90 to 95 percent and eliminating the need for periodic oil changes. In one recent application at a mid-sized paper mill, implementing RecondOil technology in the wet end lubrication system generated annual cost savings of around £50,000, while reducing associated annual carbon emissions by 20,000 kg.

Condition monitoring: from detection to decision support

Unplanned stoppages remain among the most expensive events in pulp and paper operations. Condition monitoring provides structured early warning through vibration, temperature and lubricant analysis. However, the real differentiator lies not in data collection but in interpretation.

Effective data management and analysis are facilitated through the use of a common platform such as SKF's @ptitude Observer software suite, which can integrate data from mobile, fixed and connected measurement systems, along with offline information such as lubricant analysis results and installation and maintenance records. This enables trend recognition and cross-correlation rather than isolated signal review.

With expert interpretation, monitoring moves beyond fault detection.



Image 6: Fan at UPM Schongau.



Image7: Sealed spherical roller bearing.



Image 9: Observer in REP Center.



Image 8: Open and sealed srb 22320 e and BS2-2220-2RS.

It can inform lubrication adjustments, reveal installation errors, highlight shaft geometry issues, or signal the need for design modification. Increasingly, predictive analytics and machine learning enhance this capability, identifying subtle patterns that precede visible failure. The objective is not simply to avoid breakdown — it is to optimise intervention timing and eliminate unnecessary maintenance.

Remanufacturing and embedded carbon

Large bearings in paper machines are typically replaced on multi-year cycles. Traditional replacement embeds fresh material and manufacturing carbon into every shutdown event.

Remanufacturing offers an alternative. Bearings are returned to their manufacturer, inspected, refurbished and upgraded to original equipment standards, delivering performance equivalent to new components. With appropriate replacement timing, a single bearing can undergo multiple remanufacturing cycles.

From a sustainability perspective, approximately 80 percent of embodied carbon can be retained through each remanufacturing cycle. Economically, remanufacturing also reduces direct expenditure and shortens supply chains.

Image 10: SSAB Finland RecondOil.

Integration as competitive advantage

Historically, lubrication, condition monitoring and remanufacturing strategies were implemented independently. Today, competitive mills are integrating them.

Condition data informs lubrication optimisation. Monitoring trends define optimal removal points for remanufacturing. Design improvements are fed back into component specification. The result is a closed-loop reliability model rather than a sequence of isolated upgrades. As datasets grow, predictive capability strengthens. AI-supported analysis will increasingly enable earlier intervention, lower lubricant consumption, reduced waste, and higher machine availability.

For pulp and paper producers seeking durable advantage, rotating equipment performance is no longer about keeping machines running. It is about engineering reliability, environmental efficiency and capital discipline into the core of operations.

