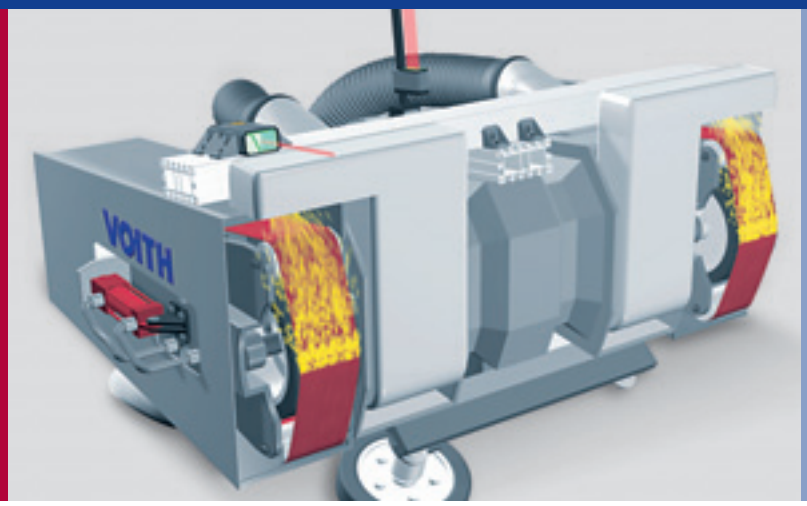
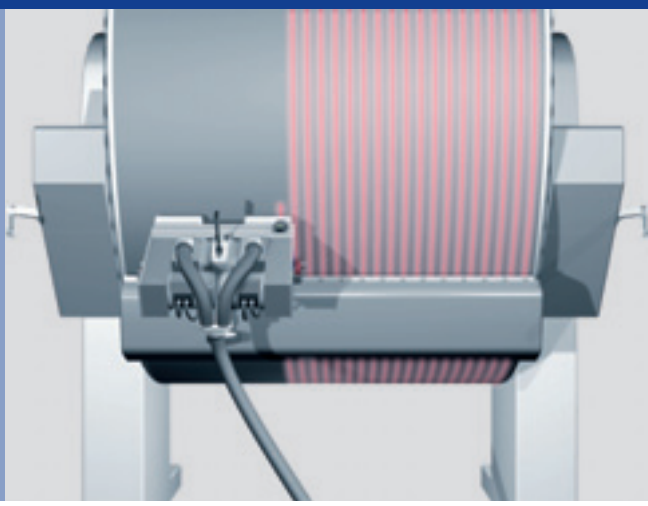
Profile Maintenance Program utilizing Virtual Reference Grinding (VRG)

The recent development by Voith Paper's Tissue Cylinder Services group of its Virtual Reference Grinding (VRG) technology has truly revolutionized the way Yankee and MG cylinders are ground. By combining scanning lasers with computerized control of grinding forces, the VRG has set a new standard for speed and accuracy in the grinding of crowned or profiled cylinders in the field.



VRG system.



Helix surface measurement.

This technology has led to a re-examination of the practices concerning the planning of Yankee profile grinding. The new paradigm is the Profile Maintenance Program (PMP). PMP takes advantage of other planned maintenance outages to complete a profile maintenance grind in 24-32 hours. By adopting this program tissue companies are embracing the philosophy of preventive maintenance. This as opposed to the run to "failure" practice currently used by many in the industry with regard to the condition of their most important assets.

The Yankee dryer is the heart of conventional tissue machine. Its crown or profile is critical in establishing the proper geometry between the pressure/dewatering rolls and the Yankee when it is under a full condensing load. The Yankee profile degrades over time due to the cumulative effect of process upsets. Yankees have been typically ground on a cycle that has been established with experience over time. Normally this cycle was based on the amount of time the machine could run before problems with moisture control, edge breaks and picking made a significant impact upon the machines efficiency. The focus was on extending the runtime as long as possible to avoid the 2-3 days downtime required to complete a full profile grind. A typical grind removes, on average, 0.030" from the radius of the cylinder. Often mills over estimate the amount of run time required to get to the point of significant machine impact caused by poor conditions of the Yankee's profile. This can result in weeks or even months of reduced paper machine efficiency and off quality production.

With the development of the VRG, crown profiles can ground by a system that mounts directly on an existing doctor blade holder. This doctor mounting eliminates the need to remove pressure rolls and other heavy paper machine components. This compares to the efforts required to prepare a machine for the previous Tangential Grinder (TG) technology which utilized a heavy platform bed that weighted 14,000 lbs!

A typical mill can save 12-24 hours of pre and post grind machine preparation work when using the VRG for a typical grind. Another advantage of the VRG is the unparalleled level of documentation included in the grind package.

The VRG system gives complete topographical scans of the drying cylinder before, during and following the grind. This allows the mill to evaluate the condition of the cylinder before the grind to determine any unusual wear conditions which might indicate a problem with the condensate removal system or the coating sprays etc.

Experience has shown that the wear rate overtime for the Yankee surface is not linear. As the miss-crown condition increases between pressure rolls and the Yankee and as operators make doctor blade adjustments to cope with low/high moisture areas, the wear rate accelerates.

Yankee Wear Rate.

	Number of grinds	Downtime hours per grind	Total downtime for profile grind	Material removal /grind	Total removed	$ per grind	Total $
Current 24 month cycle	3	60	180	0.030“	0.090“	$ 50,000	$ 150,000
New 18 month cycle	4	30	120	0.015“	0.060“	$ 57,500	$ 230,000
Hours saved		60					
Increased grind cost							**$ 80,000**
Machine time ($/hour)							$ 5,000
Based metal savings					**0.030“**		
Total downtime savings						**$ 300,000**	
Efficiency savings in last 90 days before grind $ 2,400 (per day) x 90 (days) = 216,000 x 3 (regrinds) = $ 648,000							**$ 648,000**
Total 6 year savings							**$ 868,000**

Profile Maintenance Program savings. Time frame 6 years, 72 months.

As shown in the graph, the wear rate accelerates as the radial loss passes the .012'' point in the low areas. During the final 6 months of operation prior to grinding, the tissue machine usually experiences an increase in breaks and quality issues that are gradual but very persistent. Efficiency losses during this period which can have significant economic impact on the mills results. Due to the gradual nature of this degradation it may go unnoticed until the operation of the machine is effected to the point the mill can not longer put off the need to grind.

Many mills experience an increase in the amount of organic coating required to keep their machine running well during the final phase of the extended grind cycle. The additional cost of this chemistry can run several thousand of dollar per day when compared to usage rates just following the grind.

By adopting a Profile Maintenance Program (PMP) the mill can avoid reaching the accelerated portion of their machines wear curve. In the example from the graph, a grind is indicated at or before 18-19 months versus the previous practice of 24 months. The actual wear curve varies for each machine. But a rule of thumb is that a grind is most likely indicated at the 2/3 point of the historical grind cycle for each machine.

The table gives an example of the potential savings from adopting PMP practices. More frequent grinds of a shorter duration result in significantly reduced downtime over the sample period. A net savings of $ 868,000 in downtime (minus additional grind costs) was found in this example. Efficiency losses were valued at $ 2,400 per day for the final 90 days of the tradition grind cycle (including breaks, chemical usage, machine speed, quality issues).

These saving figures do not attempt to put a value on the savings of one additional grind worth of material base stock left on the Yankee by adopting a PMP. This reduction in base metal loss can considerable extend the useful life of the Yankee.

In summary, by adopting Voith's Profile Maintenance Program philosophy for your conventional Yankee dryer you can substantially reduce downtime associated with profile grinding, avoid efficiency/quality losses associated with miss-crowning, and extend the lifetime of this critical assets. At the same time you will receive all the benefits of the VRG's accuracy, advanced mapping and documentation capabilities.

Contact

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