On-machine maintenance

William B. Kennedy

Rubber-covered (including polyurethane) press rolls are required to run under a wide variety of operating parameters. A combination of high loads, high speeds, and high temperatures, together with a hostile chemical environment, result in some very demanding operating conditions which need to be met.

Roll cover cracking, corrugating, ridging, and unusual wear are known to affect the cost of maintenance because of the need to shut down for regrindings and recrownings.

To understand what happens to cause these problems, a knowledge of some of the physical properties and behavior of roll covering materials, as well as mechanical conditions, is required.

Rubber is a noncompressible material. When it is subjected to pressure, it is displaced and forced to assume a different shape. As the rubber cover passes through a press nip, it must yield and distort to satisfy the mechanical conditions imposed and then quickly return to its original shape to be ready for yet another trip through the nip.

Although rubber has high resilience and recovers rapidly, it is not completely elastic. Mechanically induced deformation can be so great that permanent deformation may take place. If the pressure applied is evenly distributed across the face of the rubber-covered roll, the ability of the cover to withstand that load is increased.

Crown-load balance

To establish a uniform pressure across the face of the roll, the cover must be crowned for the operating load. The amount of crown required is directly related to the applied load. A change in one requires an adjustment in the other to avoid creating nonuniform pressure across the face. The amount of crown is determined by the deflection of the roll body at a given load.

Matching the crown to the load is called "proper crown-load balance." It is when this balance is not kept consistent that nonuniform pressure (stress) is created. The roll cover then exhibits another of its physical properties, called "plastic flow" or "creep." This results in the rubber area under the greatest stress trying to move toward the area of lesser stress. This can create visible circumferential ridges and, if severe enough, a buildup of rubber near the edges of the roll. Proper load—that is, crown balance—can be checked by taking nip impressions and then making the necessary adjustments in the load or crown as indicated.

As this condition develops with time, the load distribution also changes until a condition of high and low pressure exists side by side. The localized stress can become greater than the rubber can bear. As a result, cracking, shearing, and, ultimately, complete failure will result.

Corrugations are ridges on the cover surface formed because stress conditions exceed the ability of the cover to resist permanent deformation. Unusual conditions of wear and distress on the cover are produced by mechanical conditions and are rarely caused by the cover itself. Investigation of these unusual conditions when first observed often leads to mechanical adjustments that could save the cover from further damage and premature replacement.

Early detection of these problems is best accomplished by routine visual inspection of each roll whenever the machine is down. It takes very little time and may save future unscheduled downtime. The inspection should note the general condition of each roll, especially of those with unusual conditions. Signs of distress, such as cracking or checking, should be sufficient reason to ready the spare and schedule a roll change.

It has been clearly established in many mills that with regular inspection and scheduled maintenance, including regrinding, the life span of "nipped loaded" rolls can be increased, thus reducing operating costs. This is particularly true for critical applications such as size press, Yankee pressure, and breaker stack installations.

With routine maintenance on a rigid schedule of regrinding rubber-covered rolls, the time and money saved is well worth the effort. Maintenance time is actually reduced, and less rubber loss results. Spares should always be ready and available in case of accidents, and all rolls should be maintained in good condition.

Importance of good recordkeeping

Good recordkeeping is the best way to identify the need for corrective action. Chronic troubles become evident with accurate records. Records should be relevant, concise, and accurate. **Figure 1** shows a roll covering service record form used by Stowe Woodward to track maintenance on roll covers.

The form requests such basic information as roll position, type of roll, roll number, serial number, face length, core diameter, finished diameter, cover material and hardness, cover thickness, roll weight, crown, drawing number, and bearings. This information describes completely the roll as

Kennedy is Comput A Cover manager with Stowe Woodward Co. Ltd., Southborough Technology Park, 333 Turnpike Rd., Southborough, MA 01772.

1. Roll service record

Roll Service Record

Position: _____ Type of Roll _____ Roll No. _____ Ser. No. _____

Length of Face _____ Diameter of Core _____ Finished Diameter _____

Cover Material and Hardness _____ Thickness of Cover _____

Weight of Roll _____ Crown _____ Drawing No. _____ Bearings _____

Installed	Taken Out	No. Days Service	Date Reground	Crown	Hardness Reading	Finish O.D.	Covered by	Remarks

it should be when originally installed. The chronological order of the roll history should be documented with each installation and removal. Space is provided for recording the date installed, the date removed, days in service, date reground, crown (in and out), Pusey and Jones hardness reading (in and out), finished outside diameter, covered by, and remarks.

The section for remarks should include any observed problems of surface appearance and general condition of the roll. By being thorough in describing how well the roll performed, any indication of a problem should be relatively easy to identify. Action should be initiated to correct whatever problems may be evident.

These recommendations, if followed, will make it possible to get the most out of your roll coverings and take much of the mystery out of it as well. □