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Press roll cover application guidelines

Scope

Faster paper machine speeds and higher press loads have placed increased demand on press roll covers. These changes have resulted in development of new cover compositions and venting patterns to provide reliable operation on modern machines. The information that follows has been compiled with an objective of providing general guidelines for press roll cover application. Specific cover application for each position requires information on machine speeds, press loads, felt designs, web temperature, steam shower application, roll diameters, and other variables. This information must be developed by working with roll cover manufacturers. Guidelines for press roll applications follow. Parameters discussed include: (1) cover thickness, hardness and venting of various grades; (2) crowning; (3) cover release characteristics; (4) grinding frequency; (5) water cooling considerations; (6) polyurethane covers; (7) ceramic covers; and (8) use of steam showers.

Definitions

P&J hardness—P&J plastometer measures the amount of indentation that a 3.2 mm (1/8") diameter ball makes in the cover one minute after a 1 kg (2.2 lb) weight has been applied. Bone hard covers would have a reading of zero, and the softest cover would have a reading of 300 P&J.

Safety precautions

While this technical information paper is concerned with application of roll covers to the press sections, physical measurements may be taken on the paper machine. Before measuring crowns and hardnesses, the press section drive should be locked out to prevent movement.

Cover application guidelines

Roll cover application guidelines for plain, suction, grooved, and blind-drilled rolls are listed in Tables 1–4. The guidelines are necessarily general and are representative of covers currently used on the grades listed. For example:

- Some mills run outside the cover hardness ranges shown. Special circumstances can require different cover hardnesses for optimum results.
- Cover release requirements vary with furnish characteristics, press configuration, doctor applications, and other factors.
- The most common grooving and drilling patterns are listed. Other parameters are used by some mills.
- Length of time between cover grinds varies widely. Objective standards for roll change frequency should be developed for each position on each machine.

Crowning

Crown is the difference in diameter between the center of the roll covering and reference points at or near the ends of the face. Crowns are put in rolls to compensate for deflection of the roll body under nip load conditions. Hardness of the roll cover has no impact on the cover crown. However, crown is much more critical on harder rolls and must be very precise in the range of 0-10 P&J. Cover crown is dependent on nip line load. Roll crowning must be changed when pli loading changes. Roll crown changes may be necessary when oil pressure is changed in variable crown rolls. Machinery builders and cover manufacturers have computer programs to help determine the proper crown. However, some trial and error is required, including taking nip impressions when the roll is put in service. Additional information on taking nip impressions is provided in TAPPI TIP 0404-05 "Techniques for Nip Impressions." Improper crowning causes uneven pressure profiles. Overcrowning typically results in higher loads at the center than at the ends. Undercrowning causes increased loads at the ends and lower center loading. All covers except size press, coating, or related applications should be dubbed to lower diameter outside the sheet width to relieve excessive end pressure. Additional information on press roll crowning is provided in TAPPI TIP 0420-06 "Roll Crown Specifications and Definitions."

Cover release characteristics

Roll cover release can be changed by roll cover suppliers by modifying the basic compound used, cover porosity, and finish grind. Cover porosity affects water-carrying capability of the surface. Porosity is normally changed by addition of various fillers to the elastomer. A rougher finish will generally release the sheet more easily than a smooth finish. However, smooth finishes may be required if the cover is doctored or special sheet characteristics are required.

Roll cover requirements on single-felted presses include satisfactory water removal, easy startups, no picking or sticking, and minimal need for maintenance. All furnish components and felt cleaning materials that could contact the cover must be considered. Other variables such as stock temperature, sheet basis weight, and machine speed must also be considered. Since there are so many variables, no one type of covering will provide satisfactory performance on all grades of paper and types of machines. Covers for double-felted presses do not require special release characteristics since the sheet does not directly contact the press rolls.

Release covers generally fall within the rubber, polyurethane, composite, granite, and ceramic groups. Each cover type has different surface finishing, doctoring, and maintenance requirements.

Roll grinding frequency

Proper roll cover grinding frequency is a complex problem. Factors that must be considered include cover hardness, press load, cover material or compound properties, speed (rpm), and venting pattern. Cover wear rate is also influenced by chemical attack, condition of the mating roll, inside face of wet felts, and roll size and speed differentials. Alignment and vibrations must also be considered. Some guidelines follow:

- Hard roll covers generally run longer than softer rolls.
- Highly loaded rolls require more frequent grinding than lightly loaded rolls.
- Rolls operated at high speeds must be changed more often than slower rolls.
- Comparisons of in and out crown profiles provide a good indication of appropriate roll change frequency.
- Nip impressions and fabric moisture and caliper profiles can assist in determining grinding frequency.
- Grinding interval should not exceed one year for most roll covers. Some ceramic covers are an exception.
- Abrasive fillers in the paper web increase roll cover wear and frequency of grinding.
- Roll covers should be checked for surface cracks and blemishes every time the paper machine is shutdown.
- Suction roll covers should be ground when hole cupping is observed.

Many mills do not grind roll covers often enough. A common assumption is that too much grinding shortens life of a roll cover. Regular and proper grinding procedures lengthen roll cover life and assure trouble-free service. A light grind will remove the oxidized surface and renew the crown if there are no cracks or blemishes on the roll surface. A hardness check with a plastometer will indicate if the grind is sufficient. The hardness after grinding should be very close to original hardness. Cracks and surface blemishes must be completely removed regardless of