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Press section optimization

Scope

Good press section performance is essential to efficient paper machine operation. The objective of this technical publication is to provide guidelines for improving paper machine press section operation based on references and industry experience. Many good reference articles provide guidelines for improving press section performance and the Water Removal Committee has developed several Technical Information Papers that deal with monitoring and evaluating press section performance.

Safety precautions

All applicable safety procedures for working around the wet end of a paper machine must be followed. These include the standard safety precautions for working around moving equipment as well as specific safety regulations required by the mill where the work is performed.

Optimization approach

1. **Document current performance**-The first step in improving press section operation is to determine and document current performance. Factors that have a significant effect on press section performance should be noted and recorded. These factors include:

a. Review current press design specifications and drawings. Be sure that information is current and includes changes since original installation.

b. Note any press section operating problems:

- 1) Dewatering: Streaks, nip rejection, water spray, draws
- 2) Hardware: Roll surfaces, doctor condition/buildup, guide paddle/roll operation, suction box cover wear, shower oscillator performance
- 3) Sheet appearance: Marking, wrinkles, crushing,
- 4) Fabric appearance: Wear, compaction, filling, damage, distortion, rippling
- 5) Misc.: Threading, vibration, edge flipping, drop-offs, breaks, stealing, blowing

c. Determine sheet consistency after forming section and after any press nip where samples can be safely obtained (1). (Note that sheet sealing or layering in the forming section will affect water removal direction and amount in the press section. Furnish changes that affect water retention value will also affect press performance.) Fabric suppliers and others may be able to measure web consistency with portable instrumentation depending on press configuration. Fabric suppliers can also develop water balances around the nips. Numbers generated with portable sensors may not provide absolute values but can be used for comparison purposes from a particular supplier. It may also be possible to calculate press exit solids based on dryer section steam consumption and/or a hood air system balance. Sheet consistency data is meaningful when tied to sheet grade, weight, furnish, speed, load, etc.

d. Available press section operating parameters including press loads; variable crown roll settings; vacuum levels on suction rolls and boxes; steam consumption on press steam showers; steam shower temperature

and pressure, suction box, saveall pan water flows, and weir water flows; etc., should be noted. If this information is not recorded routinely or available in a distributed control system, a recording program should be implemented.

e. For each roll position, note information on press roll cover types, cover material and hardness, size of holes or grooves, normal time between roll changes, in and out roll crowns, roll grinding specifications (crown curve, dubbing, Ra, covered roll diameter, etc.), etc. Use an inclinometer or photograph to record the position of the suction box and end seals for each suction roll that can be used in a given position. Record deckle position on each roll and angle of incidence to each roll. Check nip impressions and determine nip width and peak pressure. Check crown curves when rolls are removed to determine if cover wear is uniform. Some press roll covers have internal pressure sensors that generate nip pressure curves. Check surface for cracking, scratches, debris, unusual wear, hole cupping, plugging, and groove closure. How frequently are suction rolls flushed? Several press fabric and roll cover suppliers have press nip models to help verify nip conditions. Several techniques to do nip impressions are available.

f. Note information on press fabric suppliers, design, weight per unit area of batt and base, batt denier, average life, reasons for removal, and used fabric analysis if available.

g. Review cross-machine profiles of fabric moisture, caliper, and water permeability. Identify the optimal range for fabric moisture content entering press nips.

h. Check vacuum sources to document current performance. Liquid ring pumps can be tested or inspected with a boroscope or orifice plates to estimate current performance. Seal water temperature, volume, and water quality should be checked regularly.

i. Note suction box cover types and open area. Calculate dwell time and determine unit air flow. Check that lubrication showers provide complete coverage and that point of impingement is correct.

j. Note fabric cleaning showers, operating pressures, water temperature, use of chemicals, type of doctor blades used, etc. All cleaning showers (roll, doctor, and fabric) should be checked. For high-pressure showers check angle versus fabric-run geometry, distance from fabric, nozzle spacing, length and frequency of oscillating stroke, nozzle diameter, nozzle condition, tendency to plug, and surface condition. Chemical showers should be checked for complete coverage with sufficient overlap. Shower water temperature should be at or above process temperature but not higher than 150°F. If fabric cleaning is not adequate, investigate alternative fabric cleaning technologies. Refer to TIP0404-61, Paper Machine Shower Recommendations for additional press showering guidelines.

k. Check gauges on suction boxes and showers to make sure they are accurate. Replace all of these gauges when a suction roll is rebuilt or changed. Do not reinstall old gauges on a new suction roll.

l. Review paper machine operating records for a period of at least six months. Parameters that should be reviewed include operating speeds on major grades, web breaks in the press and dryer sections that may be related to press section operation, press section water removal, average steam pressures on major grades, steam consumption per ton of paper on major grades, press section draws, and furnish changes.

m. Review paper quality parameters that can be affected by press section operation such as sheet caliper, paper two-sidedness, printability, strength tests, etc. Some fabric companies have image analysis equipment and other diagnostic techniques that can relate paper surface irregularities to particular fabric constructions.

n. Check fabrics for trade line distortion, guiding, oscillation, tracking, edge wear, edge raveling, stretching, width changes, and batt loss. (Note that some trade lines are purposely distorted for vibration concerns.)

o. If press rolls are internally water cooled, inlet and outlet water temperature should be checked and recorded.

2. Implement use of a detailed log book. Routine use of a log book should be implemented to document all changes that could have an effect on press section performance. Detailed records are necessary to confirm the effectiveness of any change. Some mills have shown correlation between apparently unrelated changes.

For machines with a distributed control system (DCS) and/or data historian, press section monitoring and trending pages can be established to help display and track many of the parameters discussed in item 1. Note however that many parameters critical to press section operation cannot be monitored on-line.

3. Press section operation review. The information collected in item 1 above should be compared with industry standards to identify areas of greatest opportunity (2). All parameters that relate to press section operation should be reviewed in detail. Some factors may not have been changed for many years and may not reflect current industry best practices. No important parameters should be overlooked or taken for granted. Press section performance should be discussed with representatives from paper machine equipment suppliers, clothing suppliers, chemical suppliers, roll cover suppliers, and others who can provide assistance. The primary goal should be to improve press section performance without large capital expenditures. However, the press section evaluation may identify significant limitations which may require capital expenditure to improve performance.