TIP 0404-29

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Porosity measurement of press felts on the paper machine (HSPT)

Scope

This Technical Information Paper[1] describes a test procedure for the measurement of relative airflow through a felt running on the paper machine.

Correlation between Huyck-Smyth Porosity Tester (HSPT) readings and void volume (*1*) and between HSPT readings and water removal (*2,3*) have been reported. This tester has been used by numerous mills to monitor changes in felt porosity throughout its life.

Safety precautions

Standard mill safety procedures and personal protection equipment should be properly utilized when taking measurements with the HSPT. Special care should be given to handing air line in the press section around moving components.

Content

Summary

The porosity tester is essentially a miniature suction box used under standardized conditions for indicating the relative porosity of running felts. This property is measured by the vacuum developed in the tester head as a result of pressure drop through the felt.

There are other state of the art instruments which are used to measure the performance capability of wet felts. One such device is the Feltperm. This instrument uses water permeability, and pressure differential through the felt to measure the resistance to water flow into the felt. Both porosity and permeability measurements are a function of felt design, degree of filling, level of compaction, and felt density. The operation of the Felt Perm unit, and a more detailed discussion of water permeability in wet felts can be found in TAPPI TIP 0404-43. Both the felt's air porosity and water permeability characteristics can be used during monitoring to indicate the felt's ability to absorb, carry, and release water. The HSPT may not detect small areas that are plugged or narrow bands of wet streaks in the machine direction, which may be detected by the feltperm. However, it does provide an economical means of measuring general cross direction porosity profiles. Both instruments are useful tools in assisting the papermaker with monitoring felt filling,

[1]This TIP was previously issued as T 680 su-71 under the same title.

Predicting time to batch wash and end of felt life

Where felt fill-up is the determining factor in felt removal, H-S number vs. days life curve may be used to predict the end of felt life once the critical H-S number for the position and felt design has been established (Fig. 8).The critical H-S number is defined as that at which crushing, marking, or other adverse conditions associated with lack of felt porosity occurs. Experience has shown that after initial major changes have taken place in felt openness, further changes often become linear with time. When the curve begins to straighten at about half-life, it can be extrapolated to the critical H-S number for that position and an end-of-life prediction made. This allows the papermaker to schedule felt changes in coincidence with wire changes or other mechanical shutdowns and also to assist him in efficient scheduling of critical grades.

Based on previous felt performance, a sub critical H-S number can be based on some percent below the critical H-S number. The desired percent in reduction could vary depending on the felt and the stage in the felt life. For example, if the critical H-S number is 90% at the end of a typical 23-day felt life and 70% at 12 days into the felt life, target to batch when HSPT number reaches 20% below midpoint target (70 - 20 = 50%) or 60% closed and target to batch again when HSPT number reaches 10% below endpoint target (90 - 10 = 80%) or 80%.

This allows the papermaker to apply preventative maintenance and control felt contamination and filling. The final result will provide improved performance during the economical felt life and/or extend the felt's useful life.

Comparing two or more felts

The comparison of one felt design with another is one of the more valuable uses of the porosity tester. By observing H-S number vs. days of life for two or more felts run on the same position, comparisons can be made easily in terms of rate of porosity change. See Fig. 9. Woven felt (A) vs. needled felt (B).

Irregularities

1. *Crown vs. load.* Curve A of Fig. 10 is an extreme case of a press position which is running with a roll that is over crowned.
2. *Localized fill up.* Profiles similar to Curve B of Fig. 10 are frequently found on the press positions when a localized fill up condition exists. It is generally attributable to a machine condition such as plugged shoe-type felt conditioner, poor seal strips or declasse on the suction roll vacuum box, plugged holes in that area of the suction roll, or increased press loading or increased water removal necessitated by a wet sheet in that position. Frequent profiling of the felt throughout its life permits early identification of plugging problems and enables the papermaker to make corrective action before the problem becomes serious. Figure 11 compares the porosity changes of a given felt at four different stages of the felt life (new, 5 days, 12 days, and 19 days). It can be noted that at day 12 and 19 a significant increase in porosity numbers are shown on the back section of the felt as measured in the machine cross direction.
3. *Wear streaks or areas.* Figure 12 shows the progressive wearing of the center of a felt throughout life. Low HSPT number in the center indicates excessive wear as the felt ages. If a machine condition is causing this wear, the same general profile will be repeated in future felt runs.

Keywords

Porosity, Press felts, Wet felts, Felts

Additional information

Effective date of issue: November 29, 2004.
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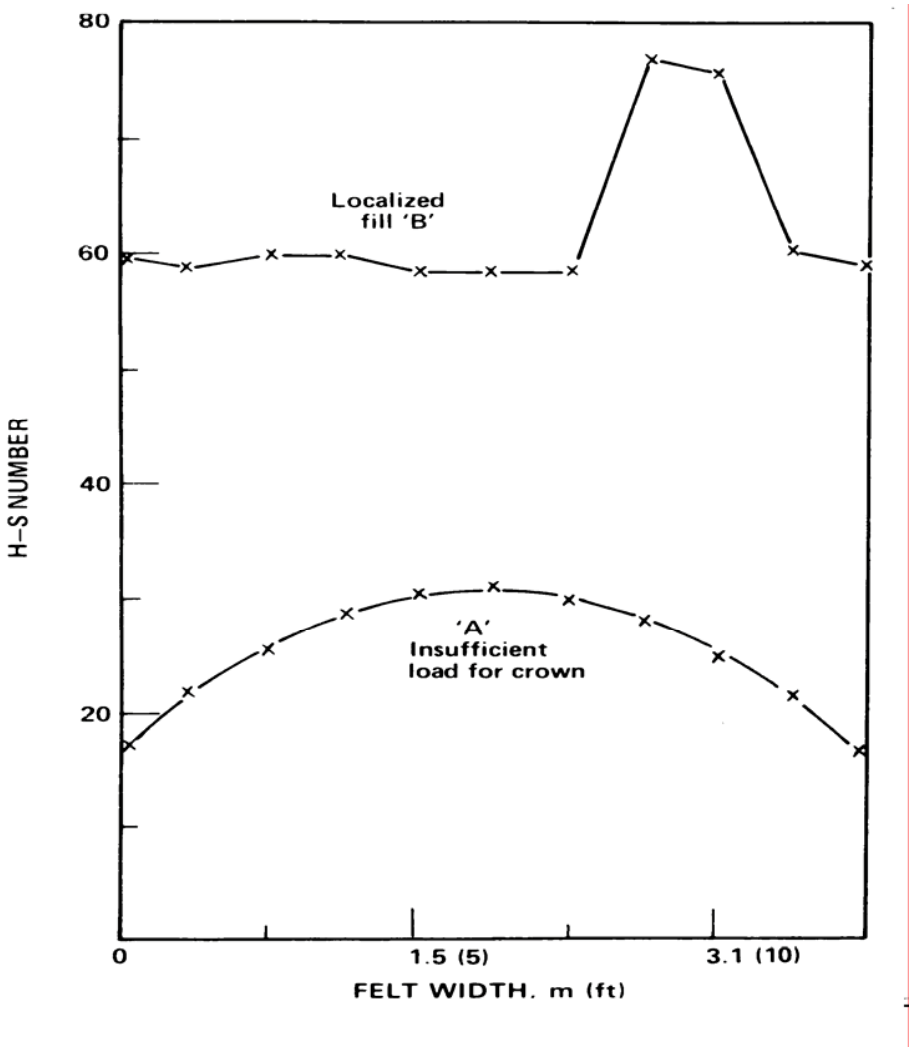

Fig. 10. Typical felt profiles; H-S Number x Felt Width, m (ft).