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Dandy roll applications

Scope

This Technical Information Paper provides application guidelines for plainwove dandy rolls, which are used for formation improvements.

Safety precautions

Use caution when working near the in-going side of the dandy roll nip. Use appropriate mill roll handling procedures when the dandy roll is installed or changed.

Dandy roll mechanism

A dandy roll is an open structure roll with a coarse metallic wire backing cloth and a finer mesh surface fabric. Dandy rolls are positioned above the forming fabric on some fourdrinier paper machines in the area where sheet consistency is 2-5%. The dandy roll is driven at the same or slightly greater speed than the fourdrinier forming fabric to redisperse the fibers in the web and improve sheet formation and sheet top side smoothness.

Proper application of dandy rolls can improve key sheet properties including formation and z-direction filler distribution. Manson discussed the mechanism of operation of the dandy roll (1,2):

- At the in-going side, there is a compression of the sheet between dandy and wire, creating a pressure pulse. Water is driven both up through the sheet and down through the wire. The relative movement of water and fiber creates a shear force, which redistributes the fibers in the upper layers of the sheet, since much of the water flow is upward due to a moisture gradient through the sheet prior to the dandy roll. Shear forces also redistribute fines into the depleted wire side (3).
- Past mid-nip, dandy and wire are separated creating a small vacuum pulse, pulling some water out of the dandy creating the spray that is seen at the exiting nip of the dandy (1).
- The rate at which the pressure pulse develops and the magnitude of the pulse are a function of dandy roll diameter, machine speed, and wire tension.
- Larger diameter dandy rolls develop pressure more gradually so the pressure pulse is gentler. The same is true of the vacuum development at the exit side of the dandy /wire nip. Gradual development of pressure and vacuum at the entrance and exit nip are important to minimize sheet formation disruption.

Dandy roll applications

Proper dandy roll application includes the following:

- a. Diameter-** Generally, dandy roll diameter is selected based on machine speed in combination with the criterion of maximum dandy roll speed of 150-160 rpm (4, 5). (See speed discussion below.) The larger the roll, the wider the nip at a given depth into the sheet; and the smaller the angle of the roll surface leaving the wet web, reducing the chance of fiber being pulled away from the sheet surface (3).

- b. **Position-** The open area under the dandy roll should be equivalent to the diameter of the dandy, to provide a natural cushion for the roll and permit running the sheet wetter without crushing (4,5). See Figure 1.
- c. **Orientation-** The dandy roll should be placed so that one-third of the open area is upstream of the dandy roll centerline, to minimize water throwing (4). See Figure 1.
- d. **Speed-** Generally, dandy roll revolutions per minute should be less than 150-160 rpm, with speed 0.5 to 2% faster than the wire for optimum formation and minimum picking and throwing (2,4,5,6). On some machines formation and surface characteristics are improved by overspeeding the dandy roll up to 3-4%, but at higher overspeed levels the stresses in the dandy roll cover can reduce life of the seam (5). Also, if dandy roll speed is too high (diameter is too low), water drop trajectory downstream is larger, causing drops to land on the dry sheet creating water spot problems (1).
- e. **Drive-** A precision variable speed AC or DC drive linked to the dandy roll through a timing belt or direct drive to insure positive drive is recommended (2,5). Recommended horsepower requirements are based on roll diameter and machine width (5).
- f. **Height** (depth into wire) - Height of the dandy roll should be adjusted to the wet line. The dandy roll should depress the plane of the fabric 3.2-19.1 mm (0.124 to 0.75 in.) (3-5). Dandy roll height can be tuned by setting the roll 6.4 mm (0.25 in.) into the wire and making 3.2 mm (0.125 in.) adjustments until optimum results are obtained. Radius of curvature of the wire around the dandy is determined by dandy radius, length of free wire, and wire tension. Wire tension and degree of loading on the dandy determine how much of the dandy is wrapped; when the tension is high, wrap is smaller. When tension is low, the dandy can settle into the wire more deeply, and wrap is greater. Greater wrap provides larger shear zone to redistribute the fibers.

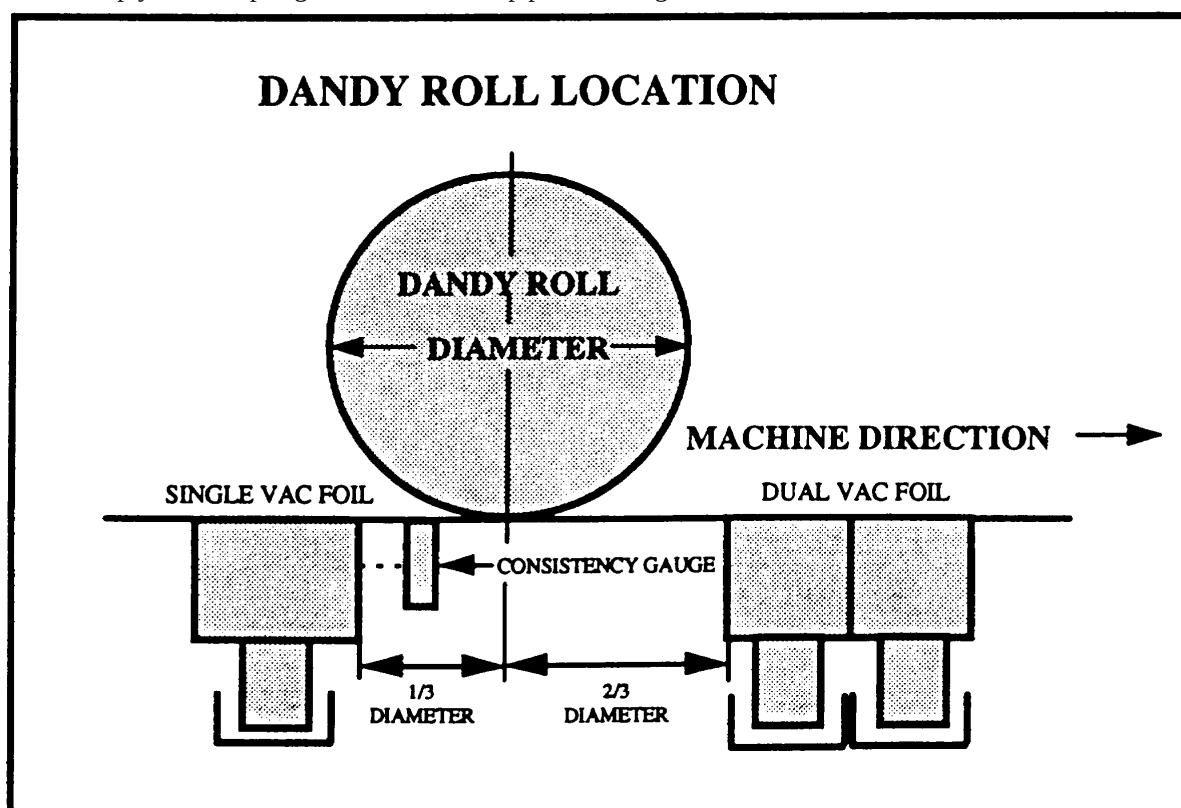


Fig. 1. Dandy roll location (5).