

Factors to consider in hydraulic spray systems

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Many techniques have been tried over the years to apply coating and release to the Yankee dryer surface. Spray methods have gained favor and, thus far, the most successful spray techniques have been hydraulic spray systems. Hydraulic systems allow good particle droplet size and velocity to reach the Yankee surface and form a good spray pattern.

A number of factors should be considered when designing a proper system. First, the water volume must be minimized so that the impact on energy is minimized. A typical flow rate should be approximately 0.1 gal/min (0.3785 L/min) per nozzle. An overlapping spray pattern must be developed so a uniform coating on the Yankee is achieved: "What you spray is what you get." A triple overlapping spray system does a very good job of providing uniform coverage without overusing water.

Hot water (150°F or 65.5°C) should be used to reduce the impact on drying energy, to help promote the coating reaction, and to minimize any biological growth in the spray shower. For every 10°C you are able to raise the temperature of the sprayboom, the coating reaction rate will double. This will be especially important on a machine that has a great deal of variation in the moisture profile, or on a wet crepe towel machine. Your coating supplier should be consulted as to the temperature tolerances of the coating and release package in use.

The distance of the spray from the Yankee surface should be great enough to take advantage of the full width of the spray pattern but close enough so that excessive pressure is not required to drive the spray to the surface. Typically, a distance of 8–10 in. (20.3–25.4 cm) from the nozzle tip to the Yankee is satisfactory.

The water pressure required will depend somewhat on the speed and configuration of the machine. A good operating range is between 40–70 psi. A check on the impact angle of the spray will determine the proper spray pattern. Excessive pressure will reduce the spray angle, while too little pressure will result in a poor pattern and the possibility of felt contamination.

The feed equipment is as important to success as the design of the spray shower. The system should be simple to use, easy to adjust, and reliable. In our experience, the use of make-down equipment generates excessive cost and does not allow the operator to make the rapid changes required. In a make-down system, coating chemicals are made down to a certain concentration. To effect a change, the concentration in the tank must be brought to a new equilibrium before the change will be seen on the machine. In addition, the make-down equipment is often subject to improper cleaning, which will result in contamination. Dried-out polymer and airborne dust from the papermaking process will cause deposits in the make-down tanks. These deposits often will break free and get lodged in the sprayboom and foul the spray nozzles.

The two most successful addition methods have been introducing the coating and release chemicals directly into the water stream or into a small recirculation tank that feeds the spray headers. Both systems have been found to be reliable; however, if a recirculation system is used, the recirculation tank should be as small as possible to facilitate rapid turnover. The tank should be 15 gal (56.8 L) or less.

The last consideration should be good filtration of both water and the stream going to the coating spray header. The proper-sized filter can help reduce the number of nozzle changes that are required. Generally, 10-micron filters on the water and 100 mesh/in. are recommended.

Providing the chemical solutions to today's papermaking challenges requires a thorough examination of your coating requirements based on your production and the proper mechanical application system to make it work. Evaluation of the factors we've cited should yield true production efficiencies and improved product. ■

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