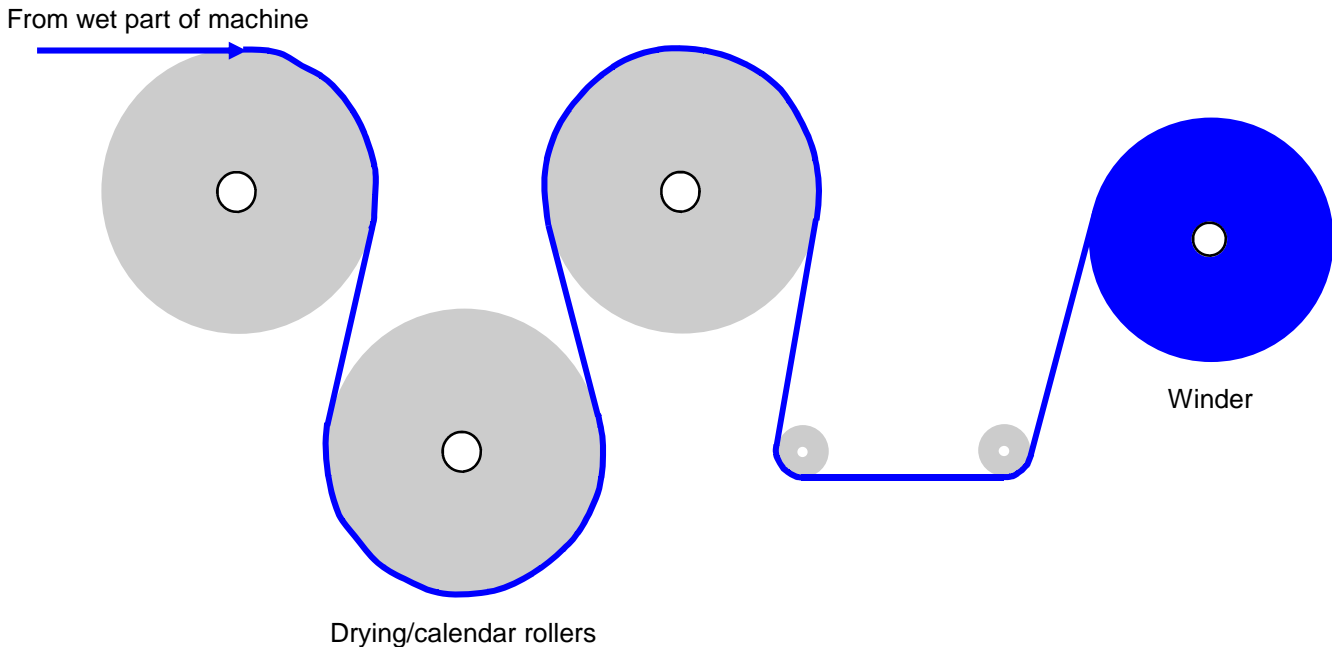


## Paper Inspection

Paper inspection is usually performed very near the take-up reel at the end of the line, as the paper isn't dry and fully calendared until then. An example portion of this end of the machine is shown below:



Paper inspection is usually performed as close to the windup location as possible, as this ensures that any defects produced by upstream rollers or other devices are detected.

It is possible to inspect paper for holes in transmitted light, but most paper inspection is performed using reflected light. A very bright light source is positioned close to the web and illuminates it. High-speed linescan cameras view the illuminated web and examine it for holes and other contaminants. For coated papers, it is also possible to view coating issues utilizing the same technique. Bright light and fast cameras are necessary due to the high speeds in the paper process. It is not unusual for paper lines to have speeds in excess of 3,000 feet per minute (FPM). This is the equivalent of a car traveling nearly 35 miles an hour.

Linescan cameras are high-speed devices. Depending on the camera type and size, they are capable of scanning at rates of up to tens of thousands of exposures a second. This allows the fast-moving web to be imaged without blurring, and in sufficient resolution to detect the required defects.

Normal aperture lighting is not bright enough in many paper inspection situations. Instead, fiber optic, metal halide, or other light sources are used. The brighter lights reduce the amount of exposure needed for each scan, which increases the system resolution in the machine direction.

Inspection systems can operate flaggers or markers to indicate the defective parts of the web after it has been made into a roll. Sufficient distance is required downweb of the inspection station to allow time to detect, classify, and mark the

defect. This generally needs to be only a few feet, but increases as web speed increases.

For some coatings, especially those on release papers, the contrast between the coating and the paper itself is of very low contrast. In this event, it is possible to increase this contrast via use of monochromatic light sources and/or filtering on the cameras. For clear coatings, the presence or absence of the coating can usually be detected as a change in reflectivity of the paper.

Proper setup of the inspection will allow best detection of the widest array of defects, as that is usually the requirement. Some inspection systems, such as those supplied by WEBVIEW, include video processing modules which can enhance certain types of defects and make them even easier to detect. WEBVIEW systems, even the low-cost Web-i, come with a special video mode called "Small Defect Channel". Video is sent through a rate-of-change filter to enhance spots where brightness is changing rapidly from pixel to pixel. This video mode can be used to detect even defects which can get to be much smaller than the calibrated pixel size. This can allow resolution requirements to be relaxed and cost of a system to decrease significantly.

For various reasons, it may be preferred to place the inspection system in a high-temperature area. When mounting electronic equipment of any type, one must take into consideration ambient temperatures. As camera operating temperatures increase, noise generated within the camera increases due to the nature of CCD and CMOS devices. As this noise increases, the dynamic signal range of the camera is reduced. To prevent this, some sort of supplementary cooling is suggested when the camera(s) or light source(s) will be placed in areas where ambient air temperatures are at or above 100°F (38° C). This can be provided by plant air (dry air of instrument quality is a must to prevent condensation and other issues), external fans, or self-contained air conditioning units.

Webview markets a complete line of inspection systems for paper. Please see our website at:

[www.webinspection.com](http://www.webinspection.com)

Copyright © 2006 Webview, Inc. All Rights Reserved.