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Checking for coating wear on corrugating rolls

Scope

This TIP will address the measurement of the coating (typically chrome or tungsten carbide) thickness in order to determine the amount of wear and to provide some guidelines for maintenance decisions.

Significance

Corrugating rolls are one of the most expensive components of the singlefacer. Good management of your rolls will extend the life of your rolls and in turn, facilitate the production of good quality for longer periods of time between roll changes. Worn or damaged rolls can impact a variety of combined board quality attributes such as caliper, ECT, and flat crush. Typically, rolls can be re-coated two to three times before skim cutting, rebuilding, or replacement, is required. Additional information on corrugating roll wear is in the following publication: “Corrugating Roll Wear Measurement” Atlanta, GA.; TAPPI PRESS, 1996.

Safety precautions

Flute depth should be checked when the rolls are cold and if possible, out of the machine. If rolls must be checked in the single facer, then ensure that the machine is “de-energized” in accordance with “Lock Out and Tag Out” (LOTO) procedures. LOTO procedures require that potential energy from air, steam, and hydraulic pressure also be eliminated. Simply turning the power off may not be adequate. In addition to safety considerations, heated rolls may affect the accuracy of your measurements depending on the type of gage used.

Introduction

This TIP will address the use of copper sulfate and a room temperature blackening solution¹ for checking coating wear in the flute “valleys” and a direct contact procedure using a magnetic spring-loaded probe which measures the coating thickness on flute tips in mils (thousandths of an inch) or millimeters. Note that it is good practice to ensure the areas to be measured are clean of all debris. As a minimum, use a soft bristle brush and a cloth to clean the areas to be measured.

Coating wear in valleys

The procedure for the copper sulfate test is documented in TIP 0304-53. **Please note that when corrugating rolls are rebuilt, the new coating is put on a substrate of stainless steel. Copper sulfate will not plate out on**

¹ The only known trade name for this blackening solution is Insta-Blak, available from a number of suppliers. If any other manufacturer of such a blackening solution wishes to be included in this footnote as material that may be used in conjunction with this TIP, please contact the Standards Department at TAPPI.

stainless steel. A room temperature blackening solution **should be used in place of copper sulfate in this case.** The blackening solution is applied in the same way as copper sulfate but a dark flat black substance appears where the coating is worn away instead of copper “plating out” on the worn areas. The blackening solution can be used for steel and stainless steel substrates and can be used for checking wear on chrome and tungsten carbide roll coatings. You should be able to obtain the blackening solution from your roll supplier.

There is a gage that can be used in conjunction with the application of copper sulfate or blackening solution to quantify the percentage of coating loss in the flute valleys. The gage was developed by Stone Container Corporation and is referred to as “Star Gage” because of its shape (see Figure 1).

Star Gages are typically divided into three sections: A flute, B flute, and C flute. In each section there are four sub-sections or “points”: 10%, 20%, 25%, and 30%. After the copper sulfate or blackening solution has been applied, insert the appropriate star gage tip into the flute valley as shown in Figure 2. The percentage of coating loss in the valley is estimated by aligning the lines on the gage with the worn area that is highlighted by the characteristic copper color which, results from the chemical reaction between the copper sulfate or the blackening solution and the exposed base metal. Figure 2 shows the coating wear at about 30%.

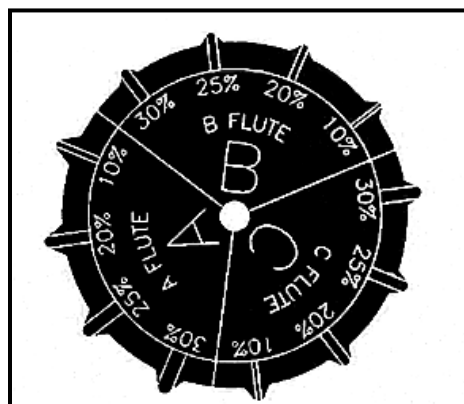


Fig. 1. Star gage

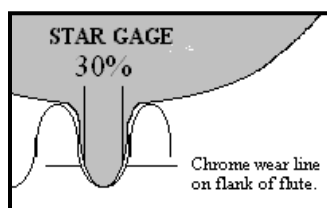


Fig. 2. Star gage tip inserted into the flute valley

Generally, to prevent damage to the base metal, the coating loss in the valleys should not exceed 25% to 30%.

Coating thickness on flute tips

A few different companies manufacture coating thickness gages. The most common and least expensive is a pen sized gage which has a small spring-loaded magnetic probe. Figure 3 shows a typical gage with case.

The corrugating rolls are most easily inspected when they are cold and if possible, removed from the machine. The tip of the gage with the magnetic probe is placed on the flute tip so that the probe touches the coating. The gage is gently pulled away perpendicular to the surface until the probe releases. The coating thickness must be read on the scale quickly at the point the spring-loaded probe releases and retracts back into the gage. Several readings should