ADVANCED ADHESIVES REPORT

JANUARY 2002

Your corrugating adhesives newsletter from Harper/Love Adhesives Corporation

The true cost of out-of-round and out-of-parallel glue rolls

How to calculate the volume and cost of excessive adhesive

by John Kohl

It isn't hard to understand that glue rolls with excessive TIR (total indicated runout), or glue rolls that aren't parallel, will cause your corrugator to consume more adhesive. It's trickier to calculate *how much*, and when it makes economic sense to correct the problem. As long as board quality, productivity, and waste are acceptable, it is tempting to postpone maintenance. Reducing the question to a comparison of costs helps managers make informed decisions.

When the glue roll is out of round, the gap with the metering roll changes with every revolution. As a result, the adhesive film thickness on the glue roll changes from thick to thin as the roll turns. The gap between the lower corrugating roll on the single facer will also change with every revolution, which affects adhesive application. To compensate for these variations, the operator usually adjusts the metering gap so there is enough adhesive applied where the film is thinnest. The effect is to increase overall adhesive consumption; this increase is proportional to the TIR or the distance the rolls are out of parallel. This proportion, or ratio, can be used to calculate the additional cost to the box plant that defective rolls create.

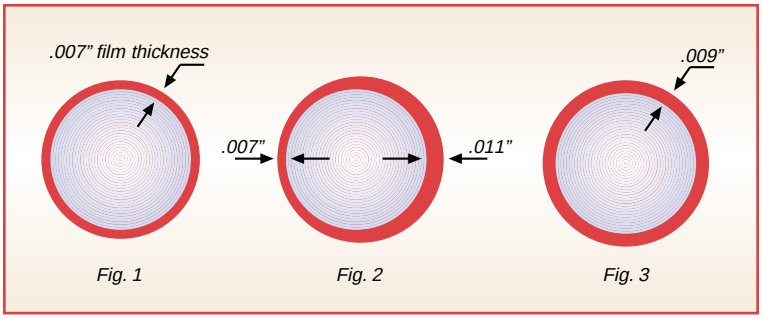

Fig. 1 Fig. 2 Fig. 3

Out-of-round example

On a finger-type single face machine, with a glue system in good condition, the actual glue film thickness on the glue roll will average about .007" in normal operation (Fig. 1).

If the glue roll has a TIR of .006", the gap must be increased by this amount to maintain a .007" where the film is thinnest. Allowing for the film split between glue roll and metering roll, the film thickness will increase by some two-thirds of that gap increase, or about .004". The result will be a glue film as shown in Fig. 2, with the film thickness ranging from .007" to .011".

The total volume of adhesive available in this example is the same as we would have with a uniform film thickness of .009" (Fig. 3).

On a 10" roll, the increase in glue volume calculates to 27%. About three-fourths of that ends up on paper, for an effective consumption increase of 20% with a TIR of .006".

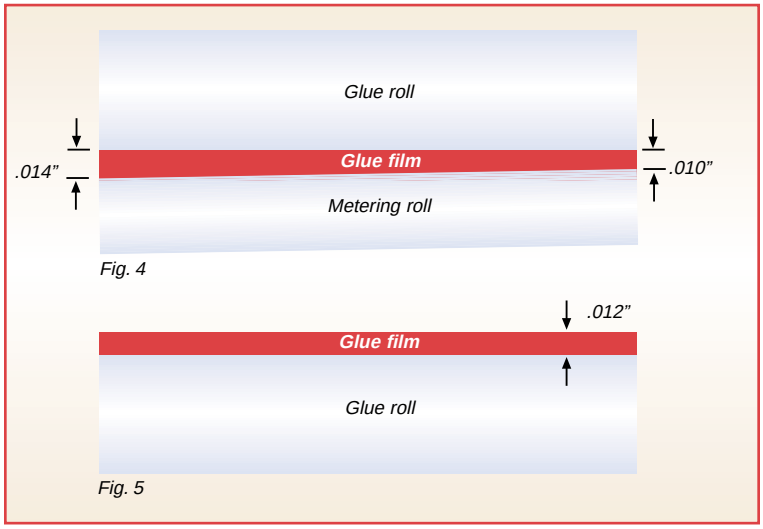

Fig. 4

Fig. 5

So, as a rule of thumb, we can conclude that every .001" of TIR will increase adhesive consumption almost 3.5%. (This is true for both finger-type and fingerless machines.)

Out-of-parallel roll has the same effect

If the metering gap is .006" out of parallel (Fig. 4), the change in film thickness across the machine would be about .004", or 2/3 x .006. Assuming a .010" minimum glue film (fingerless machine), the film changes from .010" to .014", and the volume would be the same as if there was a uniform film thickness of .012" (Fig. 5). So .006" TIR and .006" out-of-parallel result in the same increase in adhesive consumption.

What about double back glue machines?

On double back glue machines, we need to consider the cell count and size of engraved rolls. Glue rolls with cell counts of 16 or fewer cells per inch carry the majority of the adhesive in the cell. These rolls have a very thin surface film thickness, so the application rate is not increased dramatically when there

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are small changes in the TIR for this type of roll.

Glue rolls with higher cell counts—25 quad and up—are affected by TIR at about the same rate as the single facer rolls, or about 3.5% per every .001" TIR.

The bottom line

With today's modern equipment and high run speeds it is possible to produce large quantities of board, consuming great quantities of adhesive in a short period of time. Out-of-round or out-of-parallel rolls increase adhesive application rate significantly.

A formula can be derived from the information in this study to reveal the true cost of glue-roll TIR or out-of parallel conditions (see right).

Daily checks of the glue-roll gap with feeler gauges are imperative to ensure board quality and even application of adhesive. It is not uncommon for plants running high speeds or small flutes to check gaps once or twice per shift. This ensures the rolls are parallel and the glue film thickness and subsequent application is even across the web. In any case, the TIR should be checked for all stations at least once per week.

THE FORMULA

Cost per .001" of TIR = (TIR x 1000) x .035 x Dry Pound Cost x Average web width factor.

Example:

TIR=.005

Dry pound cost = $0.18/lb

Average web width = 80"

Average web factor = 80/98 = .816

Cost = (5) x (.035) x (.18) x (.816)

Cost = $0.0257 per MSF

For a plant producing 50 MMSF per month, the TIR would cost $1,285 per month in excess adhesive application for only .005" of roll runout.

The additional adhesive will only be applied to the web width being run at a particular time, so a plant will need to factor in the average web they run. Adhesive formulations differ from plant to plant, but can be compared by the dry pound cost. Application rates also vary but are not a concern for this study.

COST PER MSF OF EXCESSIVE ADHESIVE USE DUE TO OUT-OF-ROUND GLUE ROLL

TIR (INCHES)	DRY LB. COST $0.12	$0.13	$0.14	$0.15	$0.16	$0.17	$0.18	$0.19	$0.20
0.001	$0.004	$0.005	$0.005	$0.005	$0.006	$0.006	$0.006	$0.007	$0.007
0.002	$0.008	$0.009	$0.010	$0.011	$0.011	$0.012	$0.013	$0.013	$0.014
0.003	$0.013	$0.014	$0.015	$0.016	$0.017	$0.018	$0.019	$0.020	$0.021
0.004	$0.017	$0.018	$0.020	$0.021	$0.022	$0.024	$0.025	$0.027	$0.028
0.005	$0.021	$0.023	$0.025	$0.026	$0.028	$0.030	$0.032	$0.033	$0.035
0.006	$0.025	$0.027	$0.029	$0.032	$0.034	$0.036	$0.038	$0.040	$0.042
0.007	$0.029	$0.032	$0.034	$0.037	$0.039	$0.042	$0.044	$0.047	$0.049
0.008	$0.034	$0.036	$0.039	$0.042	$0.045	$0.048	$0.050	$0.053	$0.056
0.009	$0.038	$0.041	$0.044	$0.047	$0.050	$0.054	$0.057	$0.060	$0.063
0.010	$0.042	$0.046	$0.049	$0.053	$0.056	$0.060	$0.063	$0.067	$0.070
0.011	$0.046	$0.050	$0.054	$0.058	$0.062	$0.065	$0.069	$0.073	$0.077
0.012	$0.050	$0.055	$0.059	$0.063	$0.067	$0.071	$0.076	$0.080	$0.084
0.013	$0.055	$0.059	$0.064	$0.068	$0.073	$0.077	$0.082	$0.086	$0.091
0.014	$0.059	$0.064	$0.069	$0.074	$0.078	$0.083	$0.088	$0.093	$0.098
0.015	$0.063	$0.068	$0.074	$0.079	$0.084	$0.089	$0.095	$0.100	$0.105
0.016	$0.067	$0.073	$0.078	$0.084	$0.090	$0.095	$0.101	$0.106	$0.112
0.017	$0.071	$0.077	$0.083	$0.089	$0.095	$0.101	$0.107	$0.113	$0.119
0.018	$0.076	$0.082	$0.088	$0.095	$0.101	$0.107	$0.113	$0.120	$0.126
0.019	$0.080	$0.086	$0.093	$0.100	$0.106	$0.113	$0.120	$0.126	$0.133
0.020	$0.084	$0.091	$0.098	$0.105	$0.112	$0.119	$0.126	$0.133	$0.140

Based on average web width of 98 inches

New technology: the infusion preheater

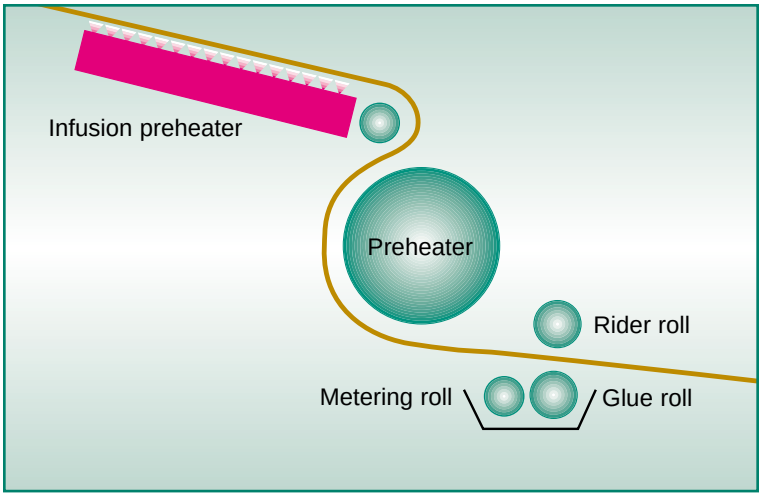
Steam preconditions flute tips before adhesive is applied

by Raul Perez

Since its introduction to the industry by Westvãco in the late 1960s, the jet assist has been very beneficial in combining heavyweight single wall and multiwall corrugated board.

I have recently had the opportunity to observe another device in several facilities, which appears to also offer beneficial results in these situations. The *infusion preheater* was developed by United Container and has been recently installed in a number of plants.

The infusion-type preheater plate provides preconditioning not only by heating the flute tips through surface contact but also by subjecting them to steam impingement as well.



The infusion device I worked with was installed on the bridge prior to the glue machine. This immediately eliminates the danger of starch in the pan overheating and gelling as can be the case with an improperly operated Jet Assist installation. The booster unit, when activated, blows live steam through holes in the plate to precondition the flute tips before the adhesive is applied at the glue station.

During the limited test I was able to run the infusion preheater, it seemed to help the glue line to maintain its uniformity and also produced a wider glue line than was achieved utilizing the Jet Assist.

My initial experience with this unit was very positive. I can also see where more trials may be needed to help determine the cost effectiveness of possible increased adhesive usage and possibly increased steam consumption.

Go-to Guys gear up for expanding opportunities in Latin America and U.S.

Gonzalo Galaz

Marcela Stephenson

John Hoffman

Don Wolfe

Gary Rowland

Bob Jenkins

Harper/Love's presence in Latin America continues to grow with representation in Chile and dedicated customer service in Charlotte. These additions strategically support the Harper/Love service group which is currently represented in Guayaquil, Ecuador; San Jose, Costa Rica; Bogota, Columbia; and Miami, Florida.

Gonzalo Galaz has joined us as an exclusive agent based in Santiago, Chile. Gonzalo is a graduate chemical engineer active in the paper/adhesive industry for the past 18 years. He has provided technical adhesive support for corrugating and paper industry clients for the past 10 years.

Marcela Stephenson will work in the Charlotte office as customer-service contact for Latin American customers.

In the United States:

John Hoffman offers a chemical engineering degree and 17 years of experience in the adhesive industry to serve Harper/Love customers in Northern California. He is based in Sacramento.

Don Wolfe hails from Moline, Illinois. He has over 10 years of experience as a machine operator and supervisor in the corrugated industry, as well as considerable experience on the converting side of the business. He will cover the upper Midwest as a technical representative.

Gary Rowland is based in Arkansas. He will serve as a technical representative in the Southeast. He brings 17 years of corrugating experience, including service as a supervisor and general foreman for two large integrated companies.

Bob Jenkins started in the corrugating industry in the early 1980s as a corrugator operator and worked his way up to superintendent and plant/production manager. As a Harper/Love technical representative, Bob also will offer his expertise to our customers in the Southeast. He is based in Atlanta.

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IN THIS ISSUE

LiquiBond®

It's about time!
And money!
And quality!

LiquiBond adhesive performance enhancer dramatically improves quantity and quality of corrugator output.

Users report up to 30 percent faster running speeds, and drier, firmer board. LiquiBond is conveniently post-added to the starch formula. Automation is easier and more economical than with powdered products. It can be used in manual starch systems, as well.

LiquiBond is available in convenient 275-gallon returnable totes.