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Causes and corrections of common corrugator bonding problems

Scope

Problems in the manufacture of corrugated board often relate to the paper, the equipment, the adhesive, or the heat. The trouble shooting guide provided in this Technical Information Paper can aid in getting to the problem's root cause quicker and hence to faster correction. This is a partial list of problems relating to zipper board, loose liner, or inadequate bonding. Along with the problems are the expected causes and the most probable corrections that will solve them

Safety precautions

Follow all safety instructions and procedures in place for the individual plant. Wear appropriate safety equipment when mixing chemicals and working with knives.

Introduction

Much has been written on the subject of corrugating and what to do when there is a problem. Failure to address the specific component that is causing the defect makes solving the problem difficult. Should we be looking at the machine, the paper (liners or mediums), the adhesive, or the heat? Problems in the manufacture of corrugated board often relate to one or more of those areas. This TIP was prepared to assist personnel in arriving at causes and remedies more quickly. A key factor in problem solving is to ask why, find an answer, and repeat the process in order to avoid addressing merely the symptoms of the problem and not the root cause. Because problems may arise from a combination of causes, steps taken to remedy one problem may cause other problems. Therefore, corrective action should be done sequentially and each step should be reviewed to see which remedy has corrected the problem. The following questions may help in solving problems related to bonding.

Examining the glue line is critical to the beginning of the process. If the glue line is clear but has a "sandpaper" feel to the touch, this is a strong indication of excessive heat producing a brittle bond. If the glue line is white or partially white in areas it suggests either the lack of heat or premature dewatering of the glue line. After examining the sample you should perform an iodine soak test to look for patterns.

1. What is the type of bonding problem?
2. Is the bonding problem located on the single facer or double backer side of the sheet of combined board?
3. Where is the problem located on the sheet? Operator, middle or drive side, or uniformly across the web?
4. Does the problem repeat in the machine direction, thus indicating a mechanically related problem?
5. What type of pattern does the bond exhibit?
6. How severe is the bond defect?

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7. When was the defect first observed? New roll of liner or medium? Speed change? Preheater wrap arm position change? Gap change? Other?
8. Where was the first defect noted?
9. How does the speed affect the bonding problem?
10. Is there a trend, such as heavyweight vs. lightweight liners? Wide width vs. narrow widths? Does the defect switch sides of the corrugator if one or more rolls are reversed? Others?
11. Is the board being run with normally settings?

Troubleshooting technique

Web bonding defects often exhibit a repeated pattern when they are mechanical in nature. A glue roll that has excessive TIR in the center or on an end will result in a heavy to light starch application with each revolution of the roll. This means that the bond strength may vary in the machine direction. In this case we can use the defect to help us pinpoint the problem roll by measuring the distance between the defects occurring on the combined board. For example, if the distance between “unbonded” or “weak bonded” areas is approximately 32 in. (812.8 mm), then that distance can be divided by π (approx. 3.14), or $\frac{32}{3.14} = 10.19$ in. (258.83 mm). Therefore a roll with a 10-in. (254-mm) diameter would be the most likely candidate for excessive TIR. Note that the “green peel bond test” can be used to detect bond strength in the machine direction and this method is discussed in UM 822 “Green peel bond procedure at the corrugators.”

Causes and corrections

Causes	Corrections
Insufficient adhesive	1. Too much clearance between the corrugator roll and glue roll. <i>Readjust setting.</i> 2. Check pan, pumps, lines, valves for blockage or stoppage of adhesive flow to rolls. <i>Clean or open blockage.</i> 3. Poor circulation of adhesive, resulting in dead flow areas causing temperature and viscosity to rise, causing cross direction variation in glue thickness and penetration characteristics. 4. Gelled adhesive wiping fresh adhesive off the glue roll. <i>Clean and remove gelled adhesive.</i> 5. Oil or grease on glue rolls. <i>Clean the glue unit and remove oil and grease.</i> 6. Bent or out of round glue roll over, or metering roll over .002” TIR (Total Indicated Runout) each or a maximum of .004”. <i>If over .004” remove rolls.</i> 7. Bearing failure over .002”. <i>Replace bearings.</i> 8. Improper meshing of glue rolls. <i>Clean gears.</i> 9. Taper speed drive not operating properly at high speeds or electronic drive not following speed curves correctly. <i>Repair or replace drive, correct/adjust speed curve or replace bad component(s) such as circuit card</i> 10. Glue roll motor burned out and paper may be driving roll. <i>Replace motor.</i> 11. Condition of the surface of glue and/or metering rolls: have they been damaged or scarred, or is the surface too slick from a highly polished chrome finish? <i>Replace rolls.</i> 12. Single facer fingers and cleanout prongs. Is the finger bar, fingers, and clean out prongs set properly? <i>Clean, adjust, and replace any fingers or prongs as needed.</i>