



Increasing production through adhesive thermal conductivity

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Increase production speeds & quality to raise output

Demand for corrugated boxes is intensifying and accelerating production speeds (while meeting and improving bond performance) is more critical than ever for corrugators.

How can we speed up production and improve board properties?

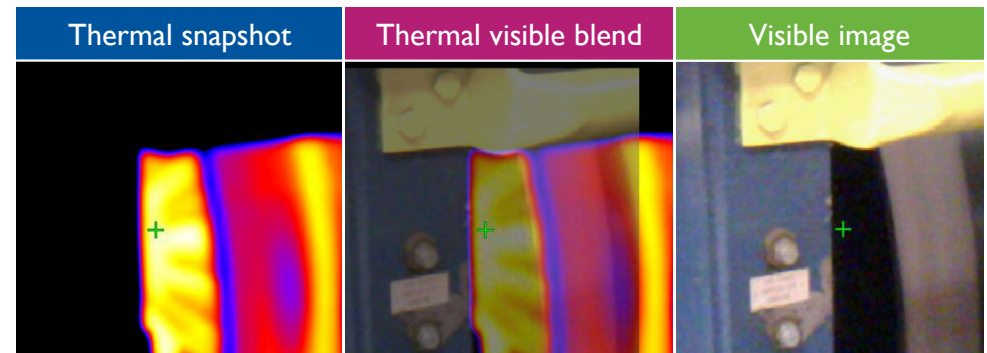
- Improve drying rate of the adhesive
- Improve bond performance
- Reduce waste

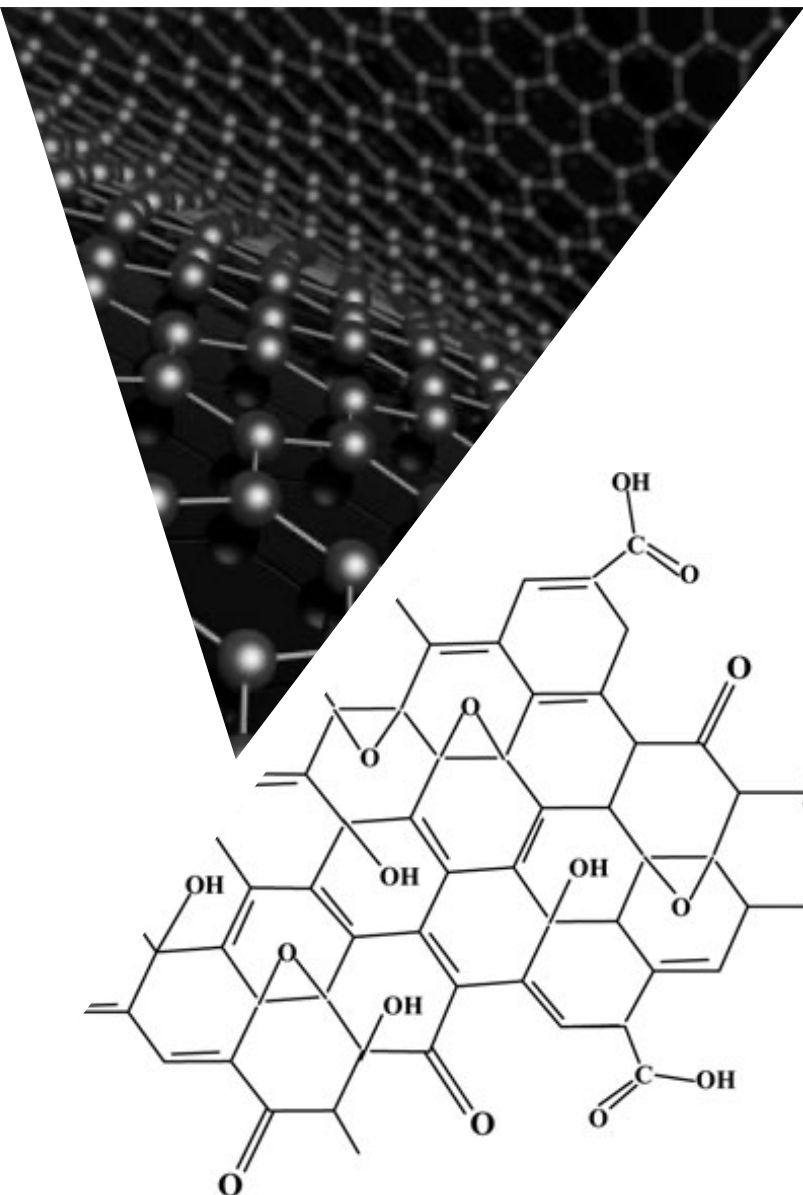


The struggles with heat limited production

In multi-wall, heavy weight and specialty coated papers there are many situations where heat cannot effectively gel and dehydrate the adhesive before stress impacts bond quality.

- Most solutions are very complicated or capital intensive, such as:
 - Jet assist: Limited improvement
 - Application reduction (solids increase or reduce application)
 - Flexibility, costs, bond impact
 - Mechanical solutions (syphon, steam control, conditioning/hot plates)
- Heavy impact on product speed and quality





Now you can accelerate drying to **maximize production speed**

How? CORAGUM®TCE (Thermal Conductivity Enhancer)

- Revolutionary superconducting material based on nanoparticle technology
 - Dispersed short length fibers increase thermal conductance
 - Rapidly increases drying and dehydration of adhesives
- Additive is added directly into corrugating adhesive in very small doses
 - 10-35 oz. per 100 gallons, based on grade needs

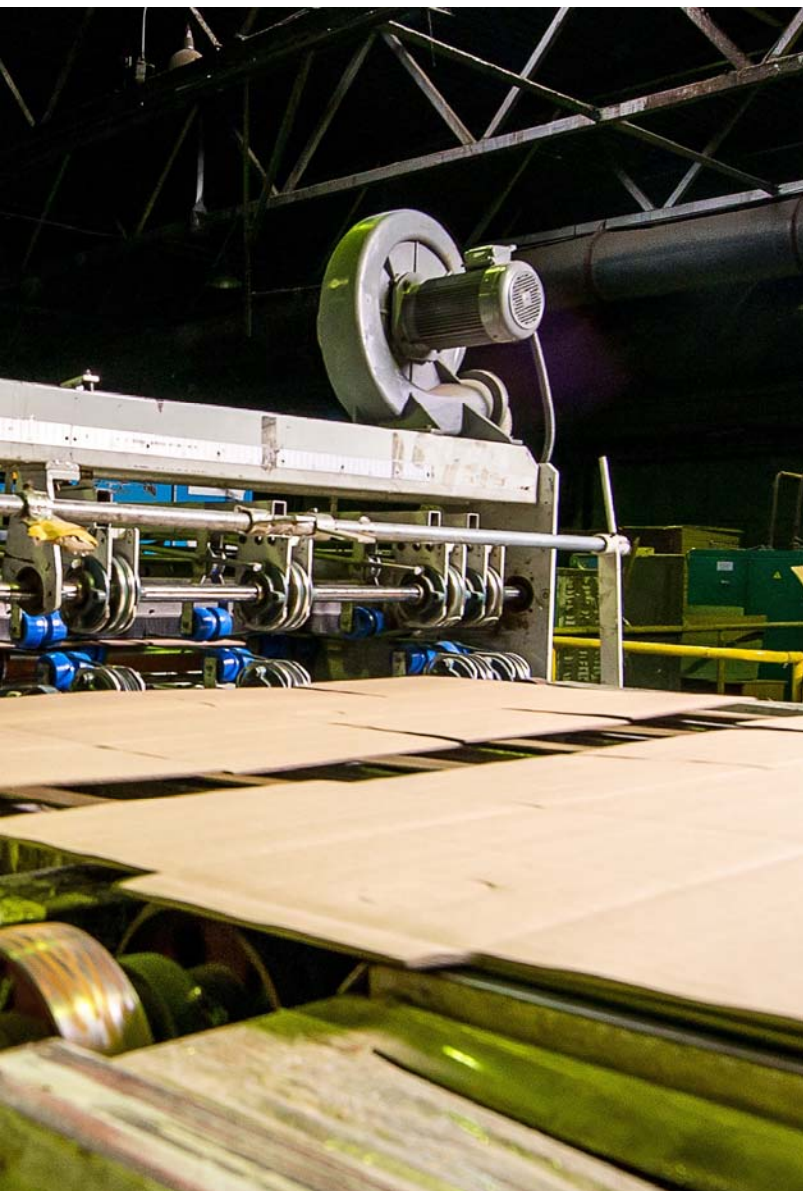


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IDEAS TO SOLUTIONS

Additive is easy & efficient to use: **Automatically dosed at run tanks**

- Minimize product usage to impacted grades by using only at the necessary addition points
 - Turn on or off by grade
 - Primarily target DB (double back) run tank addition
 - Single Face (SF) addition when necessary
- Can use existing resin/additive dosing
 - Optional: Integrate pump into run tank
- Can be formulated as needed to full batches if dosing or run tanks unavailable





Improving speed in double and triple wall

Challenge: Triple wall production speed issue in 55 and 82 lb. liners, 36 lb. mediums AAC

- Heavyweight production speed was limited due to DB bond failure

Solution: COARAGUM® TCE additive was added to double back only

Result: Increased speed by 30% with the additive at standard dose

Challenge/Solution/Result: Double wall production issue for 350BC, 23 and 33 lb. mediums

- 350BC (23 medium): 550 FPM increased to 700 FPM with TCE
- 350BC (33 medium): 500 FPM increased to 750 FPM with TCE

FPM: Feed per minute



CASE STUDY

Reducing edge delamination while using engineered medium at high speeds

Challenge: Fiber reducing medium has high stiffness, high density (high Gurley), requires higher conditioning and resists flute formation

- The bond on the edge of the sheet was disturbed by the blades at the slitter (slit from bottom) with immature DB bond

Solution: CORAGUM® TCE Thermal Conductivity Enhancer was made only in DB to reduce costs

- Hot plate temperatures were maintained to avoid over drying board

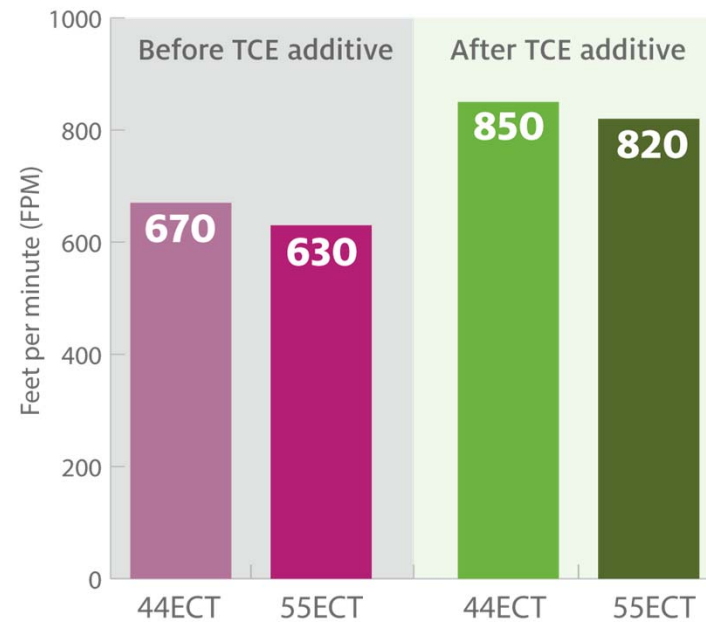


CASE STUDY cont.

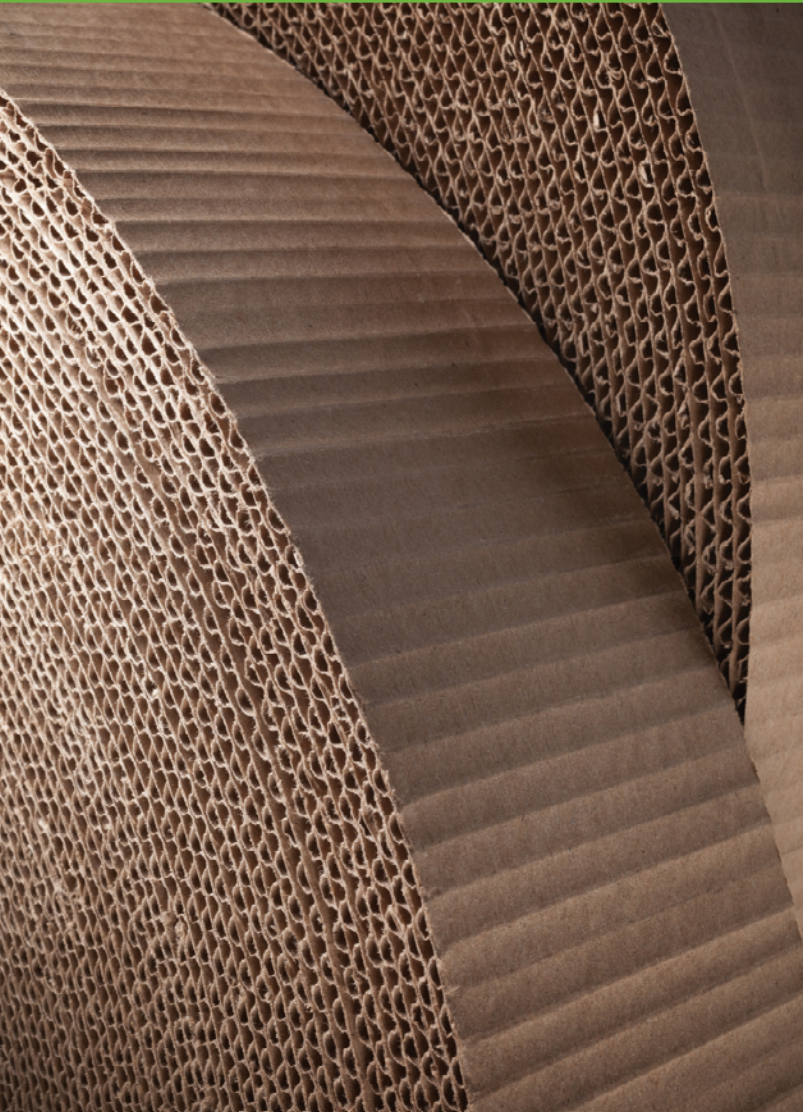


Reducing edge delamination while using engineered medium at high speeds

Result: Improved machine speeds on 44ECT and 55ECT and reduced delamination



CASE STUDY



Increasing speed in heavy weight single wall

Challenge: Speed limited heavyweight board issues in 90 lb. liner and 36 lb. wet strength medium

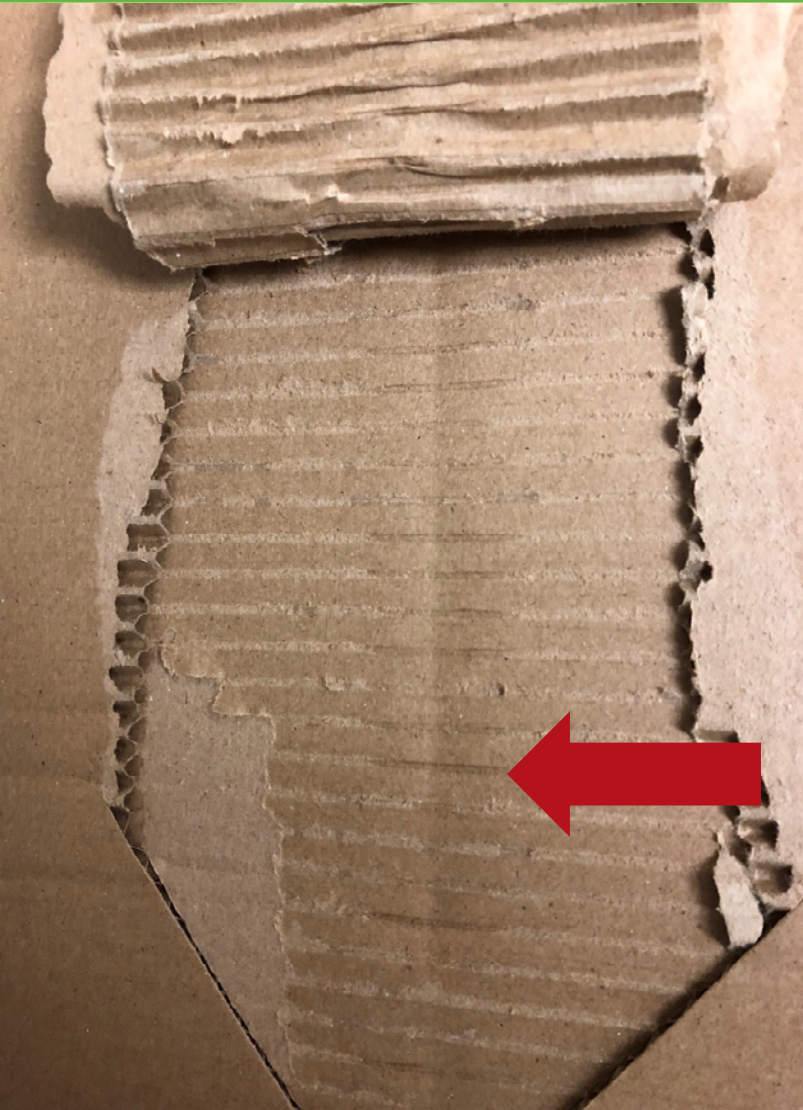
Solution: CORAGUM® TCE additive was dosed at both DB and SF

- Initially trialed only at DB, but SF bond suffered as speed increased
 - At first had a 25% speed improvement, but 20% dry pin reduction in SF bonds
- To maximize speed performance further optimized TCE additive dosage for each location
 - Full dose at DB, half dose at SF

Result: Achieved 30% speed improvement while increasing SF to run conditions



CASE STUDY



Reducing score damage and improving speed

Challenge: Double wall production issues in heavyweight grades

- Insufficient preconditioning heat and limited hot plate length
- Three Point Score stresses immature double back bond
 - Resulting poor fiber tear between the C flute and B flute web on the score line
- Machine speed needs to be reduced to avoid quality issues
- Significant waste from delamination

CASE STUDY cont.



Reducing score damage and improving speed

Challenge cont.: Before treatment had poor fiber tear at normal operating speeds on Double wall, with delamination at scores

- Speeds had to be reduced by 40-60% to meet quality needs
- Dry pin values were acceptable except at score points

Solution: Treated with addition of CORAGUM® TCE additive at the DB station

Result: After treatment had solid fiber tear at full production speeds

- Grade speed increased 30-70%!
- Waste reduced significantly

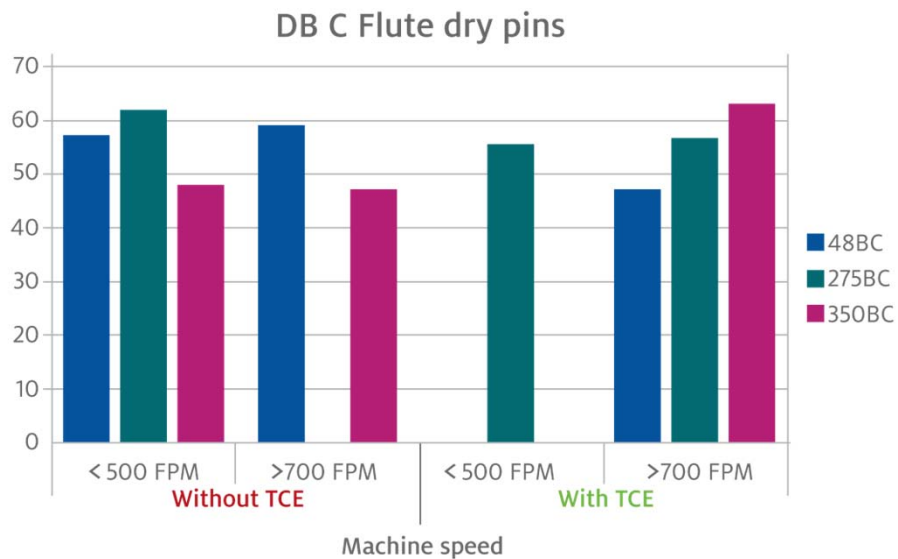


CASE STUDY cont.

Reducing score damage and improving speed

Dry pin testing (including scored areas)

Board samples with and without CORAGUM®TCE additive showed good dry pin values over a range of speeds



Dry pin testing of the scores showed marked decrease without CORAGUM®TCE additive as speed increased

	Without TCE		With TCE	
	Dry pins	Fiber tear	Dry pins	Fiber tear
<500 FPM	45-55	Good	45-55	Good
>700 FPM	0-20	Poor	45-55	Good

CASE STUDY cont.



Reducing score damage and improving speed

Results cont.

- Double wall speed increases of 25-75% led to an overall monthly production increase of over 10%
- Waste reduced by 20% overall
 - Primary - loose liner with double wall
- Production was so far ahead of conversion that plant was able to take additional downtime for needed maintenance

Operator confidence

- When you're not afraid to run the way you can because you just know it will work



Improve speed and performance with less waste today

- Faster machine speeds
 - Improved thermal conductivity of corrugating adhesive, leading to faster drying and increased production speeds
 - Improved performance and efficiency on heat-limited production
- Improves board properties
 - Produces flatter, drier boards with improved printability and overall strength
- Reduced waste
 - Reduces blistering and delamination

Use **CORAGUM®TCE** additive in:

- Multiwall board
- High density paper
- Heavyweight paper
- Specialty paper





Let's get started!

Let us help you solve your corrugating challenges

Contact us

1-800-713-0208 | ingredion.us/corrugating

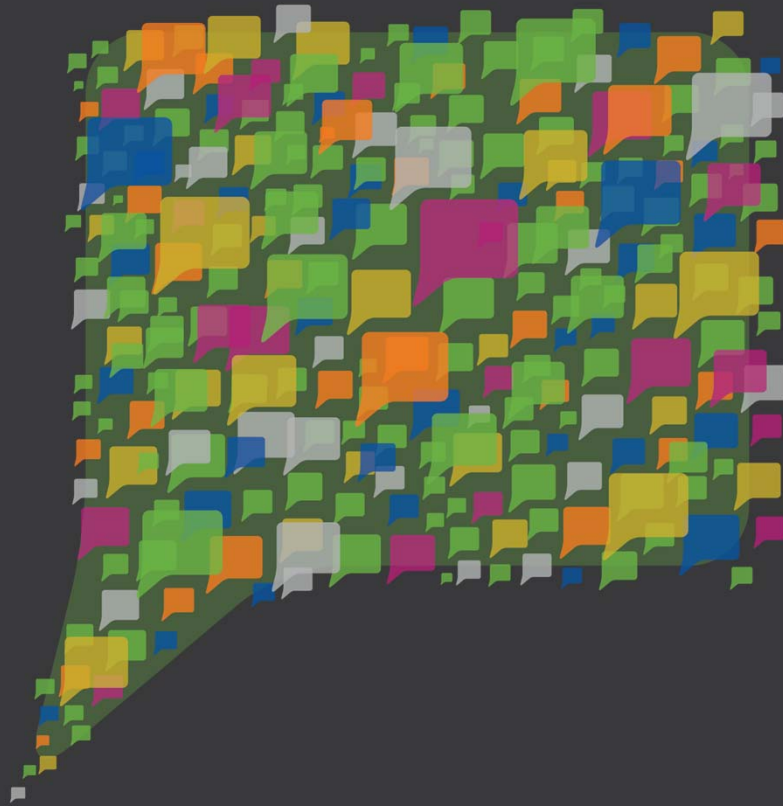
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Thank you