Paper physics issues addressed at IPST regarding Folding Carton

1. Bending stiffness
2. Compression strength
3. Gluability
4. Coating adhesion
5. Surface friction
6. Waterproof coatings development
7. Reel orientation profiles
8. Dimensional stability: curl, cockle, hygroexpansivity
9. Score cracking
Bending stiffness

• Required for carton stability in end-use
• Optimization of layer properties for a fixed caliper: latex/pigment characteristics, furnish selection
• Impregnation of board with wax or polymer or pigment – investigated and characterized
• Basic mechanics/physics applied to paperboard multi-layered structure for optimization
Compression strength

- Fundamental property for carton stability
- Test for SCT, use TSI (ultrasonics to confirm)
- Fiber optimization: species, length, coarseness and fines reduction, ash level
- FQA analysis for fiber characteristics, species identification through stained microscopic analysis
Gluability

- Corona beer cartons, Walgreens cough formula boxes, coated surfaces do not adhere to uncoated flaps
- Test for ZDT, Scott bond, dynamic contact angle, UTM tensile pulls of hot melt glue joints
Coating adhesion

- ZDT, Scott bond, ultrasonic ZD testing, fiber tear
- ZD grinding of layers plus analysis by layer for ZD ash distribution
Surface friction

- Important for packaging operations, affected by application of coatings and printing processes
- Can measure accurately with Amontons II equipment
Application and development of waterproofing coatings

• Combinations of pigment/polymer found to be most cost-effective and least invasive for waterproofing coarse linerboard substrates, can be applied by flexo-printing

• Application of 100% polymer coatings will affect printability/ gluability
Reel orientation profiles

• Continuous Improvement programs to mitigate stock edge flows, draw tensions
• Back and front edges usually problematic, variation is often worst for the bottom layer, confirm by ZD grinding of CD strips
Dimensional stability

- Front and back edge flows and lack of restraint drying along with differences in hygroexpansivity of the bottom-top layers causes curl upon change in ambient humidity.
- Can measure hygroexpansivity of layers, curl and cockle (localized buckling) of sheets using optical Moire shadowgraphy.
Score Cracking

• Problems become worse at low humidity with stiff coatings, bleached white-top kraft
• Measure propensity using MIT fold, IPST crack angle test, AF&PA Honshu tester, - can predict using a loop tension test
Contact Information

Roman Popil
Senior Research Scientist
404 894 9722
Roman@gatech.edu