



*Debonder Formulation Optimization Using
a KCV Mixture/Process Design in Paper Handsheets*

Gregory Perrine, Georgia-Pacific

Georgia-Pacific is a leading producer of consumer products in the Tissue, Towel, Napkin (TTN) category, with such brands as Quilted Northern Ultra Plush[®] bath tissue, Brawny[®] paper towel, and Vanity Fare[®] napkins. In order to manufacture paper with the desired physical properties, various chemical additives are applied in the papermaking process. “Debonders” are one such chemical additive, leveraged to improve the softness of paper products by reducing the strength/stiffness of the paper. Debonders function by reducing cellulose hydrogen bonding and decreasing strength generation within the consolidated paper network.

Debonder chemical formulas commonly include a mixture of nonionic surfactants and charged hydrophobic materials containing fatty side chains. The development of these chemical packages has been an area of research within the GP Chemistry Group for decades, and although there have been several effective additives generated internally by this effort, there are still opportunities to advance understanding of the mixture relationship of debonder components and their impact on retention and strength attenuation. Thus, there was an opportunity for more robust characterization of the mixture system to pave the way for new debonder formulations with greater efficiency, lower cost, and fewer undesirable side-effects to the papermaking process.

To properly optimize the debonder formulation, a study would need to factor in the mixture components as well as the overall dosage to the papermaking process. Running this experiment using a one-factor-at-a-time approach would have required an impractical number of runs and testing. Fortunately, Design-Expert (Version 12) offers Kowalski-Cornell-Vining (KCV) mixture/process designs, which significantly reduce the number of runs required to study mixture components and the impact of process settings.

This presentation will discuss the use of a KCV mixture/process design to characterize and optimize a mixture system and the impact of dosage to handsheets. A commentary on how design of experiments has been advanced within Georgia-Pacific R&D will also be briefly discussed.