Proposal Title: Next Generation Acacia/Eucalyptus ECF Bleaching

GT Project Staff:

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PROJECT OBJECTIVE:

ECF pulp bleaching of acacia and eucalyptus kraft pulps remains one of the central unit operations which can enhance final pulp properties. This program is directed at improving the strength of these pulps while at the same time optimizing the bleaching costs associated with the D_0-(EOP) stages. Employing commercial acacia and eucalyptus kraft brownstocks, the researchers will determine optimal O, D and extraction conditions which maximize fiber charge retention and fiber strength.

PROJECT BACKGROUND:

Research studies by Ragauskas et al have shown the surface and bulk fiber charge of a kraft pulps beneficially impacts a host of key physical properties of paper including:

- Tensile and burst strength
- Sheet Stiffness
- Retention of Wet-End Chemicals
- Improved Refinability/Reduced Refining Energy

Most of these studies have been accomplished with SW kraft pulps although recent publications have indicated that fiber charge retention for HW kraft pulps is equally beneficial. (see Pira. "Developments in Engineered Fibers" by Pu, Zhang, and Ragauskas) Studies by Ragauskas have demonstrated that the O-delignification stage can be used to maximize fiber charge which enhance the strength properties of fully bleached pulps by 10-15%. The use of high O-stage temperatures and/or high caustic charges was shown to be equally detrimental to fiber charge retention and strength development. Equally important to fiber charge retention is the remaining portions of the bleaching sequence. For example, the bleaching sequence OD(EOP) removed more fiber charge than D(EOP) which was shown to be detrimental for strength development. Nonetheless, the relationship between fiber charge and ECF bleaching technologies for tropical HW resources is largely unknown and provides a unique opportunity for tropical pulp mills to increase the strength of their current furnish by simply optimizing process conditions. This program will provide the key information needed to accomplish this opportunity.

DELIVERABLES:

Research studies in this program will provide its sponsor critical information on how ECF bleaching technologies can be optimized to maximize fiber charge retention and sheet strength for acacia and eucalyptus kraft pulps. This will be accomplished employing the "front part" of kraft bleaching including (i) O, (ii) D_0, D_{HT}, $A/D_{(additive\ reinforced)}$ and then extracting with either an (EOP) or (PO) stage. The benefits of fiber charge retention will be further documented by a full sequence bleaching to high brightness values (i.e., ~+90).

VALUE OF DELIVERABLES: The value of tropical kraft pulps for high-quality printing grades is globally recognized and is an important component in their continued growth. A major limitation of these fibers is their strength properties due to their intrinsic fiber length properties. Based on our past fiber charge studies, we anticipate being able to enhance sheet strength and stiffness properties by 15-25% by optimizing fiber charge retention during ECF kraft bleaching.

PROJECT GOALS: This project will identify fiber charge retention protocols for eucalyptus and acacia kraft brownstocks during O-delignification, D_0 and the first extraction stage. The benefits of this technology will be demonstrated by a full sequence bleaching to high brightness values and establishing the benefits of high-fiber charge on sheet strength properties.

PROJECT APPROACH: Researchers will optimize fiber charge retention in:

- O-stage by optimizing temperature, time, caustic charge
- D, D_{HT}, and $A/D_{(additive)}$ by optimizing kf, time, temperature
- (PO) and (EOP) by optimizing temperature, time and chemicals charge

Once these sequences are optimized, the optimal-treated pulp and a control will be bleached to high brightness and assessed for their optical and physical properties.