Pulper Additive Maximizes Recycled Fiber Quality; Impact on Tissue Production

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ABSTRACT

This paper will highlight the impact of a patented blend of surfactants & dispersants as it is used in a combination washing & flotation deinking facility. Specific information presented will outline chemical modification/performance theories and document the benefits realized during stock preparation and during machine production of lightweight tissue grades at the SCA facility in Alsip, IL.

INTRODUCTION

This overview discusses the mill results of using a commercially available chemistry that works *with mechanical equipment* to more cost-effectively remove ink & stickies contaminant resulting in significant production value to tissue production facilities. The theory behind the contaminant modification in the pulper, extended mill evaluation results, and ongoing process & tissue machine benefits will be discussed. The chemistry is patented and FDA approved under CFR 176.170.

CHEMICAL MODIFICATION OF STICKIES & INK

Stickies, ink and wax is introduced to the system via the variable recycled furnish. During the repulping process the modification chemistry that is added to the repulper enables the stickies, ink, & wax "fused" to the fiber to release from the fiber substrate. Although ink is effectively liberated in a size ideal for process removal, the unique impact realized is on the stickies/wax. In typical repulping applications the stickies are only partially liberated from the fiber. The "stickies & fiber bundles" are then processed through screening & cleaning equipment. The end result is the process operations efficiency is compromised because equipment will often accept fiber that has some contamination attached. This leads to stickies in the furnish going to the paper machine. In addition, the rejects of these mechanical unit operations will reject stickies that have some fiber attached. This negatively impacts fiber yield.

Actual mill experiences have shown this unique modification chemistry, fed to the repulper, results in a significant reduction of the fiber/contaminant bundles by more efficiently liberating the stickies from the fiber. Subsequently, the screens and cleaners can more easily identify and remove the contaminants, while disseminating the valuable fiber from contaminants to more efficiently accept the usable fiber. Mill results have documented a 100-200+% stickies removal improvement during screening and a 300+% improvement in contaminants removal during lightweight cleaning, while fiber yield can be improved by 2%. This results in reduced levels of Macro/Micro stickies and wax in the processed recycle pulp. Surface passivation of remaining contaminants inhibits system wide deposition. Correspondingly the cleaner furnish results in significant production value as sheet quality is improved and machine fabric & dryer section deposition is dramatically reduced. The result is maximized machine efficiencies and significant incremental production gains, while lowering overall chemical costs.

SCA MILL EXPERIENCE

SCA in Alsip, IL operates a wash/flotation Deink facility to support a 180 t/d, Twin Wire Light Weight Bleached Tissue Machine. The mill was experiencing stickies deposition on the forming fabrics causing sheet holes and related downtime for fabric cleaning. In addition, felt filling and limited doctor blade life was negatively impacting production. The mill used a machine chest stickies control additive and sprayed the forming fabrics with a wire passivation treatment to help minimize the stickies deposition problems. Standard procedures also incorporated solvent cleaning when required.

The advanced Deink Stock Preparation system which includes .006 mm slotted fine screens, lightweight cleaning, four (4) stage flotation and two (2) stage washing was being pushed for maximum production. The system produced variable quality stock, often reflecting the recycled furnish variation. The mills goal was to increase Deink Plant production, while improving the furnish quality to maximize quality & tissue machine production.

TRIAL EVALUATION REVIEW

The mill initiated a lengthy evaluation process to incorporate mechanical and chemical supplier recommendations to maximize machine efficiencies, while improving sheet quality. Applying a recycled fiber plant stickies treatment application to improve machine efficiency and quality was evaluated based on meeting two criteria. The first being that the addition of the chemical would improve the removal of contamination without negatively impacting other furnish parameters and machine performance. The second was documenting a justified positive impact on machine production over the extended evaluation period. The mill was committed to trialing several alternate competitive chemistries.

Subsequently, a baseline of information was gathered under typical operating conditions. Baseline process samples were gathered over a two week period and consisted of hand sheet & filter pad samples of accepts & rejects from stock preparation unit operations (fine screens, lightweight cleaners, flotation cells, wash effluent, etc.). The modification chemistry was initiated at recommended dosage rates. The results of the testing showed the chemistry did improve removal of the contaminants during the initial 48 hour-Phase 1 evaluation period. Highlights included final stage fine screen rejects showed a 100% removal improvement of contaminants, while fiber mass in the samples was significantly reduced (documenting less fiber loss). In addition, lightweight cleaners also showed measurable improvement in contaminant removal and ink removal was consistent with expectations. All other samples showed minor improvements or remained consistent with pre-trial samples. Tissue machine performance was consistent during this operational period.

As a result of successfully meeting the short-term criteria, the chemical modification product evaluation was continued. The following weeks identified key production benefits that were targeted. No machine stickies were documented. Sheet quality was maximized and no downtime for contaminant related issues was required. Comparing production grades that were important to mill profitability showed that speed increases were achieved and the mill was producing an average of 12 T/D of additional “First Quality Production”. Other plant benefits included improved converting performance, 80% reduction in solvent use, and rolls/wires on the Vario-Split washers in the deink plant remained free of deposition.

During the following 7 months, SCA stopped feed of this contaminate modification chemistry to evaluate two alternate pulper additives. This evaluation approach was selected to determine if other “Pulper Additives” offered similar operating improvements and to confirm that the contaminant modification chemistry was truly responsible for the observed benefits. Each competitive product was run for a minimum of 6-8 weeks. Though one of the competitive additives did run with only minor stickies problems, the additional production benefits were only achieved with the original patented chemical modification product. As clearly outlined in Table I, the patented chemical modifier offered a significant performance gain throughout the evaluation process and was the only treatment solution to result in exceeding the mills efficiency expectations.

PERFORMANCE VALUE

Continuous use of the Stickies Chemical Modification technology has delivered a consistent ROI program justification reflecting a significant 3 to 1 payback. Eliminating the previous stock additive and significantly reducing the use of solvent & wire passivation chemical paid for the Chemical Modification treatment. In addition, the dramatic reduction of solvent (Table II) has enabled the mill to easily meet their VOC permit limits.

A majority of the 3 to 1 documented justification is directly related to production benefits. Production was increased by over 4.0%. The Chemical Modification technology has resulted in the mill significantly exceeding their "Std Scale TPD" forecast which is adjusted based on the operation scheduling (Table III). The production gains translate to improving operating efficiency to 104% from their pre-trial operating level of 96%. Reduced downtime, increased machine speed, and the reduction of off quality production (Table IV) were the main improvements. Additionally, sheet quality benefits insured the mill a secure relationship with customers.

Mechanical adjustments made in the stock preparation area have also positively impacted mill profitability. Improving the maintenance approach to insure screening and cleaning unit operations are performing efficiently insures the modified contaminants are removed. An upgrade of the mechanical dispersion system was also completed. The most profitable change was made when the 4-stage flotation system was bypassed for maintenance. While this system was off line, no negative effects were noted in the operation. Subsequently, at the date of paper submission, the mill has operated for 3 months without the flotation equipment. Although the calculated savings associated with this change (energy & yield savings) have not been included in the Chemical Modification justification, these savings are significant.

CLOSING

The chemical modification of stickies, waxes, and ink with this commercialized technology has given recycled mills a new tool to improve the profitability of their systems. This unique approach enables contaminants entering the recycled fiber process to be modified and removed more efficiently. Production facilities can cost-effectively minimize the impact of troublesome stickies contaminants that traditionally cycle-up in stock preparation and machine white water systems. Improved removal of the modified contaminants via traditional stock preparation screens, centrifugal cleaners, deinking equipment and process loop clarification results in enhanced furnish quality, furnish yield gains and maximum paper machine productivity.

TABLES

Table I: Productivity Results Comparing 3 "Chemical Modification Treatment" Periods to Competitive Trials.

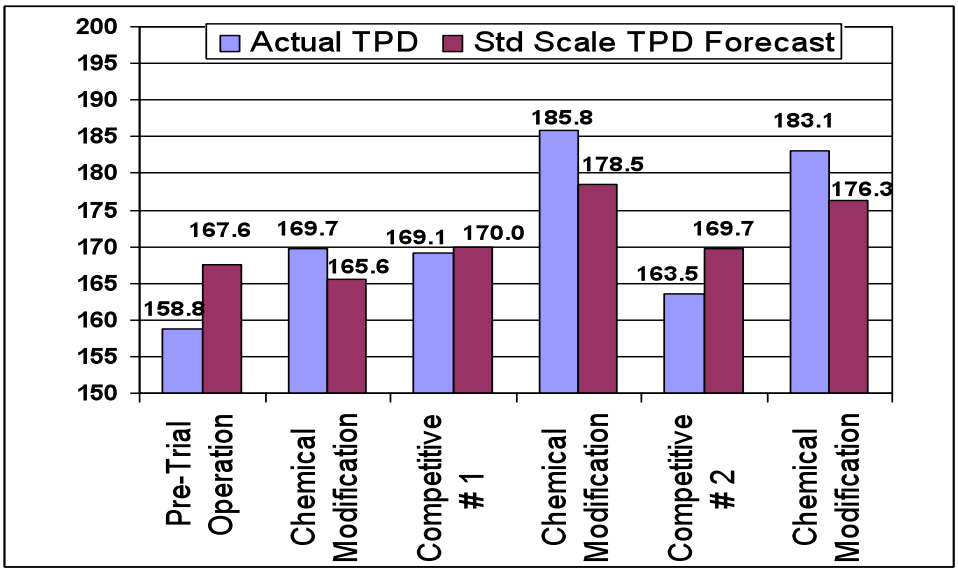

Table II: Average Daily Solvent Use Before & During Stickies Chemical Modification Treatment.

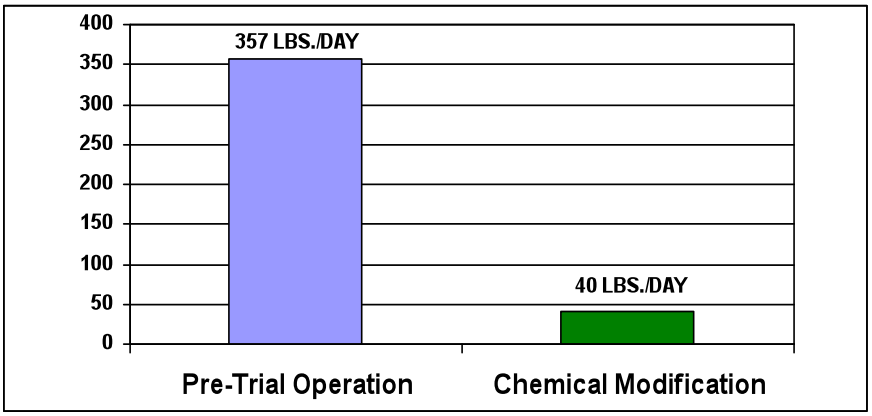

Table III: Increase In Actual Tons/Day Production Due to Chemical Modification Treatment. Note the Chemical Modification Production exceeded the Std Scale Ton/Day Forecasted resulting in 103.9% Efficiency.

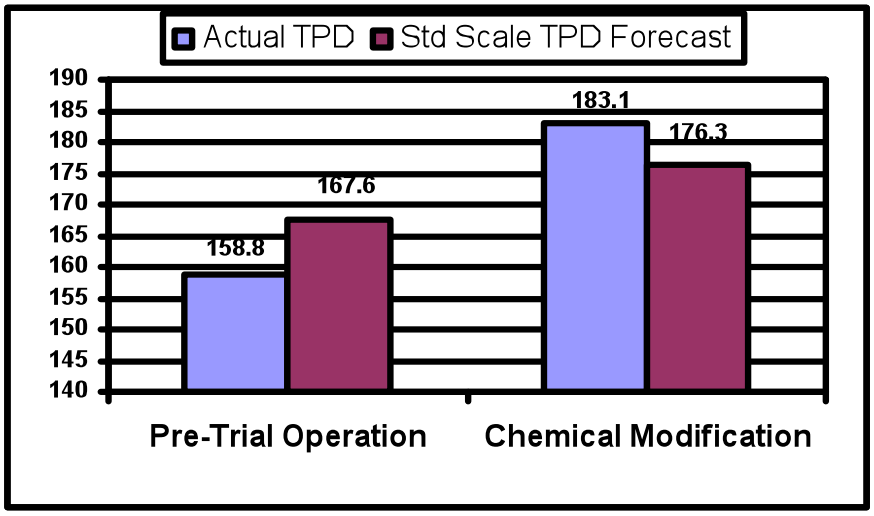

Table IV: Off Quality Production Before & During the Chemical Modification Program.