

## ABSTRACT

Title of Thesis: Creative Design Methods and Investigation of Cellulose Fiber Transport and Application System

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Many difficult design problems require the development of creative design solutions to achieve feasible results. Designers and engineers have searched for methods to enhance creativity in problem-solving to acquire new ideas. A creative design method is a process by which new, independent ideas are generated using knowledge to solve some problem or achieve an objective. Four prominent creative design methods were investigated to explore the extent to which they actually enable creativity by applying them to the design of a novel cellulose application system. Correlations between the four design methods were also discovered. These investigative methods were analogical reasoning, brainstorming, synectics, and the theory of inventive problem solving (TRIZ).

In support of the cellulose application system design, a scientific investigation examining the pneumatic suspension and transport of cellulose fibers was conducted. Measurements of air pressure gradients were conducted for various cellulose mass fractions to investigate the pressure drops involved in air-cellulose flow in pipes. Additionally, mixture dispersions were examined using laser testing to analyze the physical properties of air-cellulose mixtures in transport. Moody diagrams and pressure gradient curves were developed and compared to the physical dispersion characteristics of the air-cellulose mixtures.