



## WATER RESOURCES RESEARCH GRANT PROPOSAL

1. **Title:** Cost-Effective Strategies for Minimizing Water Usage and Discharge in the Polymer and Fiber Industries.

2. **Focus Category:** Management, Surface Water, Ground Water

3. **Keywords:** Water, wastewater, management, quality, quantity, industrial, contaminants, treatment

4. **Duration:** From: September 1 1998 To: August 31, 2000

5. **Federal Funds (for the two years):** \$90,500 (Total) \$90,500 (Direct) \$0 (Indirect)

6. **Non-Federal Funds (for the two years):** \$185,076 (Total) \$100,608 (Direct) \$84,468 (Indirect)

7. **Principal Investigators, University, and City:**

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8. **Congressional District of University Performing the Research:** Third Congressional District of Alabama.

9. **Statement of Major Regional Water Problem:**

The fiber (pulp, paper, and textile) and polymer industries are the primary processing facilities in the Southeast. In addition to providing tremendous economic impact on the region, they also result in a major ecological impact because of their high levels of fresh water usage and wastewater discharge into our rivers and aquatic resources. In light of the escalating stringency in environmental regulations on the discharge of wastewater from processing facilities and the consistent calls for "zero discharge" targets, the fiber and polymer industries are facing a significant challenge of maintaining economic competitiveness while becoming more environmentally benign. Therefore, it is acknowledged that a critical need for the industry is to have design and operational strategies that can address economic and environmental issues simultaneously.

The objective of this research is to develop comprehensive, cost-effective design and operating schemes that target the optimization of water usage, recycling and discharge in the fiber and polymer industries. Mass-integration methodology will be employed as a systematic framework for identifying optimal solutions to the above-mentioned targets. This integrated approach will not only help the fiber and polymer industries meet environmental regulations for water usage and discharge but will also create an excellent

potential for economic gain for the processing facilities in the Southeast. These economic benefits will accrue as a result of optimizing the usage of water resources, minimizing wastewater treatment costs (it is estimated that water usage and treatment cost \$1.0 - 10.0/ton of fiber product and \$5.0 - 25.0/ton of polymer produced), maximizing the recovery of valuable materials and debottlenecking the process. The program will be supported and monitored by key figures in the fiber and polymer industry. Matching funds have been committed from processing industries in the Southeast; General Electric Plastics Company (in Burkville, Alabama) and the Pulp and Paper Research and Educational Center (located at Auburn University and supported by the major pulp and paper mills in the Southeast).

#### **10. Statement of Results, Benefits, and Information to Be Gained:**

Because of the comprehensive nature of this approach, it is anticipated that the results will be generally applicable to a wide variety of Southeastern fiber and polymer plants. Short-term impact will be in the form of cost-effective implementable solutions to the water problems of the industry. Long-term impact will include the identification of technology changes and best technology-based management practices for the Twenty First Century. The research will also identify priority research needs that should be carried out by research organizations as well as the industry. Four major benefits will accrue as a result of this project:

**1. Ecological:** Because of the tremendous amounts of fresh water used by these facilities and, consequently, the significant discharge of wastewater, this project will have a major impact on the quality of water resources. It will provide unique strategies for managing water and discharge from these industrial facilities. Furthermore, the reduction in chemical content of these discharges will positively influence the public health and quality of life in the Southeast.

**2. Economic:** As a result of the decreased usage of water, the reduced cost of treating terminal wastewater streams, and the less energy required to process water within the processing facilities, the recovery of valuable chemicals from in-plant water streams, and the sustainable ability to cope with tightening environmental regulations, this project will foster the ability of these processing facilities to maintain their international competitiveness and will significantly decrease the prospects of these plants to close or move to other countries with lower wages and less emphasis on the environment.

**3. Technical:** All project results will be monitored by key personnel within the leading fiber and polymer industries in the Southeast. The results will also be continuously communicated with industry. Furthermore, research findings will be refined and implemented within several of these facilities. This is one of very few activities aimed at addressing industrial water/wastewater problems at the heart of the process not through end-of-pipe approaches. This is the inevitable wave of the future for industry. It is also the direction of EPA regulations. The methodologies developed from this project can, therefore, be of significant technical value to the American Industry.

**4. Educational:** In addition to the undergraduate and graduate students directly involved in and influenced by this work (more than 100 students per year), K-12 students will be targeted with a series of seminars and simplified publications that raise their awareness of the importance of managing water resources in industrial facilities.

Because of the systematic nature of this projects, the findings will also be significantly useful to numerous processing facilities in the Southeast. While the scope of work will be focused to work primarily with industrial co-sponsors, results will be shared with the rest of industry. But for the federal funding of this project, many industries in the Southeast will not have access to this type of critical research and results as industrial sponsors tend to keep the results to themselves. Under the umbrella provided by this project, there will be legitimate avenues for sharing the benefit with the industrial sector in the Southeast thereby providing a region-wide significant impact. In Alabama alone, the results of this project has the potential of reducing water usage and discharge by about ***three million tons/day whose treatment cost is roughly \$1.4 Billion/year***. The potential ecological and economic impact of this project can indeed be tremendous.