



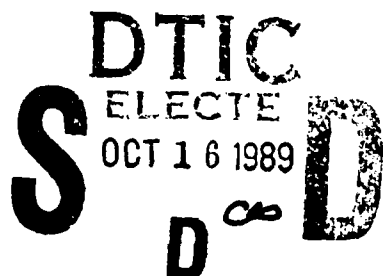
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## PHASE I REPORT

### US ARMY SMALL BUSINESS INNOVATIVE RESEARCH PROGRAM

### ULTRASONIC ENHANCED CLEANING OF FOULED MEMBRANE ELEMENTS FITTED WITH INNOVATIVE SPACERS

Contract No. DAAK70-87-C-0041  
Belvoir Research, Development & Engineering Center  
Fort Belvoir, Virginia 22060-5606



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Unclassified

SECURITY CLASSIFICATION OF THIS PAGE

## REPORT DOCUMENTATION PAGE

Form Approved  
OMB No. 07

## PREFACE

V.J. Ciccone & Associates, Inc. (VJCA) conceived, developed and applied equipment and experimental procedures related to the fouling and Ultrasonic Assisted Cleaning of water treatment membranes. This effort was sponsored by a Phase I Department of Defense Small

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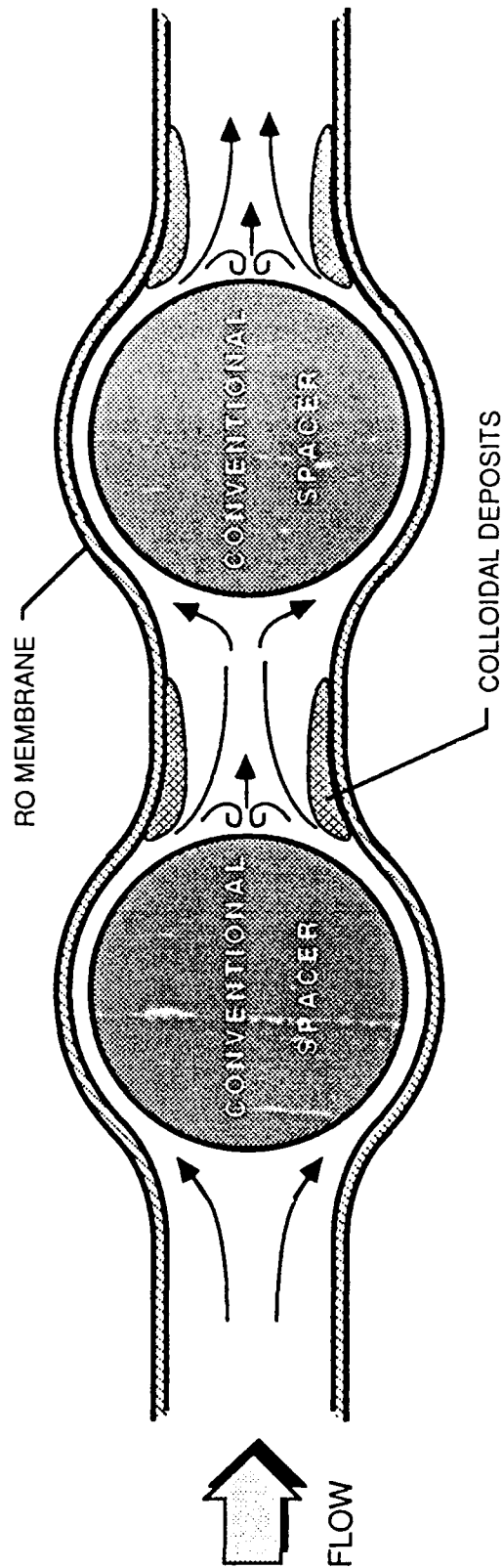
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- c. A fouled membrane will have its surface covered with packed solids which lowers access of feedwater to the membrane and reduces product yield. However, the effectiveness of the membrane may be essentially completely restored once that cake has been removed. Since the deposited materials will significantly increase the weight of the fouled element, the weight loss on cleaning can be used as a measure of cleaning efficiency.
- A third objective of this study was to determine

## **2.0 TECHNICAL APPROACH**

### **2.1 Literature Search**

An extensive literature search was conducted to develop technical information relative to

FIGURE 2-1

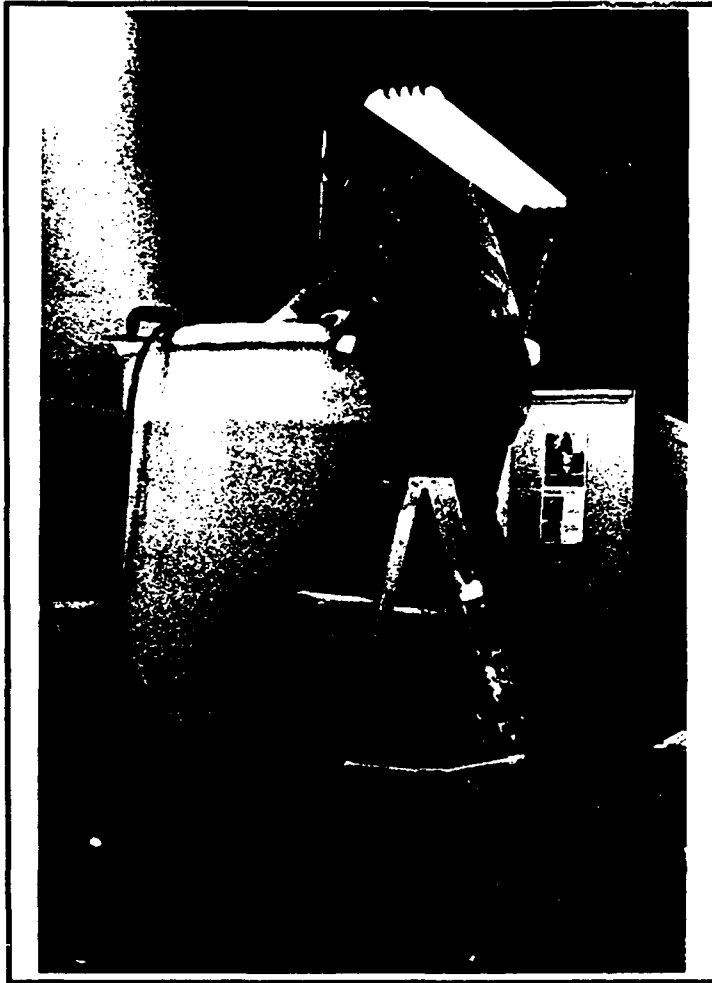
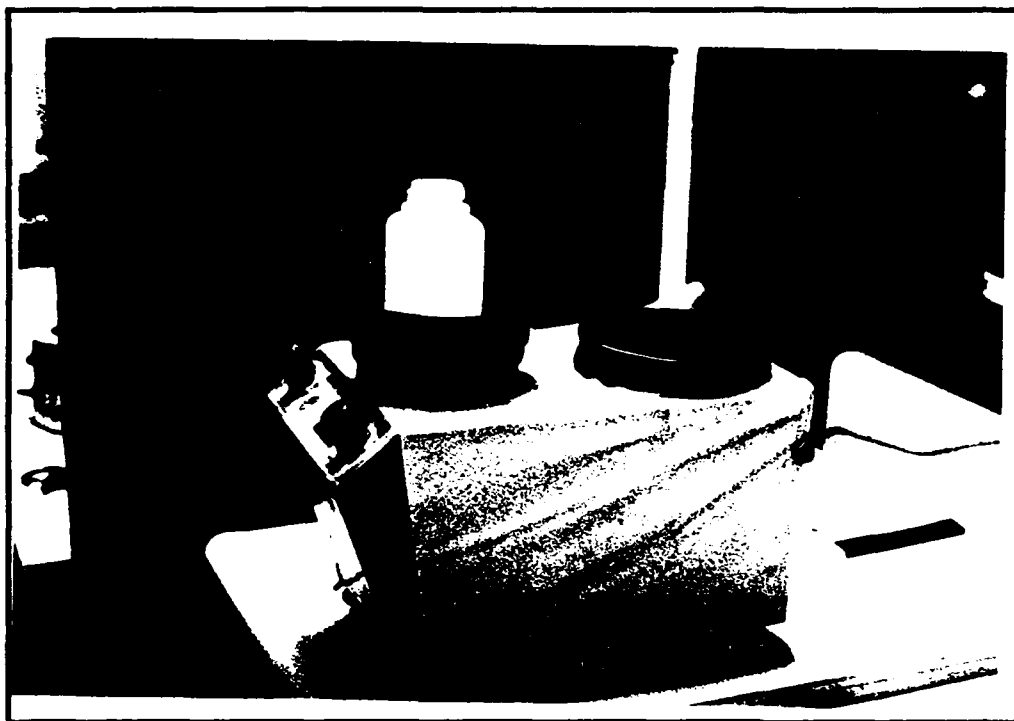




FIGURE 2-3



FIGURE 2-5





e. Since the product water flow was very high compared to the brine flow, it was convenient to measure product water flow in pounds per minute while measuring the brine flow in grams per second. All time intervals were measured by stop watch. Approximately once every two hours the following measures were taken:

- Pounds of product water































