NON-CONFIDENTIAL
REPORT OF ~~THE PHASE II PLANT~~ VISIT
DU PONT'S ACRYLIC FIBER
MAY PLANT IN CAMDEN, SOUTH CAROLINA,
REGARDING THE DEVELOPMENT OF NEW SOURCE
PERFORMANCE STANDARDS FOR THE
SYNTHETIC FIBERS INDUSTRY

I. Place and Date

Du Pont Corporation
May Plant
Camden, South Carolina

April 29, 1980/Revised Version

II. Attendees

Name	Affiliation
Ken Lillard	Du Pont
Larry Robinson	Du Pont
Jake Watson	Du Pont
Reid Earnhart	Du Pont
Roy Manley	PES
Robert Zerbonia	PES
Greg Lathan	PES

III. Discussion

Prior to the plant tour, a meeting was held with the Du Pont personnel and the PES project team. The meeting was initiated with a brief discussion of the plant visit format. PES personnel indicated that the agenda provided by Du Pont representatives was completely acceptable. Du Pont representatives also provided the project team with an Air Emissions Data booklet containing the completed discussion questions previously sent to Du Pont by PES. Also enclosed in the booklet were a series of attachments which contained information related to the questions concerning the plant operation and solvent recovery (Appendix A).

Robert Zerbonia then gave a brief description of Phase II objectives for development of New Source Performance Standards for the Synthetic Fibers Industry.

A generalized process diagram for the production of Orlon^{R} (DuPont's registered trade name for all types of acrylic fiber produced by Du Pont) was provided to PES by Larry Robinson (Figure 1). Mr. Robinson briefly described the process (diagram) and discussed the DMF recovery system. A detailed description of the acrylic fiber manufacturing process was given during the plant tour.

Plant Tour

Production Area.

Since the new source performance standards development for the synthetic fibers industry do not include operations prior to spinning dope, mixing, or blending, a tour of the polymerization operations for the production of polyacrylonitrile from AN was not conducted.

Acrylonitrile is brought to the May plant by tank cars and stored until the AN is metered into the polymerization area. The resulting polymer is filtered and the slurry is blended and stored. The blended polymer is extruded in the form of noodles, dried on a hot air dryer, pulverized, and stored. Dimethylformamide is subsequently mixed with the polymer powder and sent to a large blending tank.

At the mixing stage pulverized polymer falls down a tube into a screw-type mixer. Before entering the mixing tank, DMF is sprayed onto the pulverized polymer in a spray chamber. After being thoroughly mixed, the resulting solution of polymer in DMF falls down into a blending tank or storage vessel where the solution is agitated. The spinning dope is pumped through a heat exchanger which heats the PAN solution to lower the viscosity prior to filtering. The heated solution is filtered through plate and frame filter presses. These frame press filters are hooded to prevent DMF exposure during the time when the filter media is being changed (respiratory protection is also required when changing the filter press media). The used filter media (cellulose) is placed in bins and is repeatedly leached with water until the water used for leaching contains less than a given percent DMF. The water used for leaching is sent to the weak feed line of the DMF recovery system.

The spinning solution is then pumped through spinnerets (containing several hundred holes) using a metering device. The head of the spinnerets are kept hot by a steam jacket. Nitrogen gas enters at the top of the spinning cell and moves concurrently with the emerging filaments. The DMF is volatilized or extracted by the nitrogen gas from the emerging filaments as they travel down the length of the spinning cell. The individual filaments are brought together at the bottom of the spinning cell. Water is applied to this fiber at two points, and the excess run-off water is drained and processed for recovery of DMF. The spun fiber travels to a set of pull rolls which pull the fiber away from the spinning cells. Multiple spinning positions converge to form a single rope or tow which is piddled into cans for storage. Here the fiber is sampled for H_2O and DMF content. Covers are placed on top of the cans to prevent occupational exposure to DMF. All gases originating from the piddling operation are vented to the atmosphere.

The cans containing the spun fiber are transported to subsequent washing and drawing operations. Hot water extracts [redacted] residual DMF, [redacted] AND THIS SOLUTION IS sent to the dilute DMF (weak stream) recovery system.

From the drawing operation, the fiber or tow moves up a semi-enclosed incline. Excess water is drained from the tow before it is crimped. At the top of the conveyor, the tow is crimped. After the crimping operation the fiber contains little residual DMF. After crimping, air is pulled into the covered conveyor belt to cool the crimped fiber. From here, the tow is piddled into a creel can. After the creel operation, the tow is cut wet to form staple prior to drying or is sent directly to a drying operation uncut. At the dryer four tow bands are dried side by side. The steam and hot air from the drying operation are exhausted to the atmosphere. After drying, the tow is placed in cartons.

Three work areas are monitored for DMF concentration at 52 points in each area. Samples from these points are fed into three centralized Miran Infrared Gas Analyzers. These points are monitored continuously.

Recovery System

DMF and nitrogen, vented from the spinning cell, are routed to a condenser. The nitrogen gas from the condenser is sent back to the top of the spinning cell where it is reheated and again used in evaporating the DMF from the extruded filaments. The condensed solvent is sent to a "strong feed" holding tank (termed "strong feed" because this portion of the recovery stream is very high in DMF concentration). The liquid stream from the strong feed holding tank is next routed to the bottom of a large distillation column where the DMF is recovered.

Aqueous DMF streams from the spinning, washing, and drawing operations are sent to a weak feed holding tank (termed weak feed because these liquid waste streams contain low concentrations of DMF). In addition, the gaseous exhaust (emissions) from the end or bottom of the spinning lines is sent to a scrubber. The scrubber solution containing DMF and H_2O is also fed into the previously mentioned weak feed line. The liquid from the weak feed holding tank is vaporized and sent to the top of the distillation column.

Pure DMF recovered from both the strong and weak feed streams from the distillation column is sent through a cooler (heat exchanger) and solvent deionization process. It is subsequently stored in a solvent storage tank along with any make-up solvent needed in the process. The stored DMF is then used in the dissolving stage to dissolve the powdered polymer.

After the plant tour another meeting was held between Du Pont personnel and PES project team to discuss the agenda (Appendix A). Mr. Ken Lillard, Du Pont, reviewed the agenda and provided the Du Pont responses to the various questions. Mr. Lillard also noted that not all the cost data request in the agenda is being provided. Du Pont officials feel that the cost figures related to the overall process are extremely sensitive; and, therefore, only the cost data on the recovery system were provided.

Air Emissions Data Manual

April 29, 1980

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TABLE OF CONTENTS

PACIFIC ENVIRONMENTAL SERVICES/EPA VISIT - MAY PLANT
APRIL 29, 1980

VISITORS

Robert Zerbonia	Pacific Environmental Services
Roy Manley	Pacific Environmental Services
Greg Lathan	Pacific Environmental Services
Dennis Crumpler	U. S. Environmental Protection Agency

MAY PLANT

C. F. Mullikin	Plant Manager
S. P. Young	Safety, Health, and Environmental Affairs Manager
J. F. Watson	Safety, Health, and Environmental Affairs Supervisor
C. R. Earnhart	Process Supervisor - Environmental Control
L. G. Robinson	Senior Research Engineer - Orlon® Research & Development
K. C. Lillard	Senior Research Engineer - Environmental Control

AGENDA - APRIL 29, 1980

9:00 A.M.	Planning Center

- Welcome and Review Agenda

9:30 A.M.	Planning Center

- Plant Tour

10:30 A.M.	Planning Center

- Discussion of Data

12:00 Noon	Lunch
12:45 P.M.	Planning Center

- Discussion of Data

2:00 P.M.	Break
3:30	C. F. Mullikin's Office

- Summary of Discussions
- Follow-up Information, if Needed

APPENDIX A

Plant Survey Agenda

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ATTACHMENTS 1-18

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Figure 1

Orlon Process Diagram

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