Allied Chemical

Fibers Division
P.O. Box 166
Moncure, North Carolina 27559
(919) 542-2200

October 27, 1980

Mr. Don R. Goodwin, Director
Emission Standards & Engineering Division
United States Environmental Protection Agency
Research Triangle Park, North Carolina 27711

Dear Mr. Goodwin:

Please find attached our response to your request for information about emissions at the Moncure plant. A portion of this response has been designated as confidential and has been separated and labeled per your instructions.

I trust this information will meet your needs; but should you have questions or if further clarification is required, please advise.

Sincerely,

ALLIED CHEMICAL CORPORATION

R K Smith

R. K. Smith, Supervisor
Environmental & Industrial Hygiene

RKS:jh

Attachments

POLYMERS & RESINS PROCESSING
REQUEST FOR INFORMATION

General Information

1. Polyester polymer (polyethylene terephthalate)

2. Allied Chemical Corporation
   Fibers & Plastics Company
   Moncure, North Carolina

3. Plant contact:

   Mr. R. K. Smith
   Supervisor, Environmental & Industrial Hygiene
   Allied Chemical Corporation
   Post Office Box 166
   Moncure, North Carolina 27559

   Telephone: (919) 542-2200, ext. 254

100-1-542-2200

Process Information

1. PROCESS CAPACITY: See confidential information

2. PROCESS NAME & TYPE: Zimmer process for polyester from ethylene glycol and terephthalic acid

3. PROCESS DESCRIPTION: (See attached process diagram.) Terephthalic acid (TPA) and ethylene glycol (EG), containing catalysts, are mixed into paste form in paste mixer MX-14 for feeding to esterification. Combination of these materials into paste form provides a simple means of introducing them to the process and allows more accurate control of the feed rates.

   MX-14 includes a vent scrubber to eliminate dust problems. EG feed flows into a manifold that sprays the glycol through many small slots around the periphery of the vent line. This EG scrubs the TPA laden nitrogen exiting the vent line. The TPA and EG are mixed together by two (2) kneeding elements working in opposite directions. Feed rates and paste recycle are controlled to maintain an optimum "paste density" or weight percent TPA. Four (4) gear pumps meter paste to the initial esterification vessel.

   The esterification of the TPA with EG is carried out in three (3) vertical, cylindrical two-stage vessels, APT-101, APT-104 and APT-107. The vessels are staged to prevent short circuiting and heat and agitation are provided. Residence time is controlled by control valves in the transfer lines between each vessel, the differential pressure between each vessel providing the motive force. The by-products of the esterification reaction are carried over as vapors to condensers C-110/111 (two units - one is off-line spare). These condensers employ non-contact cooling with process cooling water and also have glycol sprays to minimize fouling and pluggage.

   The prepolycondensation step is carried out under vacuum on two (2) vertical, cylindrical, two-stage reactors, APT-114 and APT-117. In the prepolycondensation step, esterification is completed and the joining of short molecular chains is encouraged by removal of EG. Again, the natural pressure difference between the vessels is the motive force for product flow and residence time is controlled by control valves on the reactor inlet. Prepolymer is pumped from APT-117 by transfer gear pumps. EG and other vapors are removed from each reactor by vapor lines to separate glycol spray condensers. Vacuum pumps are employed to provide vacuum for these reactors.

   Polycondensation is carried out in horizontal cylindrical vessels (APT-201 and APT-301 or APT-401) under vacuum and continuous agitation. These vessels employ rotating wheels to create large surface exposure for the polymer to facilitate the removal of EG produced by the interchange reaction between the glycol ester ends. Product transfer is via a screw pump and subsequent gear pumps. Vacuum is provided by a series of steam jet ejectors and contact cooling water condensers. The process cooling water system employs atmospheric cooling towers.

3. (Con't)
The polymer from APT-301 and APT-401 is either conveyed directly to the melt spinning process or is quenched and pelletized to form a resin.

Spent ethylene glycol (SEG) which is recovered at various locations in the process is sent to storage and is returned to our suppliers for recovery and purification. An atmospheric distillation column (CL-1) is employed both to concentrate the SEG stream and to provide treatment of the blowdown from the cooling towers.

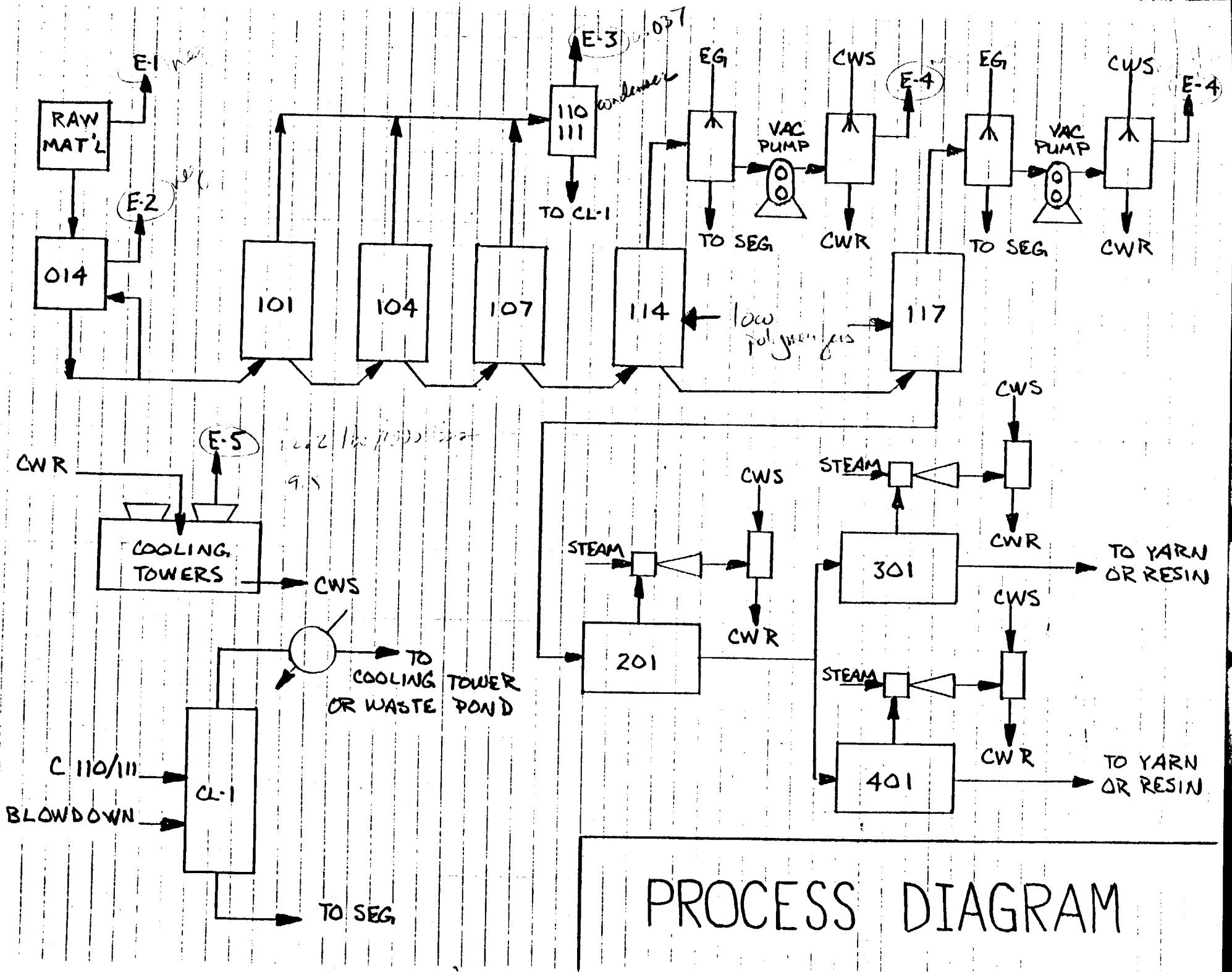
4. EMISSIONS: (Reference drawing in item 3)

- Emission #1 would include losses from the storage and transfer of raw material. These emissions are believed to be negligible but have not been sampled for or estimated.
- Emission #2 is a vent line from the paste mixer. Venting is to atmosphere at ambient temperature. Emissions are believed negligible but have not been sampled for. Each of the two (2) polymer trains would have one vent.
- Emission #3 is a vent line from the esterification condensers. Each of the 2 polymer trains has one vent on-line. Vent temperature ranges from 80^{o}F to 100^{o}F, and pressures are variable as the vent system "breathes". Emission of organic compounds are estimated at 1.0 pounds/hour for each train or a plant total of 2.0 pounds/hour.
- Emission #4 is venting from prepolymerization vacuum pumps. Each polymer train has 2 pumps on line. Venting is at ambient temperature and pressure. Emissions are considered negligible.
- Emission #5 includes fugitive emissions at the distillation column and drift and evaporative losses at the 2 process cooling towers. Total emission from these sources are estimated as: oligomers and other solids at 3.3 pounds/hour, ethylene glycol at 127.0 pounds/hour and other organic compounds at 36.0 pounds/hour.

5. DISCUSSION OF EMISSION ESTIMATES: The emission points from the process do not lend themselves to standard stack testing techniques. Emissions have been estimated from a process material balance utilizing flow and chemical composition data for various process streams. This technique also has limitations as small variations in the results of sampling can yield large discrepancies in emissions. The number of data points is also quite small and the accuracy level of emission estimates can only be considered fair.

Under certain conditions, process emissions can vary significantly from the average values given. These conditions include glycol flushes of final reactors and process upsets involving rupture disc failures on the esterification vessels.

Heat is supplied to the polymer process by a heat transfer system utilizing dowtherm A. Emissions from this system have not been discussed or included.


RAW MAT'L
E-1
E-2
014
101
104
107
110
111
E-3
condenser
TO CL-1
EG
TO SEG
VAC PUMP
CWS
CWR
E-4
114
low pressure
117
CWR
COOLING TOWERS
CWS
E-5
TO COOLING TOWER OR WASTE POND
C 110/111
BLOWDOWN
CL-1
TO SEG
STEAM
201
301
401
TO YARN OR RESIN
PROCESS DIAGRAM