CASE STUDY: E.I. duPont de Nemours & Company - Cape Fear Site

Location:	Wilmington, NC (Brunswick County)
Industry:	Textile manufacture (SIC 2800)
Pollution Prevention Application:	Process modifications
Annual Savings:	Not applicable
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Background

DuPont's Cape Fear facility is the largest site in the U. S. devoted to the production of polyester intermediates and Dacron polyester yarn and staple. Dacron is used in the manufacture of apparel, home furnishings, and automotive upholstery. The facility employs 1,130 people.

Waste Reduction Activities

Development of Polymer Grade Terephthalic Acid

In the past, polyester fiber was produced at the facility in a multi-step, continuous polymerization process. During the intermediate steps, paraxylene was reacted with acetic acid to produce crude terephthalic acid (TPA). TPA was then reacted with methanol to produced molten dimethyl terephthalate (DMT). Reaction between DMT and ethylene glycol produce polyethylene terephthalate resin (PET) which was drawn into fibers. The PET or polyester staple was cut and placed into bales, and polyester yarn was placed on spools for shipping. Methanol and ethylene glycol by-products were produced during the process.

After extensive re-engineering efforts, the facility is now able to produce a polymer grade TPA which is reacted with ethylene glycol to produce the PET resin. This modification completely eliminates an intermediate step in the reaction process and the emissions associated with that process. The methanol by-product associated with DMT production and the methanol emissions also are eliminated.

PET Recycling Facility

During fiber processing, large quantities of PET waste were produced and landfilled as solid waste. The facility is presently installing a PET recycling facility which will reprocess this material. The PET material will be converted to DMT and glycol via methanolysis. The DMT will be sold to other facilities for fiber production while the glycol is reused in the production process. All major emissions of VOC generated during the recycling process will be diverted to a Dowtherm process heater for waste heat production.

Glycol Recycling

With the shutdown of the DMT production facilities, duPont was able to modify idle process equipment to a glycol recycling/refining facility. This facility accepts glycol from all duPont's Dacron facilities and purifies millions of pounds of spent glycol annually.

Polymerization Line Modifications

The Cape Fear site has also focused on source reduction in the continuous polymerization units. Innovative process modifications have permitted significant reductions in process temperatures, which, in turn, reduce compound volatilization and atmospheric and waterborne emissions of VOCs. The volatile organics generated during the polymerization process are now separated from process materials and fed to existing fuel burning units to provide steam to production processes. The fibers facility also modified the exchanger vents and methanol tank vents to reduce methanol emissions.

Waste Reduction

The conversion from DMT to TPA reduced the facility's SARA 313 reportable emissions by 36 percent. The glycol refining facility operating with the equipment previously used for DMT production recycles 150 million pounds of glycol annually. The new PET recycling facility will divert 150 million pounds of previously landfilled material for recycling to DMT and glycol for reuse. Re-engineering of the continuous polymerization lines reduced atmospheric emissions of air toxics and carcinogens by 80 percent and organic loading to the wastewater treatment plant by 90 percent. The combined result of these projects is that SARA 313 air emissions have been reduce 51 percent since 1987; the projects have set the stage for an expected 70-percent reduction by the end of 1995.

Additional Activities

The site has made significant strides in overall waste reduction in other areas. The intermediate facility has installed a thermal catalytic oxidation unit which abates organic emissions from various process vents. Reductions of 40 percent in benzene and 20 percent in methyl bromide have been realized through the installation of this unit. A cobalt catalyst used in the production of intermediates is now recovered at a rate of 2.3 million pounds per year. Approximately 30,000 pounds per year of spent solvent were eliminated from laboratories and parts washers when halogenated solvents were switched to non-halogenated solvents.