<table>
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<th><strong>General Overview</strong></th>
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<td><strong>Production:</strong> 220,000 metric tons/year Pipe Grade Resin (K=67)</td>
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<td><strong>Documentation:</strong> Mostly electronic and excellent for equipment, operating procedures and P&amp;IDs</td>
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<td><strong>Upgrades:</strong> Modified in 1995 to include the EVC technology stripping system ($30 MM project)</td>
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<td><strong>Process Control:</strong> Provided with an “Advanced System” by ABB. All field instrumentation is electronic</td>
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| **Equipment:** (6) Reactors (18,000 gallon)  
(6) Rotary Dryers  
(2) Strippers |
Key Pieces of Equipment

- (2) Stripper Columns with 34 dual flow trays:
  Duplex 2205 stainless steel, 230 gpm, 5.3 ft. dia. X 35 ft. h. x 0.3150"
- (6) Bird Centrifuges
  75 hp, 24” x 36”, 304LSS, 50,000 lb/hr, 1,775 rpm
- (6) Bartlett-Snow Rotary Dryers:
  13,000 lbs/hr, Air, PVC, Resin, CO₂
- (6) Reactors-Closed Lid Type (18,000 G, 68 m³):
  304LSS, 11.8 ft. (dia). X 18 ft. (h), bottom entry agitator
**Major Equipment**

**PVC Resin Slurry Stripper System**

- EVC Technology
- (2) Identical Stripping Towers, (1) Dump Tank and (1) Stripper Feed Tank, Built 1995
- Duplex Stainless Steel Construction
- VCM Recovery System Includes
  - (2) Bingham Vacuum Liquid Ring Pumps
  - (4) Nash Liquid Ring Compressors
  - (3) Condensers and (2) Seal Water Coolers
PVC Resin Slurry Stripper Centrifuge and Drying System

- (6) 24x36 Bird Centrifuges
- (6) Gas Fired Bartlett-Snow Rotary Dryers
- (6) Bag House Dust Collector Air Separators
- Transfer System to Silos w/Railcar or Truck Loading
- Last Dryer System Installed in 2002
Major Equipment

Auxiliary Equipment

- Additives Preparation Facility
- VCM Railcar Unloading and Storage Sphere
- ABB Control System and Control Building (Installed in 1995)
- Water Strippers, Emissions Recovery and Thermal Oxidizer
- Utility Systems
This facility produces polyvinyl chloride polymer resin (PVC) by polymerizing vinyl chloride monomer (VCM) in a water/PVC slurry. After the polymerization step is completed, residual vinyl chloride is stripped from the polymer slurry (two strippers).

Product goes through (6) Bird centrifuges and then to (6) natural gas fired rotary kilns to dry the wet cake. Pneumatic conveying systems transfer the dried PVC polymer resin to product silos before being shipped to the customers.
Process Description

The raw material VCM arrives by rail and is unloaded into the 5 MM lb capacity storage sphere. There are also two large bullet tanks for additional VCM storage capacity. There is no VCM gas holder in this process.

Although it may appear to be six individual lines, the product comes together several places in the process so that the resultant end product is completely homogenous.
The raw materials (VCM, water, suspension agents and catalyst) are added to the reactor for each batch. The reactors typically run at about 105 psig @ 135°F with a batch cycle time of about 5 hrs, depending on which steps are included. The 18,000 gallon reactors are 1” thick stainless steel (304L) and are rated for 200 psig @ 200°F. They are jacketed for heating or cooling (800 gpm cooling water flow). They are agitated with 1 set of paddles coming up through the bottom of the reactor with 200 hp drives. Organic peroxide catalysts (front-end and back-end catalysts) are used to initial the polymerization of VCM. About 80% of the VCM is converted to PVC on each batch in the reactor. The 20% unreacted VCM is recovered and recycled back to the reaction unit. The process uses direct steam into the reactor for the initial heat up. This is more efficient and has also led to much more reliable reactor jacket operation. The reactors are also cooled by a unique process. The 2,612 sq. ft. condensers are mounted directly on top of the reactors in the vertical position and actually cool the reactor while condensing overhead VCM vapors. They have 1” dia. x 10’ long tubes made of 304L stainless steel with cooling water on the jacket running at 2,500 gpm per condenser. Alpha-methyl-styrene (AMS) is used as a “kill agent” for stopping any runaway reaction. The entire process is continuous after the polymerization reactors.
The stripping process was modified in 1995 when EVC technology was purchased. The total project cost $30 MM. Prior to this, the unreacted VCM was stripped in the reactors, which greatly reduced overall production. Two spiral exchangers made of Duplex 2205 stainless steel (1,313 sq. ft. each) are used for the stripping condensers. The agitated dump drum holds 40,000 gallons and is made of 304L stainless steel. The agitated stripper feed vessel holds 10,750 gallons and is also made of 304LSS.

The (2) stripper columns are 64” dia. x 35’ tall with (34) dual-flow trays. The columns are made of Duplex 2205 stainless steel. These columns can accommodate 230 gpm of process flow in each stripper.
The VCM recovery system includes (2) 60 hp Sulzer-Bingham Model 4G vacuum pumps (780 acfm each) and (4) 150 hp Nash Model 1256 compressors (400 acfm each). All of this equipment is “liquid ring” technology and comes with the liquid ring pumps and condensers.

The PVC slurry proceeds to (6) Bird 24” x 36” centrifuges. These units spin at 1,775 rpm and can handle 50,000 lb/hr of slurry each. They are constructed mainly of 304LSS and higher alloys and have 75 hp drive motors.
The 13,000 lb/hr Bartlett-Snow rotary kilns are direct fired so that the combustion gases are contacting the wet product. This efficient process removes almost all of the 30% water content from the centrifuge outlet product. The kilns operate at 400°F inlet and 200°F outlet. They are approximately 8’ dia. x 38’ long and rotate at about 7 rpm. Five of them are made of solid 304L stainless steel and the newest kiln (2002) is stainless steel-lined. The 2002 kiln is also larger at 9’ diameter by 40’ long. Filtered air is fed to the burner and dust collectors are used to remove PVC particles from the discharge gases.

The product is classified in vibrating sieves (6) and then a dilute phase pneumatic transfer system is used to transfer the finished PVC powder. The system uses stainless steel transfer lines.
There are (4) large carbon steel storage silos for the finished PVC. They each hold 470,000 lbs (density of PVC powder is 50 lb/cu. ft.). Two of the large storage silos are mounted on weigh cells. There are (6) 304LSS railcar loading silos positioned above that the loading area so that railcar loading is gravity fed.
Utilities

There are (2) instrument air compressors in this facility. The first is a Cooper-Joy turbo compressor with a 425 hp drive. The second is a Sullair Model 375 with diesel drive for power outage backup capabilities. There is a very small Kohler generator.

Incoming electricity is 12 kV, dropped down to 460 V using (3) large transformers rated at approximately 2,300 kVA each. There are (2) main switchgear rooms. The older facility uses Westinghouse equipment and the newer facility (1995) uses Siemens and Allen-Bradley equipment.

There are (2) steam producing boilers in this facility. The larger unit is a 1976 Babcock and Wilcox Model producing 60,000 lbs/hr of 250 psig steam at 400°F (typically run at 150 psig). It is fired by natural gas or landfill gas, which is supplied by pipeline from the local landfill (575 BTU/lb versus 1,000 BTU/lb for typical natural gas). The national board number on this boiler is #24224, and it has 498 sq. ft. of surface area on the tubes. The smaller boiler is a 20,000 lbs/hr Titusville unit with Coen burners.

There is a small thermal oxidizer in this facility which includes a small caustic scrubbing system.

There are (3) electrical and (3) diesel driven fire water pumps in the far corner of the facility.
PVC plant is built in a "modular" manner, with several pieces of equipment in parallel. If less production is desired, reactors, less dryers, etc. can be removed/eliminated to make it energy efficient. Additional equipment can be stored in the yard, ready for a future production increase.

A used PVC plant, will save investment capital (up to 50%).

Purchasing a used PVC plant will reduce project implementation time by half, as production will begin quicker. Because our plant can be easily moved and installed, with all technical data, foundation design, piping sketches, lay-out, etc. included. We also have experience to recover piping and structures.

You can enrich your present technology by acquiring up to date technology included with the plant.

This plant includes extensive documentation, including records of production, quality, safety and consumption achievements.
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