Engineering Resins
Johnsonville Site Overview
April 2010
WPR Johnsonville, SC Site
Manufacturing Facilities

- Fiber Plant & Warehouse
- Engineering Resins
- Lanolin
- Building 12
- Facilities Maintenance
Johnsonville Site History


- 1964 Wellman begins to produce nylon and, shortly afterward, polyester staple fibers and plastic resins from recycled raw materials.

- 1968 Engineering Resins becomes a separate division to manufacture nylon engineering resins from recycled raw materials.
  - Installed the first twin screw compounder in 1977, which allowed us to produce a variety of highly filled resins.

- In 1998 we established a collection point in Atlanta for collecting, sorting, screening, and baling post consumer carpet.

- 1979 Wellman established a PET soft drink bottle recycling facility.
  - MRD upgraded in 1998 from deposit bottle to full curbside bottle capability
  - Expanded the bottle recycling operation in 1993.
Engineering Resins Market

- North America market over 1 billion pounds of nylon.

- The automotive sector uses more than 500 MM lbs.

- Our business focuses on the 350-400 MM lbs. that is under the hood applications.
Major Applications

- Fans & Shrouds
- Support Brackets
- Carbon Canisters
- Air Cleaners
- Head Lamp Bezels
- HVAC Doors
- Quick Connects
- Gasket Carriers
- Cam Covers
- Beauty Covers
Post Consumer Raw Material (carpet)
Our Advantage

- Engineering Resins has utilized PCR carpet in our raw material mix since 1996. We have shipped over 150 MM lbs. of engineering resin with carpet content since 1996.

- During 3rd Quarter of 2007 we developed and implemented a two stage carpet recovery process that provides a very high purity of nylon for our raw material mix.

- Cost advantage provides a “green” source of raw material that decouples us from the high cost of chemical based raw material.

- Over 2 billion pounds of face fiber goes to the land fills annually.

- Engineering Resins is a leader in processing non-traditional waste. We have over 40 years of recycling experience.

- Engineering Resins is a leader in sourcing and processing post consumer carpet. We have 12 years experience in providing the automotive industry with a quality product.
Quality

- **Product Design and Development**
  - Technical Service and R&D work with customers to determine performance characteristics

- **Testing**
  - Over 40 quality control checks during the process
    - Prior to raw material processing
    - During compounding
    - After compounding
    - During storage

- **Systems**
  - Quality Assurance through ISO/TS Procedures
    - CPAR System
    - Root Cause Analysis
    - Customer Feedback
    - Product Certifications
  - Six Sigma
  - Employee Participation
    - WIN System
    - Employee Luncheons

- **Quality Accreditations**
  - Lab ISO / IEC 17025:2005
  - ISO/TS 16949:2002
  - ISO 9001:2000 (Raw Material Building 12)
ER Compounding
Processing Equipment

- Capacity to produce over 70 MM lbs
- Multiple compounding lines utilizing twin screw extruders that provide a flexible manufacturing operation.
- Various additive feeding systems to handle over 100 different additives for our resins
- The integration of the twin screw extruders with the additive systems, dryers, material handling systems, blenders, process controls and packaging systems provide a unique technology to compound nontraditional raw material that meet rigorous specifications set by the automotive market.
Engineering Resins Manufacturing
Competitive Advantages

- Raw Material Blending
  - Can Use Wider Range of Materials
  - Enables use of PCR
  - Improved Product Performance and Consistency

- Can Run Fiber Waste without Densification

- Multiple Machine Sizes / Common Vendor
  - Can Run Both Large and Small Lots
  - Allows for Quick Changeovers
  - Common Parts Supply

- Water Slide Pelletizing / Quench

- Finished Goods Blending
Two concerns about the cost of plastics in the future

(1) The obvious concern is about the cost of feedstocks since benzene, cyclohexone, butadiene and other basic chemicals that are the building blocks for plastics all come from oil, and the price of these chemicals all track the price of oil.

(2) The not-so-obvious concern that might be even bigger is that the Middle East has finally discovered “value added.”

(a) Why ship oil around the world and have others produce these chemicals when they can be produced in the Middle East for “value added?”

(b) As a result of this new thinking, the whole chemical industry is in the process of moving to the Middle East.
That is why we are seeing headlines like this:

- Dow-Aramco will have a $22 billion joint venture on line by 2012 to produce 300 petrochemical products in Saudi Arabia

- Exxon Mobil-Qatar will have a $3 billion joint venture on line by 2012 to produce a wide variety of petrochemicals in Qatar

So plastics will be more tied to the Middle East and OPEC in the future than today.

The sheiks will get richer faster due to value-added.
Grow auto industries faster:
Decouple the cost of plastics from the cost of oil.

(1) One approach has been to try bio-plastics from renewable sources like corn, but:
   (a) these products are still way too expensive
   (b) they normally do not have high enough heat resistance for under-the-hood applications
   (c) today there is fear they will drive up the cost of food in the future and add to global starvation.

(2) However, there is a second low cost approach that Wellman is already using that:
   (a) essentially decouples the cost of nylon and polypropylene (the two big under-the-hood plastics) from the cost of oil.
   (b) has no connection to the Middle East

What is that second approach?
Use post-consumer carpet as the raw material for injection molding resins.

1. **Collect** the used carpet from homes, offices, and hotels
2. **Sort** the carpet by type:
   (a) Nylon 66
   (b) Nylon 6
   (c) Polypropylene
   (d) other
3. **Remove** the nylon from the carpet by a special patented process
4. **Extrude** the nylon into injection molding resin by adding mineral, glass, or other additives.
5. **Sell** this nylon injection molding resin to injection molders in the BRIC countries who make car parts.
We have successfully replaced Metal and Glass Filled Nylon applications with our EcoLon® Post-Consumer Recycled (PCR) Nylon Mineral/Glass compounds.

Our customers have realized **significant cost savings** during this process!!

**For more information contact Kurt Wagoner @ 248-645-0032 ext#14**

Or customer service @ 800-821-6022
Wellman EcoLon® 2000

The square yardage of carpet being diverted from landfills by using EcoLon® Engineered Resins Products is equivalent to 1000+ football fields per year.
In conclusion

(1) Wellman has been recycling post industrial nylon for 50 years and post consumer resin from used carpet for about 12 years. We are the only ones recycling post consumer carpet into injection molding resins that we know of today.

(2) We have proven that one does not have to start with virgin resin and then switch to post consumer resins. We have implemented many new applications with 100% post consumer nylon Ecolon products. And many more news ones on the horizon.

(3) Because of the cost pressures in emerging markets and the importance of lower cost plastics for growth of their auto markets, we believe resins decoupled from the cost of oil have an outstanding future in emerging markets!
Johnsonville Idle Manufacturing Processes
Fiber Plant

- Fiber Plant
  - 235 Million Pound Extruder Based Fiber Plant
    - Polyester or Nylon
    - Recycled Waste Stream or Virgin Raw Material
    - 3 - 45 dpf Final Product Deniers
    - Solid, Hollow, Spiral, Delta, Trilobal Cross-Section Fibers
    - 0.5” – 7.5” Cut Length
    - 6 Spinning Units / 7 Drawlines
  - Smallest Line ~17 Million Pounds per Year
  - Largest Line ~70 Million Pounds per Year