Application Design Advances Through Plastics

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Plastics Technology Advances

- Materials
- Process/material combinations
- Rapid prototyping
- Design and collaboration tools

Result:

- **Inspires new designs**
- **Creates new product categories**
- **Faster product introductions**

Plastic Packaging

- Injection-blow molding of bottles
- Stretch blow molded bottles
- Blown film technology
- Multi-layer films
- Enhanced polyolefins and PET

Result: Explosion of plastics into food and industrial packaging

Electronics Packaging/Design

- High performance polymers
- Thin-wall molding
- Cell phone and laptops evolving with continuous improvements in materials and processes

Result: Smaller and smaller electronic interconnects and devices

Medical Disposables

- Improved patient protection and comfort
- Reduced costs of care
  - Examples
    - Catheters
    - Syringes
    - Surgical drapes

Sports/Recreational Items

- Many innovations in sports equipment and recreational vehicles would not be practical without plastics
- Able to offer better performance to user via improvements in materials, design, and construction

Household Items and Toys

- New categories have opened up
- Unique items developed because of blow-molding, rotomolding and improved colorants for polyolefins

Automotive

- Soft-touch interiors
- Molded-in-color body panels
- Regulatory pressures leading to push for more use of polyolefins and TPOs
- Alternative fuels and fuel cell technology

Specific Examples

In the next series of slides we will offer some examples of product innovations enabled by advances in plastics technology…

Teledyne's Water Pik Shower Massage™

- Did research on consumer habits and needs
- Adapted hand-held showerhead to be more user-friendly
- New soft-touch handle, longer hose and flexible spray nozzles

Innovative Toys

- Use of CAD and rapid tooling techniques
- Often have tight tolerances
- Incorporate state of the art in material and process know-how
- Have complex shapes
  - E.g. Lego, K'nex

Appliances - Electrolux

- Developed proprietary polypropylene material with noise dampening and vibration absorbing properties
- Pioneer in incorporation of more plastics in appliances

Automotive - Dow Chemical

- Developed fabric-free molded polyurethane foam technology
  - Replaced fabric or leather
  - Cost savings and durable soft-touch material
  - Recyclability
- More opportunities for the new technology in automotive seating and headrests, office furniture and stadium seating

Innovative Material/process combinations

- TPEs and multi-shot molding enabled "Soft Touch"
- Improved product performance and added functionality
- Enhanced color and recyclability

Automotive Industry

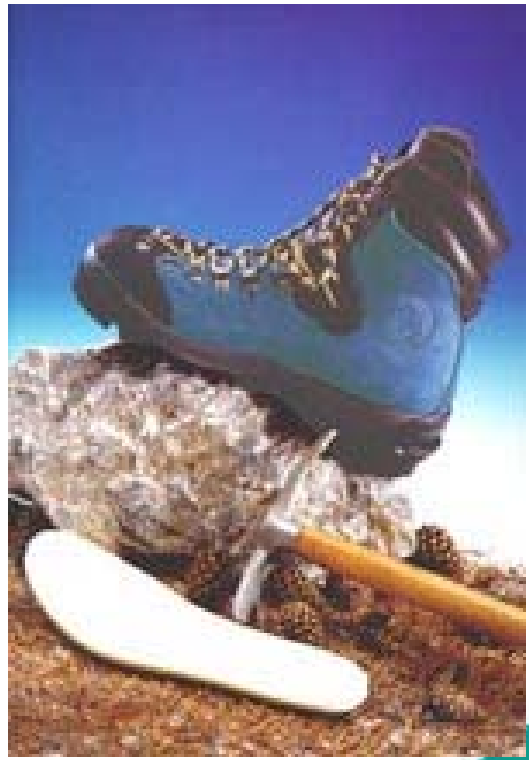
- 1st to embrace TPEs
- Today's applications
  - Range from boots,knobs, fascia and bumper systems to instrument panels

Other Industries

- Consumer products, personal care, sporting goods, appliance and medical
  - Many and varied applications
  - Formulations customized to specific end-users

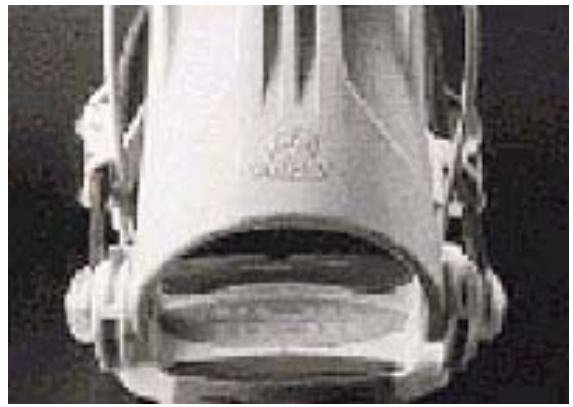
Sporting Goods

- La Sportiva-High-performance mountain and trekking boots
  - **Key to new design- innovative insole**
- Steel shank overmolded with Hytrel



Sporting Goods-Winter

- TPE exterior components on snowboards and cross-country skis
- Ski boots-bindings

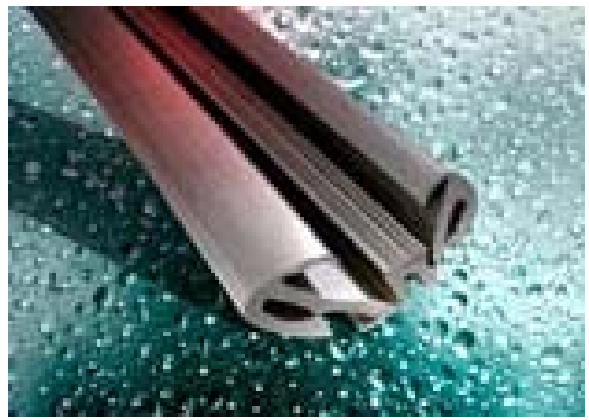


Bike Handles

- Sram
  - TPE shifter grip overmolded on a nylon-looks like integral part of handlebar
- Orange
  - Use TPE grips which offer comfort, superior control and better hold

Seals and Gaskets

- US Farathane
  - Foam in –place heating and AC seal doesn't require adhesives
  - Brake reservoirs
- Hood to radiator seal (Picture)



Consumer Products

- Camera
  - Styrenic TPE compound and two shot injection molding enabled Kodak a weather resistant, waterproof and colorful camera

Consumer Products

- Great Grips-helps seniors and arthritis sufferers turn doorknobs, faucets and other slippery devices
  - 14 A styrenic TPE
- Imperial Shrade
  - Styrenic TPE multi-shot molded with a durable polypropylene to form a one-piece, safe-t-grip (picture)

Baby Products

- The Fascination Station
  - Custom formulated styrenic TPE overmolded on a polypropylene handle
- "Too Hot" Spoon
  - Styrenic TPE molded to a polypropylene handle

Hand Tools/Equipment

- Klein Tool
  - Two different durometers of Noveon TPU
    - Toughness and abrasion resistance along with colorability, comfort and shock insulation
- Elastolatch
    - A two piece Hytrel latch replaced a spring-operated latch consisting of nine metal and plastic parts (picture)

Apparel

- Shoe soles- enhanced durability and flexibility- So.F.Ter(picture)
- Lego Watch(picture)
- Bioform Bra-glass-reinforced PP with TPE cup
- TPU Film for breathable apparel

Innovation in Solid Waste Management

- Management of plastics in the environment has offered challenges as well as opportunities for innovation
- Leading the way to material and energy efficiencies

Packaging in the Plastics Industry

- Amount of material in packaging minimal
- More products being marketed as concentrates
- Thinner gauge blown film in bags
- Trend to minimize packaging in fashion industry

Advances in Packaging Technology

- Improving strength and barrier properties
- Efforts by material and equipment suppliers to make plastics overall energy efficient
- Trend to continue
- Collaboration in solid waste management is yielding favorable results

"Win-Win" Solutions

- "Sanity" or rationality is emerging
- Systems/collaborative approach needs to be taken for plastics waste issues
- Result in economically viable solutions
- Need a continued trend to "life cycle" responsibility by manufacturers

Coca-Cola Change in Emphasis

- Once saw itself as marketer of soft drinks
- Now more responsible in packaging
- Lightweighted each of its packages by 40%
- Trying to educate consumers in recycling programs
- Now uses 10% recycled PET in 3 of 4 NA bottles

Biodegradable Polymers In Textiles/Fibers

- Cargill Dow-introduced PLA in 2000
  - Unifi fiber yarn
    - Draper Knitting Company
    - Kanebo
    - Penn Nyla

Biodegradable Polymers in Textiles/Fibers

PLA

- Bridge the gap between natural fibers and synthetic
  - Superior hand and touch
  - Drape
  - Comfort
  - Moisture management
  - UV resistance
  - Resilience

Biodegradable Polymers In Textiles/Fibers

- Cargill Dow
  - Working closely with industry leaders and brand-name customers

Biodegradables in Packaging

- Cargill Dow PLA
  - Golf ball packaging
  - Package for radios
- Earthshell
  - Replace polystyrene cups
  - Clamshell package for McDonald's

Other Innovative Applications

- Biodegradable shotgun wadding-Millenium Plastics
- Golf Tees
- Agricultural Films

Collaboration in Technology

- Brings solutions
- We have illustrated some examples of new product designs which have been enabled by plastics materials and processes
- Collaborative efforts will bring the next wave of innovations

How do you collaborate?

- Understand the value proposition- “do your homework”!
- Look for areas where you can be part of a solution
- Seek partners with mutual objectives

Summary

Many new plastics applications demonstrate

- Versatility, design advantages, economic benefits
- Improved aesthetics, ergonomics and functionality
- Environmentally responsible

Summary

Plastics materials and process developments offer companies:

- Ways to differentiate products
- Revolutionize product design
- Invent entirely new products

Opportunities and Challenges

- Need to continue to improve the price-performance of plastics
- Broaden property and performance envelope
- System approach needed to continue growth

Credits

- Photos/applications
  - Kraton Polymers
  - GLS Plastics
  - QST division of Teknor
  - DuPont
  - Advanced Elastomer Systems (AES)
  - Noveon