Outline

- About Grace
- Global PP market trends and presentation objectives
- Technology drives
- Showcases
- Summary
Grace Fast Facts (NYSE: GRA)

- True Specialty chemicals business
  - High value product portfolio
- Strong franchises in large, global markets
- Global leadership positions
  - Number 1 or 2 in over 70% of 2013 sales

Catalysts Technologies
- #1 in FCC catalysts
- #1 in resid hydrotreating catalysts
- #1 in independent polyethylene catalysts
- #1 in independent polypropylene catalysts

Materials Technologies
- #1 in Specialty silica gel
- #1 in can sealants

Construction Products
- #1 in cement additives
- #2 in concrete admixtures

2013 Grace Sales
- $3.1 billion

2013 Grace Sales by Region
- North America: 31%
- Western Europe: 24%
- Asia Pacific: 21%
- Latin America: 12%
- Middle East & Africa: 6%
- Eastern Europe: 6%

Catalysts Technologies: 40%
Materials Technologies: 27%
Construction Products: 33%
Grace® Polyethylene Catalyst Portfolio

**MAGNAPORE® and Cr-based catalysts**
- Industry-leading pipe resin catalyst
- Strong history of performance in loop process
- New products for gas phase processes

**Ziegler-Natta PE Catalysts**
- HD and LLDPE technologies
- Commercial offerings for loop, gas phase, and CSTR processes
- Customer-specific catalysts

**Single Site Catalysts**
- Integrated solutions provider
- Finished supported catalysts
- Metallocenes, ligands and borate co-catalysts
- Silica supports
Grace Polypropylene Catalyst Recent History

2002  Purchased catalyst manufacturing assets in Finland to advance production of polypropylene and polyethylene catalysts

2006  Purchased additional custom catalyst assets in New Jersey

2009  Expanded manufacturing capacity in Germany to meet demand for polypropylene catalysts

2010  Purchased facility in Oregon for production of specialty single site and polypropylene catalysts

2013  Acquired UNIPOL® PP Licensing and Catalyst business from Dow
# Grace® Polypropylene Catalyst Portfolio

<table>
<thead>
<tr>
<th>POLYTRAK® Catalyst</th>
<th>HYAMPP® Catalyst</th>
<th>SHAC® Catalyst and Donors</th>
<th>CONSISTA® Catalyst and Donors</th>
<th>Custom Polypropylene Catalysts</th>
</tr>
</thead>
<tbody>
<tr>
<td>4th generation technology</td>
<td>6th generation technology; high yield</td>
<td>Industry leading catalysts for gas phase processes</td>
<td>6th generation technology; high yield</td>
<td>Vast experience in scale-up and supply of customer-specific</td>
</tr>
<tr>
<td>Used in bulk and gas phase polymerization processes</td>
<td>Offerings for bulk (liquid) polymerization processes</td>
<td>Homo- and co-polymer capability</td>
<td>Offerings for gas phase polymerization processes</td>
<td>Polypropylene catalyst products</td>
</tr>
<tr>
<td>Homo- and co-polymer capability</td>
<td>Non-phthalate, with improved resin performance</td>
<td></td>
<td>Non-phthalate with improved resin performance</td>
<td></td>
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</tbody>
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*Images of various products are shown to illustrate the diversity and quality of the catalysts.*
## Global Trends

<table>
<thead>
<tr>
<th>Trend</th>
<th>Results in increasing</th>
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<tbody>
<tr>
<td>Aging population in Europe and NA</td>
<td>Health products and medical needs</td>
</tr>
<tr>
<td>Population growth and middle class expansion in Asia and Latin America</td>
<td>Automobiles</td>
</tr>
<tr>
<td>Time is a luxury</td>
<td>Consumer goods</td>
</tr>
<tr>
<td>Climate change</td>
<td>Non-food packaging</td>
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<tr>
<td>Globalization of retailers</td>
<td>Packed foods, snacks and pre-cooked meals</td>
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<tr>
<td>E-commerce</td>
<td>Technology focus on performance and cost and environmental impact</td>
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</table>
Polypropylene Market trends since 2005

- Lighter
- Faster
- Cleaner
- Clearer

- Less catalyst residuals
- Lower VOC
- Lower taste and odor by avoiding peroxide cracking
- Non-Phthalate based
## Major Technology Drivers in Asia Pacific

<table>
<thead>
<tr>
<th>Technology drivers</th>
<th>GRACE Showcases</th>
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<tr>
<td>Inter-material substitution</td>
<td>CASE 1: Higher modulus to enable down-gauging of BOPP films</td>
</tr>
<tr>
<td>Faster processing</td>
<td>CASE 2: Faster heat sealing processing</td>
</tr>
<tr>
<td>Down-gauging to decrease part weight</td>
<td>CASE 3: Cleaner high MFR TPO’s</td>
</tr>
<tr>
<td>Cleaner products – less taste and odor, less metal residuals</td>
<td></td>
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**GRACE advanced catalyst systems are designed to address market trends**
CASE 1: Higher Modulus HPP to enable Down-gauging in BOPP films

Increasing Stiffness

GRACE Proposed Processing Window for BOPP HPP
**CASE 1: CONSISTA® / HYAMPP® Catalyst Systems (6th Gen)**

- HPP with 5% to 20% higher stiffness than 4th gen systems
- Potential of 2% to 3% weight reduction

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**Graph Details**

- **Y-axis:** Flexural Modulus / MPa
- **X-axis:** Xylene Solubles / w%

Legend:
- 6th Gen
- 4th Gen

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*INDIAN Petrochem - 2014*
CASE 1: BOPP Customer Trial

- 12 µm film
- 3 layers
- 5/90/5
- Bruckner

6th Gen CONSISTA® / HYAMPP® Catalyst Systems can meet the needs of the resin producer and converter in the BOPP market.
CASE 2: Catalyst Solutions For Advanced Heat Seal Grades

6th Gen advanced catalyst systems provide answers to all heat sealing needs
CASE 2: Customer Requirements and 6th Gen Catalyst Systems

<table>
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<tr>
<th>PP Producer</th>
<th>Film Converter</th>
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<tbody>
<tr>
<td>High productivity</td>
<td>Tailored Heat seal temperature</td>
</tr>
<tr>
<td>High co-monomer window</td>
<td>Hexane extractables &lt; 5.5 % (FDA)</td>
</tr>
<tr>
<td>Low XS (process dependent)</td>
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**CONSISTA® / HYAMPP®**
catalyst systems enable a broad design window for the production of Speciality terpolymers

![Graph showing C4, w% and C2, w% with lines for 5 w% HX and 9 w% XS, and temperatures for 86 °C < HST < 100 °C and 105 °C < HST < 111 °C.](image)
CASE 2: Summary of 6th Gen GRACE® Catalyst Systems

Terpolymer Technology Designed to Meet Customer Needs
CASE 3: Cleaner High MFR TPO’s with CONSISTA® Systems

- Higher number is better in all cases

Lower catalyst residuals from super-high productivities

High H₂ response eliminates unnecessary need for rheology control

High H₂ response reduces VOC generation
Summary

- The PP market in Asia Pacific is experiencing strong competition and moderate growth. These are times to upgrade product mix and reduce operating cost.

- Grace has responded to these market challenges and related technology needs with the 6th generation CONSISTA® / HYAMPP® Catalyst Systems. Designed to:
  - Maximize line speeds for BOPP
  - Meet a broad range of heat sealing needs
  - Produce cleaner TPO’s
  - Provide improved property balance and higher productivities
Thank You

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