INEOS a 3 Act play

INEOS Technologies
a new beginning

Innovene™ G, S, PP
Act I

1998
Purchase of BP’s Antwerp facilities

1999-2004
Organic growth/efficiency improvement and ICI Assets

2005
BP Chemicals business acquisition

2008
Act II
INEOS growth in the new Millennium

Turnover - USD Millions

Act II
INEOS a 21st century company - Act III

Strategic partnerships, M&A’s and growth

- JV with PetroChina for refining and trading
- Former JV with BASF now wholly owned for Styrenic & PS
- JV with Sasol in the US for a new 470 kta HDPE unit (start up 2017)
- JV with Solvay for the chlorine /PVC chain (to be fully owned by INEOS in 3 years)

Entrepreneurial & Innovative

- INEOS BASF, BAYER, BOREALIS, BP, DOWDESSA, DOWCHEN HEM, ERSTELOPHARM, FOESHT, IC, INORENIE, LAMJESS, MONSANTO, NORSK HYDRO, SOLVAY

- 60 MILLION TONNES
- 65 sites in 16 countries
- $54 BILLION

© INEOS Technologies
A new millennium company
Our polyolefins technologies

**Innovene™ G**
Advanced gas phase Swing LLDPE/HDPE
- Superior mLL and HAO LL products
- Unique C4-C6-C8 comonomer versatility
- Clean Loop Process
- High reliability / Low Maintenance
- Low Capex & Opex

**Innovene™ S**
Bimodal slurry loops HDPE/Bimodal HDPE
- Superior bimodal HDPE products
- Routine Ziegler/Cr & mono-/bimodal swing Quick transitions
- No wax generation
- Low Capex & Opex

**Innovene™ PP**
Plug flow gas phase PP (homo, RCP, ICP)
- Superior ICP’s
- Highest product consistency
- Unique plug flow process
- Quick transitions
- Low Capex & Opex
INEOS is a leading licensor of PE & PP technology
50% of our sales are based on multi-platforms projects
**Innovene™ G**

<table>
<thead>
<tr>
<th>Application</th>
<th>Type</th>
<th>Commercial</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Film</strong></td>
<td>LL C4</td>
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<td></td>
<td>LL C6 or C8</td>
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<td>mLL C6 or C8</td>
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<td>mVLDPE</td>
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<td></td>
<td>HDPE Cr</td>
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<td><strong>Blow Molding</strong></td>
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<td><strong>Injection Molding</strong></td>
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<td><strong>Pipe &amp; Conduits</strong></td>
<td>Non pressure</td>
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<td>PE80</td>
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<tr>
<td><strong>Textile</strong></td>
<td>Monofilament</td>
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<td>Tape</td>
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<tr>
<td><strong>Rotomolding</strong></td>
<td>MDPE C4 and C6</td>
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<td><strong>Others</strong></td>
<td>W&amp;C</td>
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<td></td>
<td>Geomembrane</td>
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<td>Extrusion coating</td>
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</table>

**Metallocene VLDPE, LLDPE & MDPE**
Superior processability, optical & ESCR properties

**Ziegler LLDPE, MDPE & HDPE**
Vast product & application coverage with C4-C6-C8 comonomers

**Chromium HDPE**
Vast product & application coverage
Innovene™ G

Built: 5,400 ktpa with 39 G Lines
Project: 4,720 ktpa with 13 G Lines
An advanced gas phase

Clean loop technology with cyclones

Benefits: no circulating fines, no cleaning shutdown requirement
⇒ Unique on-stream time capability

High Performance Condensation for
Injecting condensation liquid into the reactor

Benefits: Effective liquid vapourisation directly into the reactor.
⇒ No fluidisation issues, no liquid pooling

Provides outstanding operability and reliability
**HPLL™** High Performance Linear Low

Based on a proprietary Constrained Geometry metallocene Catalyst

**LCB**

**Reverse Comonomer Distribution**

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**Melt Strength (cN)**

- **INEOS HPLL**
- **Ziegler**
- **Conventional Metallocene**

**Shear Rate (s⁻¹)**

- Low
- High

**Comonomer content**

- Low
- High
**HPLL™ High Performance Linear Low**

Based on a proprietary Constrained Geometry metallocene Catalyst

- LCB
- Reverse Comonomer Distribution

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**Graphical Representation**

- Extrudability
- Bubble Stability
- Optics
- Sealability
- Mechanicals

- INEOS HPLL
- Solution C8 Metallocone
- Conventional Gas Phase Metallocone

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# Innovene™ S Product Coverage

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<td>HDPE Cr</td>
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<td>Bimodal HDPE</td>
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<td>Rotomolding</td>
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<td></td>
<td>Metallocone HD</td>
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</tbody>
</table>

**Bimodal HDPE**
- Superior ESCR/impact balance, access to leading products like PE100RC

**Chromium based HDPE & MDPE**
- Vast product & application coverage with popular grades

**Ziegler based HDPE & LLDPE**
- Vast product & application coverage

**Metallocone LLDPE & HDPE**
- In development (pilot scale)
Innovene™ S

Built: 2,090 ktpa with 13 S Lines
Project: 7,100 ktpa with 18 S Lines

Braskem IDESA

INEOS Innovene™ S
Innovene™ S built
Innovene™ S in design

2 units Confidential
Etileno 21 the 1st start up of the new wave

Coatzacoalcos, Mexico
Seismic area
Green field project
Largest petchem investment in 30 years

Cracker & derivates
750 kta HDPE
2 Innovene™ S trains
Full Ziegler/Cr product mix

State of the art process control and logistic

Signed: 2010 (Innovene™ S)
Ground breaking: 2012
EPC near completion
Start up: Very Shortly
PE100RC

« Resistant to Crack PE100 designed for alternative installation techniques »

PE100
Requires sand bed protection

PE100RC
Sandless Laying

Sand protection might represent up to 50% of the total cost!
Innovene™ PP

**Impact Copolymers**
Best in class stiffness / toughness performance balance

**Random Copolymers**
Superior clarity and optical properties

**Homopolymers**
Tailored to perform at most demanding applications, e.g. BOPP film, fibers and injection molding

<table>
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<tbody>
<tr>
<td><strong>Injection Molding</strong></td>
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<tr>
<td>Housewares</td>
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<td>Rigid Packaging</td>
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<td>TWIM</td>
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<td>Caps &amp; Closures</td>
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<td><strong>Fiber</strong></td>
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<td><strong>Film</strong></td>
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<td>Cast</td>
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<td>Thermoforming</td>
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<td>Pressure pipe</td>
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<td>Blow molding</td>
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<tr>
<td>Foam</td>
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</tbody>
</table>

- Commercial
- Development
Built: 4,160 ktpa with 19 PP Lines
Project: 7,350 ktpa with 20 PP Lines
A plug flow process

1. Catalyst is fed to the first reactor
2. Powder grows as polymer forms on catalyst particle
3. Plug flow of powder in reactor with gentle agitation
4. Reactor offgas condensed and recycled - condensed monomer provides reactor cooling
5. Powder transfer section keeps reactor compositions separate
6. Second reactor for impact copolymer
7. Powder goes to degasser for monomer removal and recycle
8. Powder is deactivated in purge column - purge column close coupled to finishing building for capex savings
9. Powder is melted with additives, extruded and pelletized

Simple and straight forward to operate
Homogeneous ICP’s

**INNOVENE™ ICP**
- Rubber segment through particle; (well-dispersed) “marbled"
- Excellent ICP properties (Impact and Stiffness)

**BACK-MIXED ICP**
- Rubber segment on surface; (not well-dispersed)
- Less ICP properties (only Impact or Stiffness)

10-20% less ethylene required
Concluding remarks

Innovene™ G
Advanced gas phase
Swing LLDPE/HDPE

Innovene™ S
Bimodal slurry loops
HDPE/Bimodal HDPE

Innovene™ PP
Plug flow gas phase
PP (homo, RCP, ICP)

3 premiere platforms
Wide market recognition
Access to specialties and advanced products

3 technologies, 1 single point of contact
= Project & engineering synergies
Solutions for the new millenium

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