Polymer modification is a **KEY** to innovative composite materials development.
COMPANY HISTORY

• Since 2001, our team has been developing innovative polymer modification technologies with product applications that satisfy very specific market requirements across many polymer fields.

• The company has experienced good demand for its products throughout Europe which it can now service through its Slovenian facilities capable of manufacturing and supplying 3500-4000 tons of product per year.
“COMBINE INCOMPATIBLE” - TO CREATE NEW POLYMER SOLUTIONS

COMPREHENSIVE - BUSINESS MODEL
Using ALL the most advanced METHODS in the polymer industry

POLYMERIC NANO ALLOYS

GRAFT / BLOCK POLYMERS

CROSSTINKING

SYNTHESIS

POROUS
BUSINESS MODEL
TECHNOLOGIES & BUSINESS FLEXIBILITY

**INNOVATIVE - TECHNOLOGIES**

- Flow induced crystallization
- Solid Phase Grafting
- Solution Grafting
- Fillers Treatments
- Powders Hybridization
- Reactive extrusion
- Alloying
- Crosslinking
- Hot ozonolysis/plasma modification
- Nitrooxide Mediated Polymerization
- Micro/Nano Porous polymer carriers etc.

**FLEXIBLE OPERATION**

- CUSTOM MADE products at Request
- Fast Focusing on HOT MARKET Sectors
- Fast production SCALE-UP
<table>
<thead>
<tr>
<th>TECHNOLOGIES</th>
<th>Slovenia</th>
<th>Israel</th>
<th>Italy</th>
<th>Germany</th>
<th>USA</th>
<th>France</th>
<th>Czech</th>
<th>India</th>
<th>China</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow induced crystallization</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solid Phase Grafting</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solution Grafting</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Fillers Treatments</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Powders Hybridization</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hot ozonolysis/plasma mod.</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitroxide Mediated Polymerization</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Reactive extrusion</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Alloying</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Crosslinking</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Micro/Nano Porous polymer</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
WHAT MAKES GPO UNIQUE – (GRAFTING)

The main global side-effects during the grafting process;

- **Crosslinking** for ETHYLENE polymers
  - For melt grafting up to 10 times
  - For Solid Phase Grafting up to 2-3 times

- **Betta-Scission** (de-polymerization) for PROPYLENE polymers

- **Peroxides** usually have very harmful post-residues:
  - Free unreacted peroxides and radicals lead to polymer aging and degradation in time
  - Treat-Butyl Alcohol (TBA) residues restricted in certain application up to 20ppm
  - High Yellowness Index (YI)

- **Gel availability** exist and influence on:
  - Mechanical Strength and Elongation of final product
  - Film transparency
  - Scotch effects in film and cable processing

GPO Solution;

- We use proprietary Co-agents and Redox initiating system
- We use Nitroxide Mediated Polymerization for Controlled grafting reactions
WHAT MAKES GPO UNIQUE – (ALLOYS)

GPO Solution;

- Co-continuous nano-morphology,
- High temperature service elastomeric alloys,
- Melt Processable alloys based on Ultra High Molecular Weight Polyethylene (UHMWPE),
- Interpenetrating Polymer Networks (IPN) unique hybrid crosslinking techniques – crosslinked one polymer in another,
WHAT MAKES GPO UNIQUE – (CROSSLINKING)

GPO Solution:

- Thermo-Reversible Crosslinking polymers (High temperature resistance),
- Interpenetrating Polymer Networks (IPN) unique hybrid crosslinking techniques – crosslinked one polymer in another,
- Smart Polymers – switching temperature behavior,
- Self-Healing polymers

PO-g-MAH - Hydroxylamine
PO-g-MAH - Diol
PO-g-TEMPO - Isocyanate
PO-g-TEMPO- Peroxide
PO-g-Furan - Bismaleimide
Halogen Free Flame Retardant based on Boron alkoxides (minimum addition to achieve V-0 requirements).

Home-made synthesis of Hyper Branched Polymers (HBP) and Drug Delivery Systems (DDS).

Home-made synthesis of unique “nitroxide stable radicals” for novel high tech synthesis.
WHAT MAKES GPO UNIQUE – (POROUS)

- **POROSITY 80% -FREE FLOWING**
- **CLEAN CELL STRUCTURE FORMATION**
- **NO CHEMICAL OR PHYSICAL BLOWING AGENTS USED**

Comparative view
Graftapore (left) vs Accurel (Membrana GmbH)
GPO has signed distributorship agreements with well-known companies in the field.

- Ferro - Plast (Italy)
- C.H. Erbslöh GmbH & Co. KG
- Bedeko (Poland)
- Bharat enterprises (India)
Member of BPF and ISO 9001 Approved Slovenian Facilities
For additional information please contact

Pavel Kobzev (CMO)
Mob: + 386 40 867 937
Pavel@graftpolymer.com

Victor Bolduev (CTO)
Mob: +386 40 534 739
Victor@graftpolymer.com