HIGH PERFORMANCE POLYMERS

Dr. Prakash Trivedi & Mr. Jaimin Zaveri
Gharda Chemicals Ltd.
THERMOPLASTICS PYRAMID

Performance

Temperature

Resistance

AMORPHOUS

CRYSTALLINE
CURRENT PRODUCT PORTFOLIO

2011  PAEK
2012  PBI
2013  PEKK
2017  PEI

UNREINFORCED POWDER & GRANULES
MINERAL FILLED & LUBRICATED COMPOUNDS
GLASS FIBRE/CARBON FIBRE REINFORCED COMPOUND
PLASTICS BLENDS & ALLOYS
PBI FIBRE
LEADER IN SPECIALTY PLASTICS!

- **PEK**  VICTREX, GCL.
- **PEKK**  CYTEC, ARKEMA, GCL.
- **PBI**  PBI PRODUCTS, HOSTECHNIQUE, GCL.
- **PEI:**  SABIC. GCL
SERVICE TEMPERATURE

the cost of the material increases with the maximum service temperature

Filler (GF) - Stiffness & HDT

Carbon Fibre - Stiffness & HDT, Lower-density, Electrical-conductivity, Tribological properties

figure 1: Max cont. service temperature versus heat distortion temperature of 30% GF materials
BENEFITS WITH PLASTICS Vs METAL

- **Design and appearance**
  - Design flexibility
  - Easy to color and decoration
  - In-mold decoration

- **Manufacturing flexibility**
  - Reduce assembly
  - Reduce secondary operation
  - Highly complex parts
  - Opportunity for part consolidation

- **Sensorial benefits**
  - Noise dampening
  - Surface aspect:
    - Warm to the touch
    - Soft touch

- **Performances**
  - Lighter than metal
  - Electrically non conductive
  - Vibration dampening
  - Low Corrosion

Productivity & differentiation
BENEFITS WITH PLASTICS Vs METAL

METALS
- Aluminum 2.5 to 2.8
- Brass 8.4 to 8.7
- Copper 8.8
- Zinc 6.9 to 7.2
- Steels 7.7 to 7.83

PLASTICS
- PEI- 1.27
- G-PAEK- 1.3 (un filled)
- G-PAEK- 1.45 (filled)

Selection criteria

- Thermal performances
- HDT, Max service temperature
- Mechanical performances
- Stiffness, Toughness, Creep
- Electrical performances
- Conductivity, Arc resistance
- Dimensional stability
- Shrinkage, CLTE
- Environmental
- Chemical, UV, Gamma
- Regulations
- FR, FDA
- Secondary operation
G-PAEK™ Grades can be processed by all conventional processing techniques

- Injection Molding
- Stock Shape Extrusion
- Film Extrusion
- Cable Extrusion
- Compression Molding
- Rotational molding
- 3D printing
- Powder Coating
- Dispersion Coating
- Fiber Spinning
PRODUCT RANGE G-PAEK™

Stock Shape:
• Stock shape from 10 mm to 100 mm Diameter (Filled and Un filled)
• Machining and annealing facility for stock shapes
• High tech Extruders / Production lines
• Capable to produce Glass fiber and Carbon fiber filled stock shape
• Testing by Ultra sonic to detect and ensure defects or blow holes
• Good machinability
Compression Molding:

- We provide different grades of powder for compression molding
- PEK filled PTFE is available for improving hardness of Virgin PTFE for various applications
- PTFE filled PEK is also available for imparting sealing applications in valve industries
- Developed sintering cycle for various sizes to provide good technical support to customers
- Facility of Compression molding machine for development
- Excellent compressive strength than PEEK
- Best alternate of Bronze to replace as filler – PEK gives superior properties
**Injection Molding:**
- We have different grades of G-PAEK for Injection molding application based on their flow.
- We have two precised and sophisticated injection molding machines
  - ARBURG 66 Tons and DR.BOY 22 Tons which fulfill all the requirement of molding of High performance polymers
- Global class compounding lines to produce different grades of molding grades
- Superior than PEEK, 20 C higher continuous temp, higher compressive strength, make in India, radiation resistance & chemical resistance
GAPEKK & GAZOLE™

Injection molding grades:
Melt Processable thermoplastic alloys
High Temperature Resistance & Superior Mechanical Performance at elevated temperatures upto 300 deg C.
Lower CLTE ( coeff of liner thermal expansion) & negligible warpage.
Low Sloughing, Excellent Wear resistance with very high limiting PV of 18.6 Mpa.
Low Co-eff of friction values of 0.12 making it Inherently lubricious with a very smooth surface finish
Excellent tribological .and abrasion resistance
NEW PRODUCT RANGE - PEI (GIMIDE™)
POLYETHER IMIDE

PEI Injection moulding grade
APPLICATIONS - FOOD INDUSTRY

G-PAEK™ Gears

- Application: Gears in Flowmeter (food processing machine)
- Process: Injection Molded
- Grade: G-PAEK™ 1200G

Benefits of G-PAEK™ Gears

- Good Strength at Low Temperatures
- Higher Mechanical Strength at higher load in Dynamic condition
- Good Wear resistance
APPLICATIONS - TEXTILE INDUSTRY

G-PAEK™ Textile components

- Application: Textile Parts
- Process: Injection Molded/ Machined/ Compression molded
- Grade: G-PAEK™

Challenges:

• Higher working Temperature
• Higher Chemical and Steam Resistance
• Wear Resistance without external lubrication

Benefits of G-PAEK™

• Outstanding Tribological properties
• Strength to weight ratio similar to steel
• Specific Flex Modulus similar to aluminum and steel
• Low creep
• Long term use temperature upto 260°C
• Excellent hydrolysis, radiation and chemical resistance
G-PAEK™ Photocopy components

- Application: Printer/Photocopy machine part
- Processing: Injection Molded for High temperature and Wear Resistance
- Grade: G-PAEK™ 1230FC

Benefits of G-PAEK™ Injection Molded parts

- Heat Resistance (260-280°C)
- Excellent wear resistance
- Ease of processing intricate and difficult geometries.
- Precision of product as per tolerance.
APPLICATIONS- NUCLEAR POWER PLANTS

G-PAEK™ Cable Ties

- Application: Cable ties in Nuclear industries
- Processing: Injection Molded for High temperature and Radiation Resistance
- Grade: G-PAEK™ 1200G

Benefits of G-PAEK™ Injection Molded parts

- Heat Resistance (260-280°C)
- High Radiation Resistance
- Ease of processing intricate for geometries.
- Precision of product as per tolerance.
- Higher Strength at elevated temperature
APPLICATIONS - MEDICAL INDUSTRY

G-PAEK™ Medical Equipment

- Application: Laparoscopic Tools
- Processing: Injection Molded for High temperature Resistance
- Grade: G-PAEK™ 1200G

Benefits of G-PAEK Injection Molded parts

- Heat Resistance (260-280°C)
- Good sterilization
- Ease of processing intricate and difficult geometries.
- Precision of product as per tolerance.
- Higher Strength at elevated temperature
- Excellent hydrolysis and chemical resistance
APPLICATIONS - CHEMICAL INDUSTRIES

G-PAEK™ in Chemical industries
- Application: HPLC Components
- Processing: Injection Molded
- Grade: G-PAEK™ 1200G

USP of G-PAEK™ Injection Molded parts
- Heat Resistance (260-280°C)
- High Chemical Resistance
- Ease of processing intricate and difficult geometries.
- Precision of product as per tolerance.
- Higher Strength at elevated temperature
APPLICATIONS - DOWN STREAM INDUSTRIES

G-PAEK™ Downstream (Value, Pumps, Compressor)

- Application: Compressor valve plate
- Processing: Compression molded
- Grade: G-PAEK™ 1230FC

USP of G-PAEK™ for Compressor Valve plate & Piston rings.

- Heat Resistance (280°C)
- High Chemical Resistance
- Higher Strength at elevated temperature
APPLIATIONS OF PEKK– OFF- SHORE INDUSTRIES (OIL AND GAS)

- Valve Plates, Valve rings and , Seals
  - PEKK supersids PEEK due to higher Tg and temperature resistance.
  - High strength and temperature resistance
  - NORSOK CERTIFICATION
MELT SPINNING:
PEK

WET SPINNING:
PBI
APPLICATIONS BY INDUSTRIES

- **Electronics & Semiconductor**: 24%
- **Medical**: 6%
- **Industrial**: 28%
- **Transport**: 34%
- **Other**: 8%
TECHNICAL SUPPORT FROM GHARDA

- MATERIAL SELECTION
- COMPOUND DEVELOPMENT AND TESTING
- PRODUCT DEVELOPMENT
- EXTRUSION & MOULDING TRIALS AT GCL OR AT CUSTOMERS PLACE
- PRODUCT TESTING
11 NATIONAL AWARDS FOR GHARDA POLYMER SBU


• FICCI AWARD FOR NOVEL PRODUCT DEVELOPMENT: 2005

• MINISTRY OF CHEMICAL & FERTILIZER INNOVATIVE PRODUCT AWARD: 2012
Thank You

For more information visit us at www.ghardaplastics.com

pdtrivedi@gharda.com

jczaveri@gharda.com