

#### **Long Fiber Composites**

**Colin Rooney Thanks to Karl Hoppe** 

#### **Presentation Overview**

- Very Long Fiber (VLF) Intro
- Property comparisons

• Metal replacement

• Case studies





#### **Standard Compounding Process**



#### **VLF Manufacturing Process**





#### **Pellet Comparison**



**Short Fiber** 

**Long Fiber** 

IMAGINEERING PLASTICS WORKSHOP

#### Fiber Length ~ 1-2 mm 12 mm



#### **Fiber Retention**

IMAGINEERING PLASTICS WORKSHOP

#### PA 66 + 60% VLF Seat Belt Tensioner Housings



#### **Advantages of Long Fiber**

- Improved impact
- Safer impact mode
- Reduced warpage
- Improved creep resistance



#### **Drop Impact Test**





## **Application: Safety Toe Cap**

- End User: Red Wing Shoes Material: VLF
- Polyurethane
- Applied Technology:
- impact modification

Benefits of stamped metal replacement

- Molded net shape
- Thermal insulation
- Non-permanent deformation





## **Application: Side Block Plates**

<u>End User:</u> Harken, Inc. <u>Material:</u> VLF nylon 6,10 <u>Applied Technology:</u> deep, rich, pre-colored black extra UV protection

Benefits of stainless steel replacement

Cost reduction

-eliminate machining

• Prohibit corrosion from sea water





## **Molding Considerations**

#### General guidelines:

- 1. General purpose screw OK (low compression preferred)
- 2. Reduce shear: low back pressure and rpm's
- 3. Reverse barrel profile



IMAGINEERING PLASTICS WORKSHOP

preferred:



## **Combining Technologies**

Polymers	Additives	Long Cut dry blends
PEEK PPS PBT TPU PP PA PC	Your color – Your way™ Impact enhancement Flame retardants Wear & lubricity Heat stabilizers Nano particles UV resistance Conductivity Taggants Spheres Anti-stat	



#### **Fiber Retention**





#### **Property Comparisons**

#### **Strength/Impact Advantage**





## Nylon 6/6 – 40 Glass Fiber%



### **Application: Auto Shifter Base**

# End User:Honda, GM,ToyotaMaterial:VLF Polypropylene

Benefits of replacing short glass nylon

- Cost reduction
- Weight reduction
- Designed for the environment

   more commonly recycled



#### **Low Temperature Impact**

50% Long Glass Compounds





#### **Metal Replacement**

#### **Metal Replacement Objectives**

- Reduce cost
- Design freedom
- Environmental concerns



- Corrosion and chemical resistance
- Sound and vibration dampening

## **Application: Brake Cylinder**

End User:Demco-DethmersMaterial:VLF nylon 6/6

Benefits of die cast metal replacement

- Cost reduction
  - –eliminate painting–eliminate machining
- Prohibit Rust
- Increased functionality
  - molded in fluid sight window





#### ZAMAK

- ZAMAK alloys are the designer's first choice when considering die casting.
  - Z for Zink (zinc)
  - A for Aluminum
  - MA for magnesium
  - K for Kupfer (copper)
- ZAMAK 3: This is the most widely used general purpose zinc die casting alloy

#### Instantaneous Properties at 23 ° C

	Zamak 3	60% VLF PA6/6
Specific Gravity	6.6	1.7
Tensile Strength (MPa)	282	275
Flexural Modulus (GPa)	85.5	19.3



## **Application: Fastening Tool**

## End User:Vertex FastenersMaterial:VLF Nylon

## Benefits of metal replacement

- Molded net shape
- Lighter
- Faster





#### Summary

IMAGINEERING PLASTICS WORKSHOP

• Increase impact, keep stiffness

• Combine technologies

• Take advantage of plastic design



#### **Application...Shield**





#### **Application...Pistol Body**





#### **Application...Textile Wheel**





## **Application...Cycle Support**







#### Ladenburg Germany



IMAGINEERING PLASTICS WORKSHOP

Equipment 4....VLF Lines

#### 2.... 58 mm Mega Compounders

#### 2....40 mm Mega Compounders



#### Ladenburg

#### VLF Materials

Glass % Compounds

Polypropylene Nylon 6, 66 30,40,50 & 60 High Volume Polypropylene Nylons



#### **VLF Concentrate Masterbatch**

- 60% VLF Concentrate
- Neat polypropylene, other
- Blend at the press
- Big parts





## **VLF PP Concentrate Market Success**



Platform:2009letdown:20%

#### 2009 Dodge Journey 20% long glass PP

Benefits of using VLF PP

Designed for the environmentEasily recyclable, use of regrindLightweight





#### IMAGINEERING PLASTICS WORKSHOP It's important to have a partner you can trust...

