AN ENGINEERING SOLUTION TO PEDESTRIAN SAFETY

Cellbond Composites Ltd
Dr. Mike Ashmead
Mr. Adam Smith

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BACKGROUND

• Increasing Importance of Safety
  – Consumer Organisations
  – Legislation

• Barrier to Markets

• Future Trend
INTRODUCTION

• Impact and Energy Release
• Energy Management
IDEAL ENERGY ABSORBER

The diagram illustrates the relationship between strength and crush depth. The area under the curve represents the energy absorption capability of the absorber material. The x-axis represents the crush depth, while the y-axis represents the strength. The diagram shows a plateau of constant strength until a certain crush depth, after which the strength increases sharply, indicating efficient energy absorption.
ENERGY ABSORBERS

Aluminium honeycomb

Rigid PU foam

Plastic ribs

PressLoad
PRESSLOAD PRODUCT RANGE

Steel PressLoad

ABS sandwich structure

Paper PressLoad

Aluminium PressLoad
PRESSLOAD SIMULATION

6X6 ANALYSIS
STEP 1  TIME = 0.000000E+00
MAX VONMISES

[Image of a graph with a grid pattern and a color bar]
PU FOAM VS. TEMPERATURE

PU foam, 82 kg/m³

-35°C
-20°C
20°C
60°C
80°C

Strength (kN)

Deformation (mm)
THERMAL PROPERTIES

- PC PressLoad membrane is stable between -35° and 80° C
• **Excellent angular impact behaviour**
BENEFITS & FEATURES

• Low cost
• Ease of recycle
• Excellent stress to weight ratio
• Stable under angular impact
PEDESTRIAN SAFETY PRINCIPLES

• Provide Homogenous structures
• Space to absorb energy
• Good Pedestrian Interaction
PEDESTRIAN IMPACT

- Passive systems
- Active systems
- Combined systems
LOAD TRANSFERRING SURFACES

• GridLoad skin
  - Localised impact area
  - Durability and compliance
  - Specialised impact panels
GRIDLOAD GEOMETRY

Variables:

- Depth of grooves
- Density of grooves
- Pattern of grooves
- Materials of construction
STANDARD SKIN VS. GRIDLOAD SKIN

Normal aluminium skin

GridLoad aluminium skin
FORCE DEFLECTION OF STANDARD SKIN VS. GRIDLOAD SKIN

![Graph showing the deflection of standard skin vs. gridload skin under varying loads. The graph plots deformation (mm) on the x-axis and load (KN) on the y-axis. Two lines are shown: one for standard skin (Ref: 2111005) and another for slotted skin (Ref: 2111006).]
RESULTS & COMPARISON

• The standard skin hardened during deformation
• The GridLoad skin absorbs energy uniformly
• Groove pattern configurations to create optimum fracture pattern
BONNET CONCEPT

Normal outer skin

GridLoad outer skin

Impactor
STANDARD PANEL VS. GRIDLOAD PANEL
GRIDLOAD PEDESTRIAN PANELS

- Absorbs energy uniformly
- Small footprint of impact
- Excellent rigidity
PRACTICAL IMPLICATIONS OF GRIDLOAD SANDWICH PANELS

- Efficient use of the impact space
- Minimum effect on styling
- Minimum weight increase
ADAPTIVE BUMPER

• Low stress at high speeds (pedestrian)
• High stress at low speeds (parking)
• Discreet high stress points (insurance rating)
CONCLUSIONS

• A bonnet concept can be developed using GridLoad technology
• The impact energy can be absorbed at peak load, reducing absorption space
• An adaptive bumper can reduce the extra space required to meet conflicting requirements
FUTURE WORK

- Simulation tools September 2001, 2 yrs project, with APU
- Optimised patterns September 2001, 2 yrs project, with APU
- Laminates and coatings July 2001
- Optimised structures July 2001, with Cambridge Uni.
- Bumper design Looking for development partners
Thank you for your attention