

Do Plastics Have A Sustainable Future?

Forum – 28 February 2006
Venue: Adelaide Pavilion

Ladies and Gentlemen,

First of all, I would like to express my sincere thanks to Mr. Jeff Groves and South Australian Department of Trade and Economic Development, for this opportunity to introduce a unique and innovative ELACO® technology and design solution to this eminent auditorium.

At the same time, this information will explain why we at ELACO see a sustainable and bright future for plastics and other types of advanced materials.

1 Introduction

Ladies and Gentlemen,

Under the current global economic situation, where the prices of composite materials and structures are high, with tendency to rise, it is desirable to develop cost effective composite structures, in terms of both materials and manufacturing.

Currently, limited applicability of some low-cost composite components in composite structures is a result of their specific mechanical properties.

It is known that mechanical properties of fibre reinforcements are an order of magnitude higher in longitudinal than in transversal direction of fibres. In case where a composite structure is loaded perpendicularly / transverse to

the fibers, the matrix properties dominate because of a fact that the load is transferred mostly by the matrix. Unlike metals, majority of fibre reinforced composite materials do not undergo plastic deformation under impact as majority of them are very brittle.

2. ELACO®

ELACO® represents, in Worldwide proportions, a new concept and technology for creating laminate structures, which exhibit an exceptionally high level of impact resistance and damage tolerance.

2.1. ELACO's specific abilities

ELACO® composites are created with an ability to extensively use properties of reinforcements in longitudinal direction of the fibre, even in the case of perpendicular / transversal outer loading with specific abilities to:

- disperse any perpendicular / transversal outer loading on the laminate surface to component forces that act in directions of the fibrous reinforcement,
- disperse any perpendicular / transversal outer loading over the large area of laminate to reduce specific loading per area, and
- allow controlled dissipation and delamination cracking.

2.2. ELACO structure

ELACO® structures are based on the use of cost-effective, standard materials (dominantly glass fibre and Aluminium), thus enabling enhanced performance while preserving costs. Yet, for superior and some specific performances, specialised materials such as Carbon, Aramid and others could be incorporated into appropriate ELACO® structures.

I will illustrate how significant cost savings may be made by using one example:

- To manufacture a 2.5 mm thick flat panel from Carbon fibre 10 -12 plies of Carbon fibre in needed;
- To make a similar panel based on the ELACO® Technology, only 2

plies of Glass fibre and one ply of other materials may be used, which could cost only as much as a single ply of the Carbon fibre, with overall reduction in manufacturing time.

The ELACO[®] generic laminate structures have mechanical properties in range of those of mild steel and higher than aluminium, with a specific density starting from around 1280 kg/m³.

Compared with a 1.5 mm thick steel plate, a 3 mm thick ELACO[®] structure absorbs as much impact energy as the steel plate, with more than 2.5 times reduction in weight.

An ELACO[®] structure may also be an integral part of other complex composite structures.

2.3. ELACO's advantages

Specific advantageous abilities of the ELACO[®] structured composites may result in specific beneficial mechanical properties, including, but not limited to:

- ✓ high impact strength,
- ✓ high energy-absorbing ability,
- ✓ high elastic / plastic deformability under impact,
- ✓ high percentage of elastic recovery during plastic deformation,
- ✓ high tensile strength, and
- ✓ high fatigue resistance and durability.

Recent comprehensive tests of various ELACO[®]-structured generic laminates show that they do not break catastrophically and the level of damage during impact is significantly lower than by existing composites and Aluminium.

2.4. ELACO Application

These valuable abilities of the ELACO[®] based composite structures enable enormous options for applications in variety of industries, such as:

- Aviation,
- Space,
- Rail industry,
- Maritime industry,
- Automotive industry ,
- Building industry,
- Protective/security industry, related to ballistics , and
- Civil and construction industry, decoration, machinery, furniture and municipal engineering, road-side safety barriers, and similar, multiple general applications.

All of the above include both civil and military aspects of these industries.

2.5. Manufacturing /Recyclability

To manufacture the ELACO® composites, the majority of existing manufacturing processes may be applied, without or with minor additional adjustments.

Moreover, because of using widely applied composite components, recycling of the ELACO® composites is possible using the existing recycling processes.

2.6. Examples of possible ELACO applications

For example, one of the possible specific applications of the ELACO® concept may be for an airplane wing leading edge to reduce damages done by bird impact.

Moreover, an official report about causes of tragedy of the Columbia Space Shuttle is that piece of the foam from main tank penetrated the leading edge of its left wing, which is currently made from carbon fibre.

The ELACO® composite structures have a potential to be specifically designed to withstand much higher level of impact than carbon based structures that may result in, at least, reduced level of damage.

High performance cars are another example where carbon based composites are extensively used to reduce weight, sacrificing safety. The ELACO® composite structures have a potential to be used in that sort of structure to increase crashworthiness of cars and to significantly reduce total weight.

Furthermore, the, ELACO® composite solutions have a potential to be applied in the manufacture of other transport devices, such as rail carriages, ships and submarines, naval ships to increase ballistic and blast protection, mega yachts, aircraft and helicopters (with abilities for electronic protection), ship and air cargo containers, man habitats on the Moon, etc.

There is an endless list of possible applications of the ELACO® Technology.

We have some samples/prototypes made by several companies in Australia.

That proves that there is a potential for low-cost production and applicability of the ELACO® composite structures in a variety of forms, starting with basic flat panels with thickness starting at 0.5 mm to some complex shapes, etc.

Another huge field of the ELACO® concept's applicability is in the nanotechnology, but this is not a subject matter of today's session.

2.7. ELACO Benefits

Market reports show that, in the World proportions, a current global increase of use of composites is over 8% annually, with the forecasts of even higher growth by 2010.

With the ELACO[®] concept, which is a mature composite technology, composite manufacturers may significantly benefit through:

- Uniquely developed technology,
- Superior features of final products,
- Short term and low implementation cost,
- Access to new markets (World wide),
- Strategic influence on the future of composite technology,
- Higher profit margins and increased share price, and
- Highly satisfied shareholders and customers.

3. Conclusion

As already mentioned, ELACO[®] represents a new concept, in Worldwide proportions, for creating composite sandwich laminate structures, which exhibit an exceptionally high level of impact resistance and damage tolerance.

Composites based on the ELACO[®] concept are created in a way to extensively use the properties of reinforcements in a longitudinal direction of the fibre, even in the case of transversal loading with specific desirable abilities to:

- disperse any perpendicular loading on the laminate surface to component forces that act in directions of the fibrous reinforcement,
- disperse any perpendicular loading over the large area of laminate to
- reduce specific loading per area, and
- allow controlled dissipation and delamination cracking.

It is extremely important to understand that both properties and cost of each composite laminate structure based on the ELACO[®] concept may vary depending on particular components used, as per specific product requirements.

With the ELACO® composites, the World is much richer having a real opportunity that everyone may enjoy the many benefits of these composites.

Those are some of reasons why we at ELACO Pty Ltd believe that there is a sustainable and bright future for plastics and other types of advanced materials.

Now, I would like to show you a Video clip of an impact test of some of the ELACO® solutions, as compared with steel and aluminium samples.

Thank you!

Any questions, please?