



# TUFFSHELL<sup>®</sup> Fuel Tanks

## Product Information

### Space-Age Performance

When new lightweight pressure vessels were needed for the Space Program, Lincoln Composites led the way. Today there is a similar requirement for earthbound alternate fuel vehicles. Once again, Lincoln Composites is in the forefront with our all-composite TUFFSHELL<sup>®</sup> fuel tanks.

### Experts in Development and Manufacturing

Lincoln Composites TUFFSHELL<sup>®</sup> tanks are manufactured using a computer controlled, high-speed filament winding process developed and refined over the past 40 years. We are a world leader in high rate production of filament wound composite structures.

TUFFSHELL<sup>®</sup> tanks have a high-density polyethylene (HDPE) liner that offers superior resistance to corrosion, stress cracking and cyclic fatigue. The patented interlocking liner to boss interface provides a leak proof seal between the plastic liner and the metal end bosses.

These tanks have a structural shell wound from a hybrid of high strength carbon fiber blended with tough glass filaments. Combining these fibers with our proprietary epoxy resin system provides outstanding toughness and durability.

TUFFSHELL<sup>®</sup> fuel tanks can be used for storage of compressed natural gas and hydrogen.

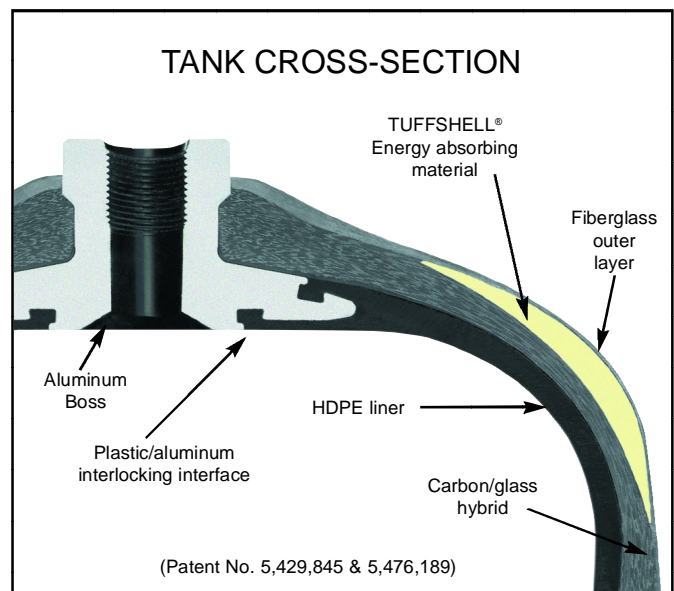
TUFFSHELL<sup>®</sup> all-composite fuel tanks are simply the best combination of light weight, storage efficiency, durability and cost available in today's market.

### TUFFSHELL<sup>®</sup> Advantages

- Weight savings of up to 70% over steel tanks
- Lighter weight than metal lined tanks
- Unsurpassed fill efficiency
- Service life of 20 years with superior fatigue life
- Corrosion resistant
- Backed by proven technology and in-house engineering expertise
- Manufacturing flexibility to reduce lead time
- Meets or exceeds all current standards
- Strap or boss mounting flexibility
- Lowers vehicle maintenance and operating costs
- Proven field service

### What is TUFFSHELL<sup>®</sup>

Only Lincoln Composites can offer our patented TUFFSHELL<sup>®</sup> system. This unique design feature combines the naturally durable hybrid structure with energy absorbing foam and a tough fiberglass overwrap. TUFFSHELL<sup>®</sup> significantly enhances damage tolerance and mitigates damage from chemical or environmental attack and abrasion from handling.



## Commitment to Quality

Lincoln Composites has a long-standing commitment to the very highest levels of product quality. Our quality system was developed to meet the exacting standards of programs such as Space Shuttle and Skylab. Our commitment to quality is just as uncompromising with our TUFFSHELL® fuel tanks. Quality is a commitment and tradition of which we are very proud. Our efforts are guided by:

- A Total Quality Management philosophy
- A dedication to continuous improvement in product and process
- Exhaustive certification and testing

## Product Availability

TUFFSHELL® fuel tanks are available in many standard sizes. Diameters range from 9.1 to 21.2 inches and lengths from 24 to 120 inches. Tank volumes range from 1.2 to 45.2 GGE (gasoline gallon equivalent). Tanks are available with operating pressures of 3000, 3600, 5000 and up to and exceeding 10,000 psi. Off-the-shelf delivery is available in some of our more popular sizes.

## Over 40 Years of Experience

Lincoln Composites is one of the worlds largest and most advanced facilities for designing, testing and manufacturing of composite pressure vessels. Over 55,000 TUFFSHELL® fuel tanks are currently in service.

## Modular Fuel Storage Systems

In response to market demands, Lincoln Composites designed a variety of TUFFSHELL® Fuel Storage Systems that incorporate our TUFFSHELL® fuel tanks. Building these systems is a natural evolution of our fuel tank product line. These lightweight modular tank packs consist of tanks, mounting hardware, support frame, interface brackets, external covers and the fuel system. The packs are available with a variety of tanks sizes and quantities with various capacities to meet range requirements. These fully assembled and leak tested modules are self-contained and have a single point connection for quick installation. The flexible mounting design of the modules is easily adapted to a variety of roof and chassis mounting interfaces for the bus and truck markets.

