

jecmagazine

COMPOSITES

118

Feature

Sports & leisure

Manufacturing
3D printing

Solutions
e-mobility, aeronautics

surfboard

The history and future of surfboard design



DANU CHOTIKAPANICH,
CEO
COBRA INTERNATIONAL

Today, the surfboard market is an even more rapidly evolving and innovative test bed for composite materials and processing techniques than when the first fibreglass boards started to come to market in the late 1940's, as well as providing experience and input to other newer board sports such as windsurfing, kitesurfing and stand-up paddleboarding.

The earliest surfing references are said to date back to 6th century Polynesia, when surfers used solid wood boards, some as long as 8 metres.

From solid wood giants to feather-weight shortboards

Nothing much changed in terms of materials or board design for hundreds of years until lighter hollow balsa wood boards started to appear in the 1920's and 30's. Shapes evolved to be more hydrodynamically efficient, and fins were added to improve manoeuvrability and control, but the breakthrough moment came just after WW2 when composite pioneers shaped PU foam cores (known as blanks) and wrapped them with lightweight woven fibreglass cloth and polyester resin.

From the 50's, these PU and polyester boards established themselves as the default construction for nearly every surfboard made until a new expanded polystyrene (EPS) core material arrived. The PU supply chain abruptly stopped with the sudden closure of Clark Foam, the world's largest distributor of foam board blanks, in 2006. EPS-cored boards were still typically laminated with fibreglass cloth, but polyester was no longer an option as styrene dissolves the EPS foam, meaning manufacturers turned to higher performance epoxy resins. Ultimately, this shift to EPS and epoxy produced much lighter and more durable boards with core weight reduced by around 65% and the new resins' flexibility allowing boards to snap back into shape better than polyester versions ever did.

With surfing's growing global popularity in the 90's came an increased demand

for high-volume production of competitively-priced boards, and it was at this point that Cobra International (Chonburi, Thailand) entered the market. Established in 1978 as a manufacturer of windsurf boards, Cobra is now the leading composite board producer for a wide range of OEM water sports brands as well as a supplier of advanced composite solutions for architectural, luxury goods and premium European automotive brand customers.

The company's serial surfboard production started in 1995 with the Surftech Tuflite, bringing windsurf board PVC sandwich construction to surfing in a ground-breaking tough and lightweight board.

Continued innovation

Cobra continued to innovate, researching and testing new material solutions and ever lighter constructions. Notable highlights included the first EPS-cored board with a full plastic skin and foamed epoxy construction for NSP in 2002, the hollow extruded polystyrene (XPS) cored board for Salomon in 2004, the first dual-core boards combining a traditional polyurethane foam core material with EPS core materials to utilize the benefits of both materials in different parts of the core for Surftech in 2010, then the first 1.80m



Surftech Fusion Dual-Core construction combines PU and EPS foam cores

EPS epoxy board Cobra built below 3kg and, most recently, the Haydenshapes Hypto Krypto, which was a 3-time Surfboard of the Year Winner.

With a massive database of core, resin and reinforcement materials and formats, the company can recommend a construction specification as well as providing a dedicated shaping bay in the factory for the customer's preferred shaper to produce the master board, though this can also be done by Cobra directly from the customer's CAD files. As part of the initial brief, it is also important to look at the specific performance the surfboard designer is trying to achieve. In addition to trying to generate hydrodynamic lift and keeping drag to a minimum, the most critical surfboard design parameter discussed today is probably flex.

Surfboard physics and a new approach to flex

A surfboard grips the face of the wave when some of the water traveling up the wave face hits the base of the board and then wraps around the inside rail. Meanwhile, the bulk of the water moving up the wave is steered along the base to the tail of the board, which acts as a hydrodynamic foil, creating lift and forward thrust. As the surfer uses this thrust, and additional gravitational potential energy as they drop down the wave, to carve into a high-speed bottom turn, the board flexes, storing energy that can be released as a sudden burst of acceleration when the board returns to its normal shape and exits the turn. So, surfboard flex, and the composite material's ability to go through this flex and return cycle with minimal fatigue, are the key to a dynamic board that accelerates well out

of the turns and into the next trick or wave section.

Traditional longitudinally-placed wooden stringers strengthened PU and EPS cores but generally resulted in the centre of the board being significantly stiffer, with a tendency for the board to flex torsionally, slowing the board and compromising the design shape of the rails. In some of the most modern designs, there is a move to relocate the stringers towards the rails, controlling the flex where the board contacts the water in the turns. The industry and the customers that Cobra work with have developed several ingenious ways to build these so-called parabolic stringers into their boards.

Haydenshapes introduced their FutureFlex construction that combines a high-density EPS core with a stringer-less construction featuring a patented parabolic carbon fibre frame around the board's rails, delivering optimum flex and response. JS Industries use a hybrid laminate made of glass, carbon and Innegra fibres to build what they call an exoskeleton around their stringer-less 2016 Board of the Year: the Black Box using HyFi Technology. Over the years, Surftex also fine-tuned different combinations of polyurethane cores combined with EPS cores to maximize flex and performance from this hybrid core technology.

One thing is certain, surfboard shapers and designers will never stop searching for the board with a perfect combination of flex, speed and feel. Production boards from CNC-machined blanks can be expected to maintain their majority share of the market but there will also always be a place for the custom shapers and their hand-crafted one-offs. For the advanced composite industry, surfing provides a challenging environment as well as a much faster development and innovation loop than some other sectors, constantly pushing the limits with lighter and faster boards. □

More information :
www.cobraitner.com

Surftex Fusion Dual-Core construction combines PU and EPS foam cores