

MORNING GLORY & PYEWACKET, 2004

The launch of the Reichel/Pugh designs, Morning Glory and Pyewacket in 2004 generated a great deal of interest within the sailing world. This was due to the fact that these 86 foot boats were the largest yachts to date to benefit from DynaYacht's patented Canting Ballast Twin Foil (CBTF) technology. The decision by owners, Roy Disney and Hasso Platner respectively, to adopt this technology for their new boats represents an exciting advance for race boat design.

Gurit's engineering team was contracted by Reichel/Pugh to produce the composite structural specification of both Morning Glory and Pyewacket. Innovative designs such as these are largely beyond the scope of the Standard Classification Society Rules, so Gurit worked closely with Reichel/Pugh's designers to agree a realistic set of design loadcases, from which to engineer the structure.

Before construction began, an extensive engineering research and development phase was executed. The study included an evaluation of the most suitable bow structural arrangement, a single skin-slamming region, and the suitability of a range of core materials. The most challenging part of the boat to engineer was undoubtedly the canting keel structure. The keel itself is controlled by twin hydraulic rams, each capable of withstanding loads approaching 350 tonnes. As part of the structural engineering package, a detailed Finite Element Analysis (FEA) of the canting keel structure was carried out using the MSC PATRAN/NASTRAN suite of programs. In addition to keel ultimate load cases, the global upwind sailing stiffness characteristics of the boat were evaluated. This analysis was used to ensure that the structure had been optimised against foredeck buckling under load.

When Morning Glory and Pyewacket race offshore, a crew of around 18 to 20 people must be accommodated for. Close liaisons between Gurit and Reichel/Pugh have enabled the interior to be developed around the structure, therefore minimising the need for design compromises. Exhaust pipes and systems conduits have been made structural where appropriate, to reduce the amount of additional structure required.

During the early stages of the project, Gurit's mechanical testing and analytical services department tested a number of laminate samples from boat builders McConaghy and Cookson. Mechanical and thermal properties were measured, and statistical analysis of the test data provided a customised set of design allowables for each boat. Gurit's team of engineers then used this design data in their



calculations. Interlaminar shear strengths, void contents and densities were also calculated to provide an indication of quality - essential in such high performance raceboats as Morning Glory and Pyewacket.

To facilitate ease and speed of construction, Gurit's structural engineering team maintained communications with both McConaghy and Cookson boat yards throughout the build. Where possible, the internal structure was made up of flat panels and laminated off the boat on vacuum tables. Once the hull and deck had been demoulded, the majority of the internals were ready to be bonded in. As well as the hull, deck and main internal structure, Gurit engineered an array of composite fittings, including the complex sail handling systems. The rigs on these boats are considerably larger than those on America's Cup yachts, therefore generating extremely high loads. Attention to detail extended as far as the sheerline padeyes where novel 'soft strop padeyes' were developed. Gurit supplied America's Cup grade carbon fibre, Nomex™ and Corecell™ structural foam throughout both vessels to provide the stiffest and lightest structures possible. Corecell™ foam was specified in the bow slamming region for its excellent fracture toughness and fatigue strength. McConaghy's used Gurit's SE 84 prepreg resin system to build Morning Glory and SPRINT™ was used extensively where solid laminate had been specified, successfully reducing the need for debulking and therefore speeding up the construction process considerably. Cooksons used their own wet impregnating technology in the construction of Pyewacket.

During sea trials, both Morning Glory and Pyewacket achieved impressive speeds, faster than the wind speed at points, giving an early indication of how exceptionally well these boats were to perform on the global circuit, both achieving significant victories and new records.