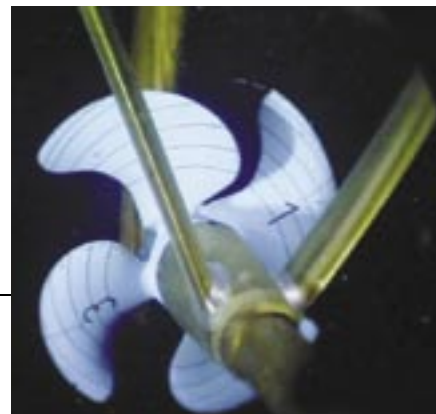


Cooperation keeps cruise ferry quiet



5.2m-diameter four-bladed propeller solution

Color Line's new ship presented an interesting propeller design challenge, which Rolls-Royce met

Color Fantasy is essentially a well-appointed cruise vessel which also has a vehicle deck. It is now in service between Oslo in Norway and Kiel in Germany, an established route that demands high standards. The 75,000gt ship can carry up to 2,750 passengers and a mix of trucks, trailers, cars and caravans. The vehicle deck can also be transformed into an exhibition area in connection with conferences and events on board.

The challenge was to meet DNV 'Comfort Class 1' requirements with a conventional twin-screw diesel propulsion system using controllable-pitch propellers. A close co-operation between Kvaerner Masa-Yards (now part of Aker Yards) in Finland, the shipowner, DNV and propeller supplier Rolls-Royce allowed the challenge to be successfully met, so that noise levels in the public spaces are below 55dB(A) and cabins are quiet.

Propeller design was complicated by the requirement that *Color Fantasy* should operate in several different modes, and in both deep and shallow water. The ship has four medium speed main engines totalling 31.2MW turning two Kamewa Ulstein CP propellers through twin-input/single-output gearboxes. At sea the normal operating mode is to run all four engines at 85 per cent of maximum power.

But there is also a requirement to run efficiently in a 1+2 condition, with one engine on one shaft running at full power and two engines on the other shaft operating at overall 67 per cent power. A third situation is running on one engine on each shaft. In the first mode the propellers can be designed to work quietly and at optimum efficiency with a minimum of cavitation. The second mode introduces a risk of pressure side cavitation on the propeller turning at full speed with reduced pitch.

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A further complication to make the propeller designers' lives interesting is that the vessel operates for part of the time in shallow areas of the Oslo - Kiel route. In shallow water the resistance increases and propeller loading increases for the same power, with a risk of sheet cavitation on the suction side and more noise and vibration. Just to make things even more complex, 'Ice class' was needed for the propellers. In fact the hubs have a higher ice class than the blades, which meet DNV Ice 1B, giving a robust unit with a reasonably thin blade profile.

Rolls-Royce gave specific guarantees on

propeller pressure pulse and efficiency, and freedom from cavitation erosion and 'singing'. Propeller designs were developed and analysed at the company's Hydrodynamic Research Centre in Sweden. Open water (efficiency) testing was carried out there while cavitation and self propulsion tests were undertaken at MARIN in Holland.

A 5.2m-diameter four-bladed propeller turning at 138 rpm was selected. The hull designers were well aware of the need for excellent inflow to the propellers as well as a good clearance between propeller blade tips and hull, if propeller-induced noise was to be minimised, and for *Color Fantasy* this was achieved with the large diameter propellers which also reduced blade loading. Both four and five-blade propellers were studied. Five blades gave slightly lower pressure pulses but also reduced efficiency, whilst four bladed units, in combination with the favourable hullform, filled the requirements under the various operating conditions.

Apart from winning the propeller contract, Rolls-Royce supplied other equipment and systems for *Color Fantasy*. These included the three Kamewa Ulstein 2,200kW tunnel bow thrusters and two 1,000kW stern thrusters, the Brown Brothers Neptune fin stabilisers and a Rauma Brattvaag anchoring and mooring winch outfit.

