

Control system conversion combines the old and the new

A flexible approach to engineering issues enabled electrical system specialists at Rolls-Royce to provide a cost and operationally-effective ship control and monitoring installation for a complex Military Sealift ship conversion



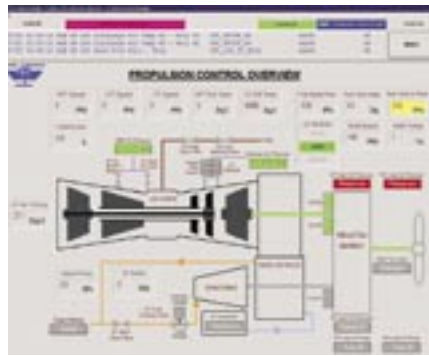
The former Soviet ro-ro USNS *Lcpl Roy M Wheat* was originally delivered in the 1970s

As part of a major conversion, a modern control and monitoring system was needed for a former Soviet ro-ro, originally delivered in the 1970s with an unusual combined gas turbine and steam turbine (COGAS) propulsion plant. This was the challenge undertaken by marine electrical system specialists at Rolls-Royce.

Lcpl Roy M Wheat belongs to the US Navy's Military Sealift Command, and has been stretched to a length of 227m by adding a 36m mid-body. Its propulsion system features twin shafts, each driven by a gas turbine and a steam turbine through a reduction gearbox – with astern power achieved by reversing the gas turbines. During the refit, the steam turbines and ancillary plant were retained, but the gas turbines were replaced with modern versions of the original Ukrainian-built Zorya-Mashproekt units.

The original control and monitoring system was effectively obsolete and impossible to support

The vessel's original control and monitoring system was centralised in the machinery room, with functionality provided by analogue control units. It was effectively



Mimic diagram showing propulsion system overview

obsolete, as it could not interface with the new plant and was impossible to support in the future. The new specification called for a minimum replacement system that would be compliant with ABS and US Coast Guard rules, with an 'ACCU' class notation for periodically unmanned machinery spaces.

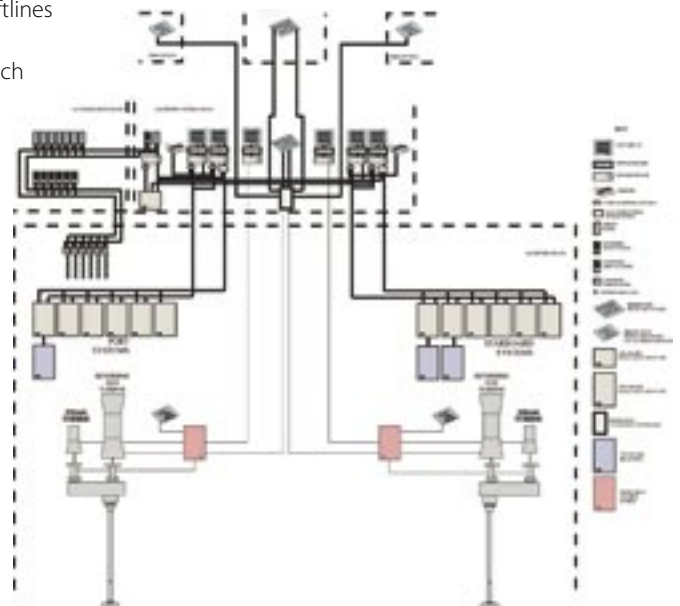
Independent systems for alarm and monitoring, and propulsion control were also specified. Further separation into port and starboard shaftlines for propulsion control would be included, which – in line with standard practice – would incorporate dedicated safety shutdown equipment. Alarm and monitoring would include some remote control for auxiliary systems.

The new Rolls-Royce-designed solution is a digital one. In line with the requirement for reduced manning, the control functionality included many automatic sequences

to ease the workload for the operators. Full control and monitoring, which grew to around 1,500 channels, is provided on the ship's bridge, complemented by a monitoring-only workstation for the chief engineer.

To meet contract budget requirements, maximum re-use was made of the existing sensors and actuators. Most were found to be in good working order, although a change in voltage dictated that all original cabling and equipment upstream of the interface points was redundant and was removed.

Among the problems that were overcome by Rolls-Royce engineers was that the shipyard found itself in charge of system integration, a task that it was neither contracted nor resourced to perform. A further challenge was that information about the existing plant was mainly in Russian, which had been translated into English by the OEMs. In fact the documentation suggested an automatic sequence which, according to the original crew, had never worked. It was necessary to modify the software to allow a degree of manual intervention, which has proved successful in operation.



The new control and monitoring system