An LED Lightvessel

A report on the First Trinity House Lightvessel to exhibit an LED Light Source.

Trinity House N° 6 Light Vessel was ordered from Philip & Son Limited of Dartmouth in November 1946 and has been in service or reserve ever since, testimony to sound construction, fine materials and excellent husbandry over more than half a century.

By Peter J Kelly, Planning and Development Manager Trinity House Lighthouse Service, Harwich.

This project was born out of a Strategic Objective to "Discontinue Diesel Light Vessels and replace with Solar Vessels by March 2012"

The value of the programme to achieve the goal was to:

- Reduce the maintenance overhead
- Negate diesel fuel costs
- Negate re-fuelling costs
- Negate environmental hazards such as heat, CO2, refuelling at sea, ship time utilised in regular attendance for engine maintenance and so forth.

Maintenance of diesel-powered lightvessels takes three men three days every six months, compared with three men on one day annually for the solar-powered version.

- The diesel-powered vessel consumes 23,000 litres of fuel each year.
- The vessel is refuelled every six months.
- The capacity of the lightvessel fuel tanks is 15,000 litres.

Criteria are set for the station in the Trinity House Navigation Action Plan. This is the starting point for the engineering design. Discussion with the Navigation Manager concluded that a range of 15 nautical miles with a flash character adjustment would satisfy the mariners' requirements.

Requirements for the navigation light were discussed with various manufacturers and the chosen supplier was Vega of New Zealand (Industrial Members of IALA) who met the specification with a VLB61 LED Marine Beacon.

Loss of the rotating optic means that, whereas in the past the mariner would be able to see some form of glow from the lightvessel, due to the loom and due to a low level of non-focussed light, with a flashed LED beacon, this is not the case. The current 20 second character is acceptable with the rotating optic but to wait for 20 seconds, in the very busy waterway of the Dover Strait, without the loom, was deemed to be too long. The light character was therefore reduced to one flash every five seconds to alleviate this problem.

Further improvements were identified by adding a fixed light, with a reduced range, above the main light. This will of course be seen all the time but will not

LV I and LV II
No 6 Light Vessel alongside at Trinity House, Harwich, for conversion to LED operation. Note the 54 solar panels on each of port and starboard sides.

Trinity House has a fleet of 12 light vessels and two lightfloats. Currently there are eight light vessels in service on the Foxtrot 3, Greenwich, Seven Stones, Sunk Centre, Channel, East Goodwin, Varne and Sandettie stations. Lightfloats are deployed at the Bar and the Sunk Inner stations. Eight of the light vessels are solar powered and four diesel. The lightfloats are solar powered. Of the four light vessels not deployed, one is ready for the Varne station (No 6), two are laid up (Nos 21 & 24), one is a hot spare as the Emergency Deployment Vessel (EDV) (No 22). It is understood that in time two of the diesel light vessels will be converted to solar power during 2010 and 2011. The LED-equipped hull was established in mid-April.

interfere with the recognition of the main 15 nautical mile light. This assembly was trialled and the result was that the intensity of the fixed light was set at six nautical miles.

Once the intensity of the fixed light was decided, it was possible to carry out the calculations to ensure that the capacity of the solar-powered battery system was sufficient to support the new navigation light and still satisfy the light vessel autonomy requirements.

The range of the beacon is 15 nautical miles and the power consumed is 326 Watt @ 25.9 V. Vertical divergence is 3.42 degrees; colour region = IALA Red preferred and the nominal supply is 24 V.

Trinity House Lightvessel N°6

The lightvessel hull used was Trinity House Lightvessel No.6 which had been converted to solar power in 1999 and was programmed to be deployed on the Varne station in the Dover Strait in place of the diesel-powered lightvessel No.19.

Until conversion this station exhibited a red light via a 1000 W MBI lamp with red filters which offer a range of 19 nautical miles.

The Trinity House Navigation Department's future requirement for the station is a red light with a range equal to or greater than 12 nautical miles.

The current main light design for Trinity House solar-powered lightvessels is a rotated Fresnel lens on a gimballed table with a 35 Watt MBI lamp. This arrangement is fine for white lights, but the red component of the MBI lamp is quite small (the red component is approximately 12% of the light source) and thus if we applied red filters to this, then the resultant range would be unacceptable. To increase the wattage of the lamp would give autonomy problems for the solar-powered battery system and thus to achieve the range and yet maintain the power via solar only, it became clear that the only option was to move towards a flashed LED light source mounted on a gimballed table.

A sub project was initiated to measure the dynamic response of the currently employed gimballed table on the Channel Lightvessel.

Information from this study was used to inform the re-design of the gimballing arrangement into a more dynamic device to better maintain the new LED light source at the horizontal. The original light source offered a vertical divergence of three degrees. The specification to beacon manufacturers called for:

- A red 360 degree LED beacon
- Three degrees vertical divergence
- 15 nautical mile range with 0.5 second contact closure
- 24 V DC supply

Un bateau-feu "DEL"

Trinity House est à la tête d'une flotte de 12 bateaux-feux non gardiennés, automatisés et télécommandés depuis la terre. Certains sont alimentés par énergie solaire. D'autres ont encore des générateurs diesel et un programme a été mis en place pour réduire les coûts de maintenance et supprimer les besoins en ravitaillement en étendant le programme de solarisation. Ceci permettra en même temps d'éradiquer les dangers potentiels pour l'environnement, le chauffage, l'émission de CO2, et de réduire le temps d'utilisation des navires de service. Il faut savoir que chaque bateau-feu alimenté au diesel consomme 23 000 litres de fioul par an et doit être ravitaillé chaque six mois. Il a en outre été décidé de réduire de 19 à 15 milles la portée du bateau-feu balisant Varne Bank dans le détroit très fréquenté du Pas de Calais, en l'équipant d'un feu DEL rouge de 360°. Comme il n'y a pas de lueur avec une DEL fixe son rythme a été porté de un éclat toutes les vingt secondes à un éclat toutes les cinq secondes. Le bateau-feu utilisé a été construit en 1948. ◆

The fixed red low intensity light above the main light.

During one of my many discussions with Captain Roger Barker (Trinity House Navigation Manager and delegate on the ANM Committee) we discussed at length the differences that would be perceived by the mariner and were jointly concerned regarding two aspects that the change from a rotated to a flashed light created.

Firstly, the loss of the loom that is characteristic of a rotated light. To compensate for this loss we decided to shorten the character of the light from Fl20s to Fl5s.

Secondly, the loss of the non-focussed component of the light, that can be seen at relatively short ranges emanating from the glassware of the lens. This we decided to compensate for by adding a fixed red low intensity light above the main light.

The Vega LED light source manufactured in New Zealand.

Un buque faro con LED

Trinity House opera una flota de 12 buques faro sin dotación, cada uno automatizado y controlado en forma remota desde tierra. Algunos funcionan con energía solar y otros cuentan con generadores diesel. Se incorporó un programa a fin de minimizar los gastos generales por mantención y eliminar la necesidad de recarga de combustible mediante la extensión del programa solar. Al mismo tiempo, se eliminarán peligros para el medio ambiente tales como el calor, el CO2 y el tiempo que se utiliza en el servicio de mantenimiento de un buque. Cada buque faro a diesel consumía 23.000 litros de combustible al año. La recarga de combustible se realizaba cada seis meses. Se reconoció que el alcance del buque faro que marca el banco Varne en el muy transitado Estrecho de Dover se podría reducir de 19 a 15 millas náuticas. Se decidió que la fuente de luz sería una baliza LED roja de 360 grados instalada en una mesa con suspensión cardan. Puesto que no existen tubos con luz LED fija, el carácter se redujo a un destello cada 5 segundos en vez de hacerlo cada 20 segundos. El buque faro que se encontraba en uso se construyó en 1948.

The light vessel's lantern demonstrating space which greatly assists installation and maintenance of the light source.

Editor's Note

No. 6 lightvessel, which was dry-docked in October 2008, was due to be deployed on the Varne station during March 2009. Earlier that month she underwent a soak test in Harwich Harbour. A spare LED lantern was, at the time of writing, en route from New Zealand for installation. For development purposes pitch and roll monitoring was being fitted and gimbal monitoring and it is understood that the output from this will decide the gimbal design for light vessels No. 19 and 24 which will be similarly converted and deployed in 2010 and 2011.

Trinity House No. 6 Lightvessel was ordered by Trinity House London from Philip & Son Limited of Dartmouth in November 1946, launched in May 1948 and initially served on the Breaksea Station in Welsh waters. The hull was fitted with an automatic light and systems in 2001 and placed on the Newarp Station on the East Coast.

Built at a cost of £61,705 the hull, as constructed, was 137.25 feet length overall, 119 feet between perpendiculars, with a beam of 25 feet and a depth of 15 feet. She was one of a Class of 17 lightvessels, each built by Philip & Son between 1945 and 1953. Others followed to N° 21 ordered in 1962.

To be operating a hull for 60 years is some achievement and surely is a result of sound construction, fine materials and excellent husbandry.

If any reader cares to report on the longevity of lighthouse tenders, buoy servicing vessels or light vessels, this I feel would make a welcome contribution to The IALA Bulletin.