Picture show

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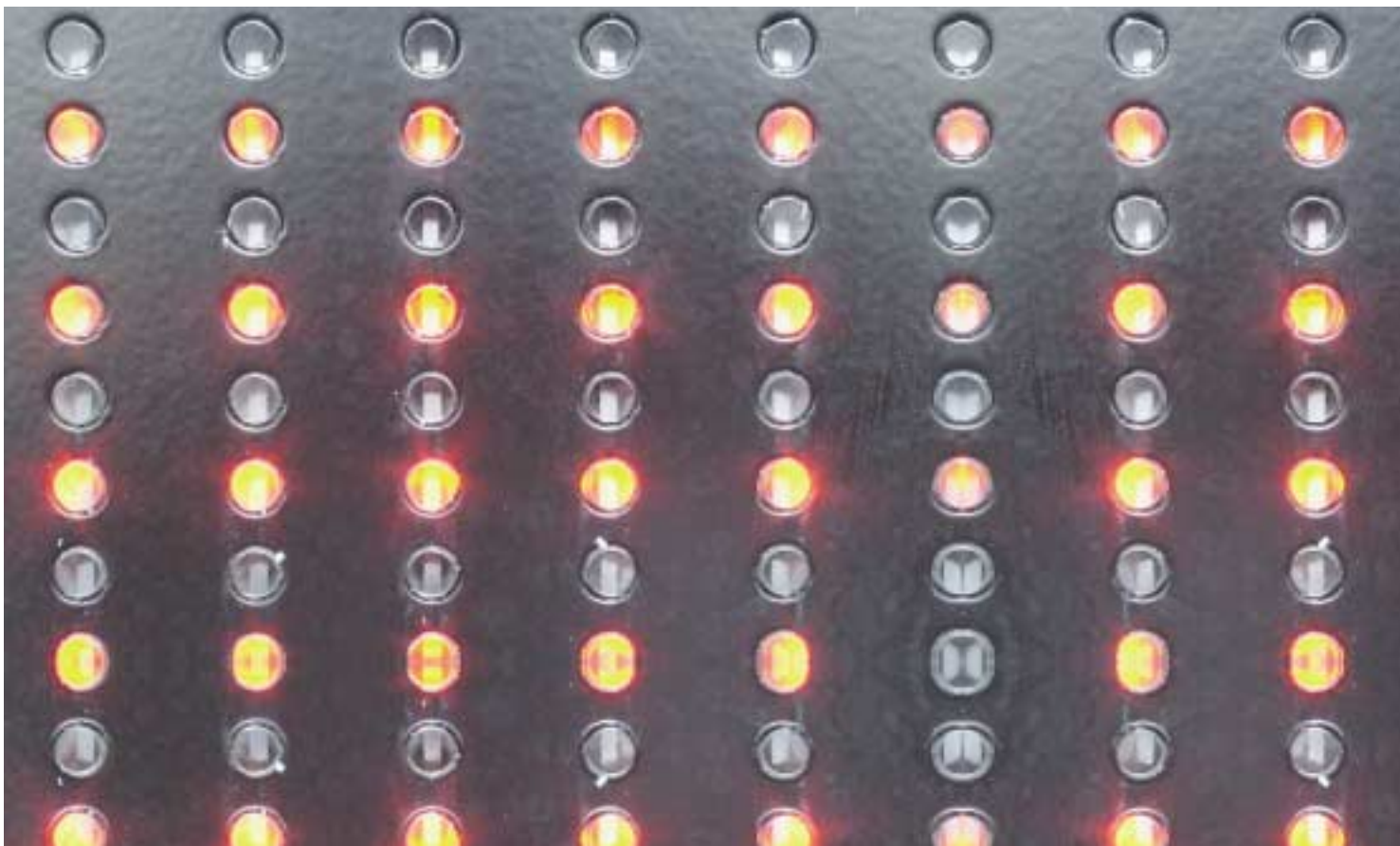
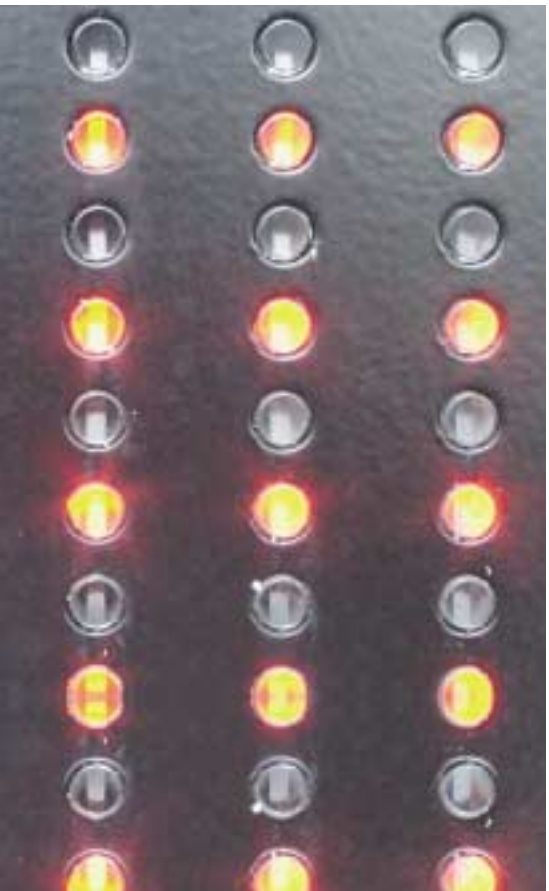
New technology for the next generation of VMS

We all know what is meant by the saying 'a picture paints a thousand words', and the idea holds true when it comes to displaying pictograms on variable message signs (VMS) to convey information to drivers





An alphanumeric-based VMS displaying messages is ideal in locations where the vast majority of drivers use the same language. Where a minority of drivers speak a different language it is possible to alternate messages e.g. Greek and English.

In a European context the question of drivers understanding information displayed on variable message signs is important, given the amount of cross border traffic plying the trans-European network of roads. On a recent journey in Belgium, I counted vehicles from 15 different countries in as many minutes, therefore many of the drivers would not have understood Flemish or French.

The organisation considering the implications of trans-national travel WERD/DERD – Western European Road Directors and Deputies – recognises that a common set of pictograms used throughout Europe would become a non-language based means of displaying information, understandable by all drivers regardless of mother tongue.

Developing the MS4

As their contribution to the WERD/DERD initiatives, the Highways Agency in England undertook an ambitious development to display pictograms and text on a high-resolution dual colour LED matrix, which has become known as the MS4.

The MS4 needs to be put in context; the two line 16 character MS3 design has over 4,000 pixels and a refresh time of 2.5 seconds. The MS4 is dual colour, has nearly 11 times the number of LED's and 10 times the rate of internal communication. So there were a number of challenges to be dealt with in developing the concept MS4.

VMS Ltd are renowned for the innovative and highly reliable Rigel LED technology, which was applied to a concept for the MS4 commissioned by the Highways Agency (HA), and installed on TRL's test track in Berkshire four years ago. Consultant, Atkins, were involved with the development of the structure and enclosure, and with the conduct of the trial on behalf of the HA. The MS4 prototype was produced very quickly to allow the HA to evaluate the concept before committing to a firm specification.

A new design

After reviewing the MS4 at TRL it was recognised that the large polycarbonate front screen had a significant disadvantage. Under certain viewing conditions it caused reflections, which could be distracting to the driver and reduce the legibility of the display.

Faced with eliminating as much reflection as possible it was tempting to:

- Apply a matt black adhesive vinyl to the polycarbonate with holes in front of each pixel to allow light to be emitted;
- Or place a perforated black metal screen in front of the polycarbonate.

Neither method was adopted as experiments showed that although a black material covered much of the polycarbonate, wherever there was a hole to allow light to be emitted there would be reflection. The VMS Ltd solution is based on precision engineering and innovative application of Rigel technology that totally eliminates a polycarbonate front screen.

Investment in tooling for the moulded plastics is the key to optical performance. The design adopted by VMS Ltd required close cooperation with Tegrel Engineering Ltd who made the enclosure to ensure the high tolerance lenses and plastics aligned with the precision punched holes in the aluminium front screen.

With this arrangement less than five per cent of the area of the front screen is made up of lenses, therefore any problem with reflection is minimised.

The Rigel technology

At the heart of the VMS Ltd MS4 optical system is the well-proven Rigel Optical Deflection Device, which has already been used very successfully in over 800 variable message signs and indicators. The Rigel technology has been developed using an innovative and patented optical deflection device to project a very high proportion of the luminous flux from each LED in the required direction.

Normally, only 20 per cent of the actual output of an LED is projected forward, but with this optical device over 90 per cent of the luminous flux is projected forward and with the primary and secondary optics, the required optical performance is achieved. This is particularly important to produce the ±10° viewing angle.

Trial of M42 ATM Active Traffic Management Scheme

The criteria for the MS 4

Display	Pictograms and text
Matrix dimension	3840mm x 2560mm (w x h)
Matrix	192 x 128 pixel (w x h)
Character modules	12 x 8 (w x h), 320 x 320 mm (16 x 16 pixel matrix)
Pitch	20mm horizontal and vertical
Overall dimensions	4,420 x 3,600 (w x h)
Optical performance	TR2136 Issue B (corresponds to pr EN 12966)
Colour	Yellow or dual red/yellow
Mounting	Cantilever with no access platform
Design	Low environmental impact, aesthetically pleasing
Refresh time	0.25s all LEDs

As a result of this, VMS Ltd are able to offer a single LED solution where the average drive current is less than 20mA even at the highest light output. These LEDs have a maximum rated drive current of 70mA and a MTBF of >150,000 hours. Therefore with the reduced drive current and the extensive onsite experience, VMS Ltd can confidently predict a life that will exceed the 15 years required by the MS4 specification.

The LED's Rigel super bright yellow (590nm) and red (620nm) devices, which are uniquely designed to give supreme visibility of sign characters at considerable distances in the brightest ambient viewing conditions.

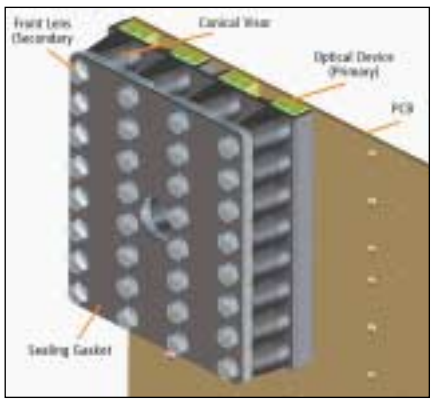
Visor and lens

The visors are precision-moulded cones with a matt black textured interior, the cone preventing any ambient light from being reflected back to the motorist. No light from any LEDs can affect adjacent pixels because the visor completely encloses the optical device.

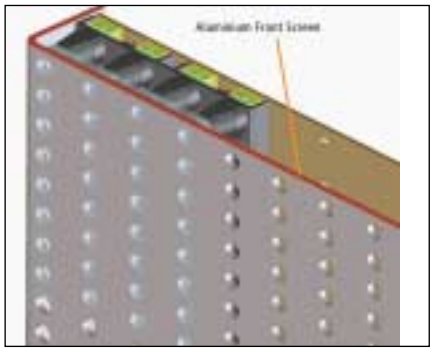
The front lens, which again is precision moulded, controls the beam of light finally emitted to produce a ±10° horizontal distribution or half angle. Moulded into the lens is a 5° down angle to ensure that any external light falling onto the lens is diverted downwards away from oncoming motorists.

The complete character module can be inserted from the rear into the MS4 enclosure front face, mounting onto M5 studs on the front face of the aluminium front screen, as shown below. The gasket material when compressed between the front lens and front screen provides the weather seal to IP.

MS4 warning of approaching roadworks



Utilising the precision moulded cones with a matt black textured interior, prevents any ambient light from being reflected back to motorists



The complete module is inserted from the rear into the MS4 enclosure aluminium frontscreen

VMS' new optical system is based around the strengths of VMS Ltd well-proven Rigel lens and visor modules and the lessons learnt from the initial MS4 trial at TRL. The visor and the lens have both been optimised for the MS4 to give excellent contrast ratio and precise control of light output. In addition the aluminium front face with precision exit lenses will eliminate problems with reflection and further improve contrast ratio. Both the optical system and the Rigel technology are fully patented.

Current trial

The HA is currently conducting an MS4 on-road trial, in which VMS Ltd is participating. VMS Ltd has designed, developed, and installed 24 of the 36 new MS4 signs between junctions 12 and 14 of the M4, London to South Wales Motorway. The project is in its final phase and the effectiveness of these new signs is currently being evaluated.

MS4 is also used on the HA flagship Active Traffic Management scheme on the M42 Motorway, east of Birmingham, England. The scheme will see MS4 and AMI – Advanced Motorway Indicators – vary the speed limit according to traffic density and control the hard shoulder as a temporary running lane. The VMS Ltd AMI sign employs similar precision moulded optical techniques as the MS4.

VMS Ltd has been of the forefront of the application of LED optical technology to road and rail driver information systems since the introduction of the Rigel technology in 1996. The company has extensive experience in communication protocols and has just recently successfully implemented NTCIP on a project in Auckland, New Zealand. ■