resolveoptics

lensinnovation

Welcome to the Autumn 2018 edition of 'Lens Innovation' – a periodic eNewsletter from **Resolve Optics Ltd**. Each issue of Lens Innovation is designed to keep you informed about the latest technological developments, applications advances and breaking news in the optical design and manufacture industry.

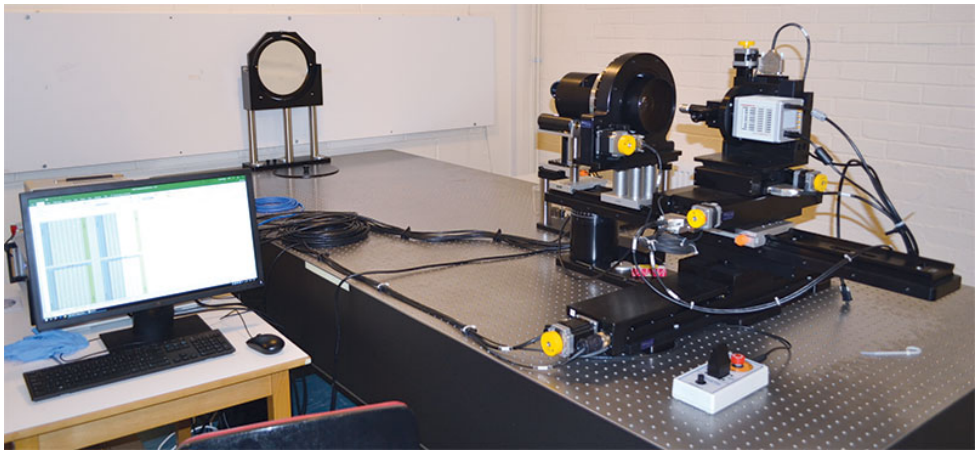
If a particular feature interests you do not hesitate to contact us or follow the link for further information. We welcome your feedback.

Mark Pontin (Managing Director)

Printable version (pdf)

INFORMATION GUIDELINES:

Advantages of Automated Versus Manual Lens Testing



Even using the most sophisticated design and manufacturing techniques, lenses and optical systems can still vary in quality. However, what every customer wants to know is that every lens supplied to them meets and exceeds the agreed specification.

Due to the ever-increasing level of testing and detailed data required by OEM customers, Resolve Optics decided to look at ways to automate and improve testing procedures.

When optical designers and manufacturers look to compare the performance of optical systems, a commonly used measure is the modulation transfer function (MTF). The MTF of a lens is a measurement of its ability to transfer contrast at a particular resolution from the object to the image. In other words, MTF is a way to incorporate lens resolution and contrast into a single specification. MTF can be used for optical components as simple as a single element spherical lens to those as complex as a multi-element zoom lens system.

Not only does the MTF provide us with a means of expressing the imaging quality of optical systems objectively and quantitatively. Traditionally MTF testing has been a laborious manual procedure that relied upon the expertise and skill of a trained optical technician.

Using a next generation automated MTF lens testing system – Resolve Optics has been able remove much of the variability of human involvement. As a result – the accuracy and repeatability of lens testing

has not only been improved but now can also be done faster.

Apart from MTF, the new automated test centre at Resolve Optics can also measure distortion, focal length and register position. All this valuable quality information can be provided to customers with their finished lenses. Our automated test centre consists of motorised stages that enable lens testing to be carried out at + 40° on image formats of + 150mm and motorised rotary lens mount. All movements stages are encoder controlled and accurate to 0.25 of a micron.

To learn more about how our automated lens testing centre can deliver better quality lenses to you time after time **click here**.

VIEWPOINT:

Are Off-The-Shelf Optics Always The Best Choice?

Mark Pontin, Managing Director of Resolve Optics Ltd., explained in a recent industry interview how optics have played a central role in the transformation of modern manufacturing processes. In case you missed this interesting Q&A session we have reproduced it in full below:

Q: THE PROCESS INDUSTRY IS A LARGE, DIVERSE AND GROWING MARKETPLACE. WHAT FUNCTION DO OPTICAL INSTRUMENTS AND SENSORS PLAY IN HELPING MANUFACTURERS AND SUPPLIERS?
Mr. Pontin: Modern manufacturing processes have been transformed by the use of optics, which can both improve current manufacturing capabilities and enable new ones. Light directed by optical systems can be used to process or probe materials remotely, even through windows isolating harsh or vacuum environments. With no surface contact, there is no contamination of the process by the optical light beam. Optical techniques such as Near Infrared, Short Wavelength Infrared, Mid Infrared and Raman spectroscopy are being used to provide information about and help improve a manufacturing process or to perform manufacturing as in the case of photolithography or materials processing. Independent market research reports indicate that the global market for process spectroscopy equipment to already be worth over $1 billion annually.

Q: RESOLVE OPTICS IS WELL KNOWN FOR ITS OEM LENS DESIGN SERVICE. WHAT ARE THE BENEFITS OF OPTING FOR A CUSTOM LENS RATHER THAN AN OFF-THE-SHELF LENS FOR YOUR PROCESS INSTRUMENT AND SENSOR?
Mr. Pontin: Typically, off-the-shelf lenses are manufactured for the mass market where unit cost is the dominant driving force. However, when it comes to an application that optically requires something a little more demanding such as high performance, high-resolution, compactness or a large format image, using an off-the-shelf lens will force you to accept a compromise in one or more aspects of optical performance. The result of this compromise can be a reduction in optical performance (restricting process measurement advantages and possible applications), a bulkier less attractive product, shorter product life and loss of competitive advantage – all of which ultimately lead to lower profitability. As a result, demand for custom lens designs for process instruments and sensors that meet the exact needs of the customer application are rising dramatically.

Q: CAN YOU GIVE SOME EXAMPLES OF PROCESS APPLICATIONS WHERE RESOLVE OPTICS CUSTOM LENSES HAVE HELPED MANUFACTURERS OR SUPPLIERS?
Mr. Pontin: I cannot give specific details of process applications helped by optimised bespoke lens designs due to customer confidentiality. However,

it is true to say that, driven by the desire to measure or identify something in a process, more accurately, at a lower level or even just faster that process operators want a custom lens design that meets or exceeds their application need without compromise. Our optimised custom designs enable process customers to get the maximum performance from their instrument or sensor without the lens being a bottleneck. We also endeavour to design the lenses to be as future proof as the budget will allow.

Q: FLEXIBILITY AND MODULARIZATION HAVE BECOME MORE AND MORE IMPORTANT IN THE PROCESS INDUSTRY: HOW IS RESOLVE OPTICS ADAPTING ITS LENS DESIGN, TESTING AND MANUFACTURING CAPABILITIES TO BEST SUIT THE CURRENT NEEDS OF THE SECTOR?
Mr. Pontin: Our lens designs are driven by each customer's specific requirements. We ensure that we understand exactly what the customer is trying to achieve, and then specify, design and produce a lens or lens system to exceed those expectations. You could say that we are as flexible as the customer requires us to be. As an organisation committed to reproducibly producing key optical components and systems for our customers of the highest quality we operate to strict ISO9001 guidelines and invest in advanced testing equipment and highly trained staff.

Q: DO YOU THINK THAT – GENERALLY SPEAKING – THE SUCCESSFUL COMPANY OF THE FUTURE WILL AIM MORE AT READINESS OR AT CUSTOMIZATION IN ITS APPROACH TO END USERS?
Mr. Pontin: Often a lens or optical system is one of the last components of an instrument or sensor to be considered by a company designing a product. This is not because the optics are considered less important but rather due to the fact that many customers would prefer to go for a readily available off-the-shelf lens. While this may be a suitable optical component sourcing strategy for some process applications, if the target application is a bit more demanding (high performance, available space, wavelength) – an off-the-shelf lens is often not available. In such scenarios, choosing to develop a custom lens system optimised to the exact requirements of the application is the best option. Not only is an optimised sensor / instrument more likely to do the job, but it can give the supplier a competitive edge over other suppliers' products that try to utilise non-optimal components.

If you are developing a new product that would benefit from a performance optimised specialist lens / lens system to give you a competitive edge – **click here** for a free specialist lens design, development and manufacture information pack.

TECHNOLOGY FORUM:

Important Considerations When Designing Optical Systems for Space Projects

Today we employ many different types of optical imaging and sensing systems to observe and measure the Earth and the universe at large. However, designing optical systems for satellites and spacecraft is challenging due to the harsh conditions that space places upon components and systems working in this remote environment.

- Strong electromagnetic radiation
- High vacuum
- Zero gravity
- Large temperature gradients
- Size and weight

When designing for a space application probably a key consideration is

the life of the application or how long is the optical system required to work for. The longer the optical system is in orbit the greater the exposure to electromagnetic radiation thereby increasing the criticality of only using optical components and structural materials that are radiation resistant. All optical elements within Resolve Optics space lens designs are made using cerium oxide doped glass or synthetic silica enabling them to withstand radiation doses of up to 100,000,000 rads and temperatures up to 55°C without discoloration or degradation of performance.

The next and probably trickiest consideration when designing spaceborne optical systems is the high vacuum environment. Careful selection of optical elements, structural materials and optical adhesives that do not release moisture or outgas is vital. Outgassing in an optical system could be disastrous as it could coat the optics and destroy the image quality. Likewise choosing optical coatings that evaporate under vacuum risks causing moving parts to fail.

Gravity or the lack of it also to be considered. When designing optical systems with moving parts in space you must minimise their degree of freedom as they will continue to move and wobble due to the lack of gravity. Any unwanted movement will of course result in loss of performance and precision.

The space environment can also potentially subject your optical system to large temperature gradients that may result in changing of optical and mechanical properties, stress, embrittlement and thermal expansion. Knowledge of how your optical elements and structural parts perform across a wide temperature range is therefore also vitally important in designing optical systems for space.

As you can see designing optics for use in space is not simple. Over the last 20+ years we have worked with the leading international space agencies and satellite development companies in North America and Europe to develop and deliver high performance optical systems that reliably perform the function they were designed for. For further information on space optics please email **sales@resolveoptics.com**

PRODUCT FOCUS:

As a result of ongoing internal R&D and collaborations with third parties – Resolve Optics has a strong track record of producing innovative lenses that set a new benchmark for performance, utility and reliability. In this issue of Lens Innovation we discuss 2 application optimised lenses.

Inspection and Material Sorting

The Model 363 is a 16mm diameter Short Wavelength Infrared (SWIR) lens for inspection and material sorting applications.

The design of the Model 363 utilises carefully selected glass types and AR coatings to ensure maximum transmission and best image quality throughout the SWIR waveband (900 to 1700 nm). Focus and colour correction on the Model 363 lens ensures that you get the best possible image from your SWIR camera, instrument or sensor without the need for constant refocusing.

Click here for Model 363 technical data sheet.

Covert Surveillance

The Model 230 is a 2.5mm diameter, f/5.6

covert surveillance lens designed for use with 7mm diameter remote head cameras. The unique design of the Model 230 enables it to be inserted and concealed in a small hole in the area to be kept under surveillance. While very small in size, the Model 230 produces a broadcast quality image.

Click here for Model 230 technical data sheet.

PROJECT NEWS:

In this newsletter feature we share with you the latest news on some of the interesting OEM lens design, development and manufacture projects that we are currently working upon.

Behind the Wheel Perspective

Earlier this year – Resolve Optics was selected by a television broadcaster to supply adapted versions of its Model 207 motorised miniature zoom lens as a key element in an in-car, onboard camera for professional racing. The aim of installing the onboard camera with Model 207 zoom lens was to provide viewers with a dynamic driver's perspective during races. Measuring just 1.85 x 0.9 inches (46.5 x 23.1 mm) the Model 207 is the smallest motorised optical zoom lens with focus tracking available in the commercial marketplace. Its high-resolution images make it highly suitable for broadcast applications.

Click here for Model 207 technical data sheet.

Designed for

Purpose Military Lenses

Internationally downward pressure on defence budgets has meant that most military equipment contractors are looking for ways to provide fit for purpose products at competitive prices. One approach to reducing cost has been to source the lowest price standard optical components / systems and then work to make them suitable for the military application the product is being supplied for. However, Resolve Optics has found producing a lens / lens system for military use requires careful consideration of its resistance to vibration, shock, temperature and water ingress in addition to ensuring high reliability and top performance.

To read more, **click here**.

HOT OFF THE PRESS

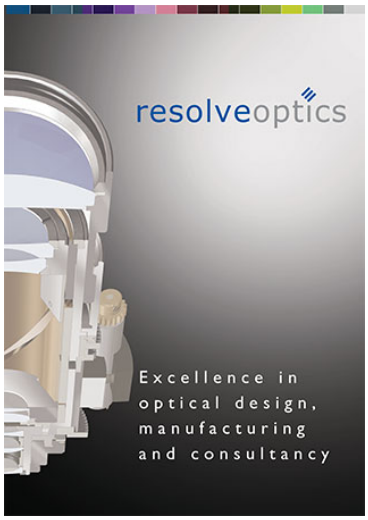
This newsletter feature is written to inform you about what's new at Resolve Optics.

Video Teleconferencing Facility

The video teleconferencing facility at Resolve Optics was set-up to

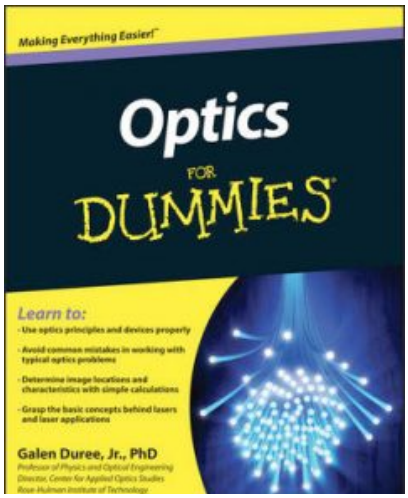
improve and enhance communications with our customers around the world. Being able to share and discuss a 3D CAD image of a prototype lens design with participants in different locations is helping us to accelerate lens developments. For existing customers, we have also been able to use the teleconferencing facility to troubleshoot and quickly solve questions raised on delivered lenses.
Why not try out this new facility – **click here** for further information.

New eBrochure to launch at VISION 2018



Resolve Optics is launching a 24-page specialist lens e-brochure for scientists, engineers and optical designers at the forthcoming VISION 2018 show in Stuttgart, Germany. The e-brochure brings together technical information on the company's growing range of high-performance fixed focus and zoom lenses. Following an easy to use turning book page format the e-brochure details specialist lens for use in the SWIR, IR and UV regions, the company's popular portfolio of radiation resistant lenses plus the most compact HD 10x zoom lens available – the Z10.

To request a copy of the new e-brochure: **click here**



THE LAST WORD:

Book Review: Optics For Dummies

We thought twice before including this useful book as our review just in case anyone thought we were casting

aspersions !

Part of the internationally renowned XXXXXX for Dummies series this book is the perfect companion to help you better understand optics if you are not an optical designer already familiar with the background science and terminology. Optics For Dummies provides an easy introduction to optical science, methods, and applications. The book offers plain-English explanations of the nature of light and optical effects; reflection, refraction, and diffraction; colour dispersion; optical devices, industrial, medical, and military applications; as well as laser light fundamentals.

Further information: **click here**

Printable version (pdf)