



**Welcome to the Spring 2021 edition of 'Lens Innovation'** – a twice yearly 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.



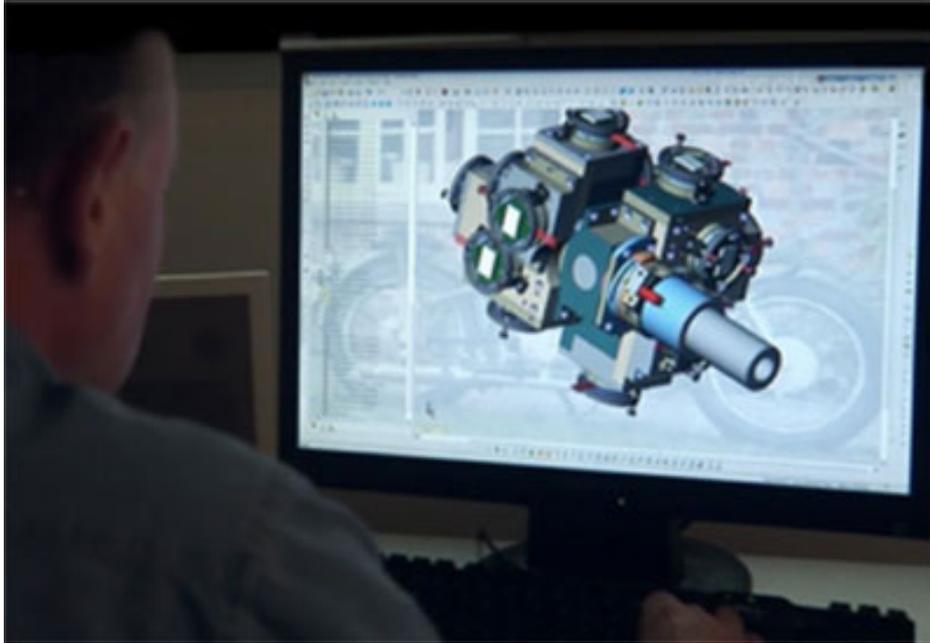
**Mark Pontin**  
**(Managing Director)**

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[Printable version \(pdf\)](#)

## INFORMATION GUIDELINES:

### The Role of Expertise and Experience in Designing & Producing Custom Optical Systems



As we have discussed many times – not every detection, imaging or spectroscopic application can be solved using standard off-the-shelf optical components or systems. 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 – opting for off-the-shelf optics may force you to accept a compromise in one or more aspects of optical performance.

Any project requiring a custom optical system starts by necessity with the need to gain a full understanding of the customers target application.

An experienced team of optical designers and engineers is critical to being able to quickly gain an understanding of the basic physics of the technology associated with the product for which a custom lens or optical system is required to improve performance or expand capability into a new application area.

The ability to provide an optimised optical and mechanical design assessment for custom optical system developments, in a timely fashion, is very difficult to achieve without expertise and experience. At this stage

of a custom optical system project, only experience can allow you to quickly determine what is possible and what isn't. This assessment can save customers both time and money.

Optical system design and development requires extensive knowledge at both the component and system levels. For a custom optical system it is important to determine whether you require an imaging or non-imaging design because the performance requirements for each are very different. Optical imaging systems are designed to transfer an image of an object to a detector, such as a camera, sensor or your eye. By comparison, non-imaging optical systems are typically designed to collect, disperse, resize, focus, or collimate light. Following this, the next step is to determine the primary optical parameters of your optical module or system. At this point, we are ready to start designing an optimised optical module or system for your application.

It is very important that any custom lens or optical system design specification is detailed, unambiguous and clearly understood by the customer to meet or surpass their requirements before proceeding to the development stage.

Once a custom optical and mechanical design is approved, typically the next step is to provide a general approximation of the cost of the development (ROM cost) plus likely lead times based on experience. A project engineer should be assigned to closely liaise with customers at all points of a development to ensure complete satisfaction with the final custom optical system.

Resolve Optics optical design and engineering teams have many years' experience of creating and producing optimised optical components and systems designed to meet or surpass customers specific requirements. We employ the latest advanced optical manufacturing and CNC machining equipment to produce high quality components and systems. In assembly, experienced workers build complete assemblies with care and attention to detail. All products are rigorously tested before leaving our factory to ensure your complete satisfaction. It is this blend of skills, experience and flexibility that have established Resolve Optics Ltd. as a leading manufacturer of special OEM lenses and optical products for a significant and growing portfolio of small and large high technology businesses.

[Watch a video](#) to learn more about custom optical design and development at Resolve Optics

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## VIEWPOINT:

### Business After BREXIT – Mitigating Impact on EU Customers



As of  
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January 2021, the BREXIT debate is over with the UK and EU finally agreeing on trade and cooperation terms. We are aware that it was the UK's decision to leave the EU and as such it is our responsibility to ensure that the effects of BREXIT do not become the problem of our EU customers and partners.

Resolve Optics has taken measures to ensure that our supply chain to EU customers remains open and uninterrupted.

This has required us to work closely with our suppliers to make sure they understand the new requirements for shipping from the EU to the UK. By paying attention to the smooth operation of our supply routes we have managed to maintain our lead times and on time deliveries.

Resolve Optics is also continuing to work with shipping couriers to ensure our orders to EU customers are delivered without delay. After initial teething troubles in January and February it appears that shipments to the EU are now running smoothly. Though, on average, shipments are taking about a day longer to reach their EU destination we are looking to offset this by shipping goods a day early to ensure our customers delivery

expectations are met.

To further smooth the transition to the new UK / EU trading arrangement – Resolve Optics will also do all the required paperwork, including customs invoices that include proof of origin and our EORI number for shipping to EU.

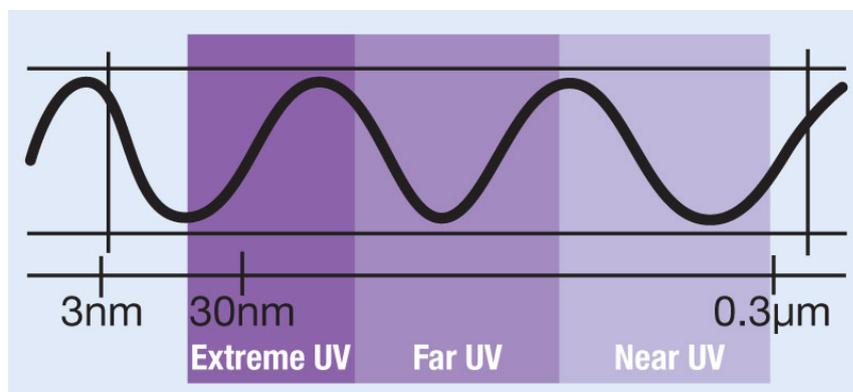
Managing Director – Mark Pontin commented “BREXIT has not changed the primary reasons that organisation choose to partner with Resolve Optics – our decades of experience of innovative optical design, high quality production all backed by excellent technical support. Our promise to our friends throughout the EU is that we will work closely you to continue to deliver the same high-performance lenses and optical systems and quickly resolve any issues that come to light”.

If you have any questions relating to this issue please [click here](#).

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## TECHNOLOGY FORUM:

### The Benefits & Challenges of Using UV Lenses



Ultraviolet (UV) is the region of the electromagnetic spectrum with wavelengths from 10 nm to 400 nm, shorter than that of visible light, but longer than X-rays.

Traditionally UV lenses were predominantly used in scientific institutions for optical research. However, many molecules contain chromophores which will absorb specific wavelengths of UV light which has led to a rapid expansion of the use of UV lenses in industrial and commercial

applications. Notable areas that use UV lenses include pharmaceutical, life science and cosmetic research, material science, petrochemicals, forensic analysis, authenticating documents/artwork to determine forgery and in the nuclear industry.

Unfortunately, many optical materials which are transparent to visible light become strongly absorbing in ultraviolet spectral region. This is essentially because the photon energy then becomes comparable to the band gap energy; a single photon is then sufficient for exciting a carrier from the valence band to the conduction band.

Also due to the shorter wavelengths – scattering effects are very strong in the UV region. Consequently, to minimise these effects, manufacturing UV lenses with tight tolerances and high surface quality ( $\lambda/10$  p-v or better) is much more critical than with visible or IR optics.

In the UV, many optical materials exhibit substantially stronger chromatic dispersion than in the visible or infrared regions. This is particularly a problem when using lenses for focusing broadband ultraviolet light. In such circumstances using achromatic UV lenses can then be particularly important.

Your target application's analytical waveband will be the primary deciding factor in choosing the most suitable UV optical material. Most materials will have a sharp cut-off wavelength, where absorption begins, and how far into the UV the cut-off goes depends on the material type and purity.

Highly purified Calcium Fluoride ( $\text{CaF}_2$ ) is a popular material for UV lenses. This is because of its very low UV absorption, high homogeneity, low birefringence, relatively high hardness (compared with other fluoride materials), high physical stability, and high optical damage threshold. Calcium Fluoride can be used down to around 160 nm and is thus suitable for use with argon fluoride (ArF) excimer lasers. However,  $\text{CaF}_2$  is brittle, naturally anisotropic, and hygroscopic. Similar properties are obtained for other purified fluorides such as Magnesium fluoride ( $\text{MgF}_2$ ) and Lithium Fluoride ( $\text{LiF}_2$ ) which can be used down to 110 nm.

Fused Silica, also known by trade names including Suprasil, Spectrosil and Lithosil is the most common of the UV grade transmissive materials. It is very popular due to cheap production, as it is made from sand, very good thermal dimensional stability, and its durability. Unfortunately, cheaper

standard-grade fused silica has significant attenuation below 260 nm, necessitating the use of UV-grade fused silica which offers good performance down to ~200nm.

**Case Study:** [click here](#) to learn about how a UV zoom lens is helping verify spent fuel rods in the nuclear industry.

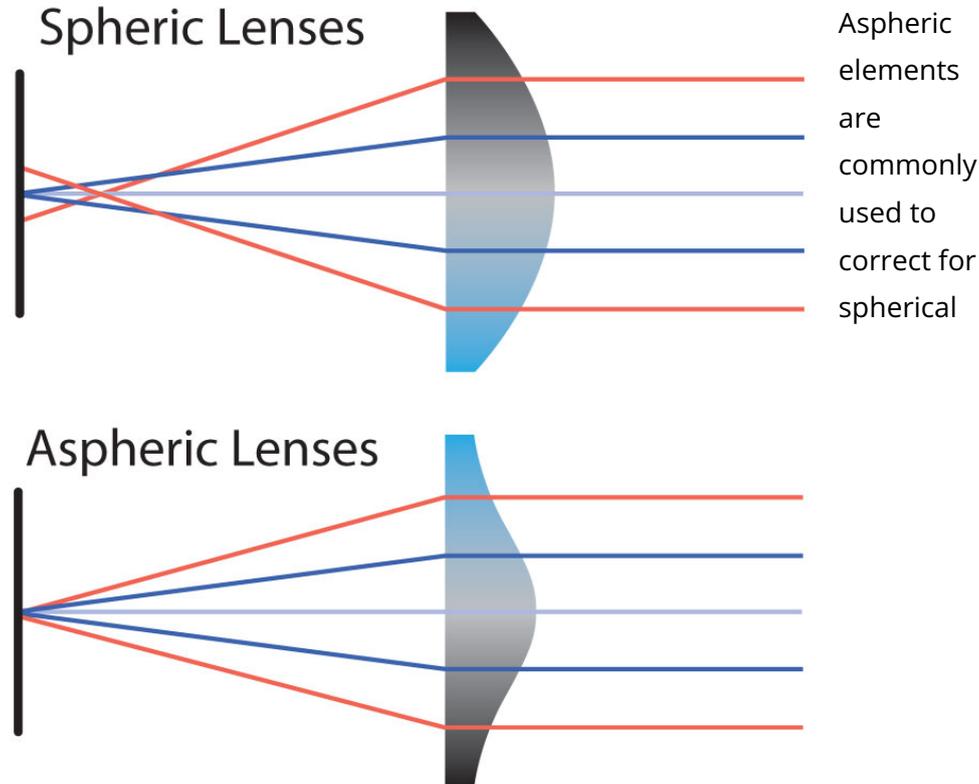
**For further information on UV lenses:** [click here](#).

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## DESIGN FOCUS:

### Considering Aspheric Optics?

In recent years there has been a trend towards increased use of aspheric elements in optical designs. The driving force behind this trend is that a single aspheric element can replace 2 or 3 spherical elements in a design whilst maintaining or improving the performance of the system. While this design strategy certainly seems to work for infrared and laser optics the advantages for incorporating aspheric optics in vision systems is less.



aberrations and they do this particularly well in wide angle and large

aperture optical designs. However, our experience is that in a typical lens design the benefits of integrating an aspheric element can be outweighed by the cost of aspheric lenses typically being twice the price of a standard spherical lens element.

Spherical lenses are optical elements that feature a spherical surface with a radius of curvature that is consistent across the entire lens. They are constructed such that the light entering them diverges or converges, depending on the lens design. Concave spherical lenses have a negative focal length that causes incident light to diverge (creating a virtual image). In contrast, convex spherical lenses have a positive focal length that causes incident light to converge (creating real and virtual images). The real images formed are highly focused, while the virtual images formed are highly magnified. The main advantages of using spherical lenses in optical systems are their simpler surface design and lower manufacturing cost. These benefits make them suitable for various imaging applications in a diverse set of markets.

When Resolve Optics starts developing a new optical design – we always go through whether the use of aspheric elements provides significant advantages over the use of spherical elements. In conclusion, we believe that Aspheric optical elements are not the magic bullet that they are sometime reported to be. They have their place in optical design but they do not automatically improve or add value.

Typically, the best optical designs are the ones that meet the specification requirements with the simplest design. Why make your optical design more complicated than it needs to be.

**To discuss a new aspheric / spherical lens design: [click here](#).**

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## **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.

### **High-Definition Nuclear Inspection in Hard-**

## to-Reach Areas



Headquartered in Norrtälje, Sweden – Ahlberg Cameras is a high-tech company that specialises in delivering radiation resistant visual inspection equipment, incorporating the latest technology, to enable monitoring of nuclear reactors and nuclear waste facilities.

As part of their development of a new radiation-hard inspection system – Ahlberg Cameras turned to Resolve Optics to design and produce a robust, non-browning zoom lens that could deliver High Definition (HD) colour images and handle 50,000 Gy / 5,000,000 Rad total dose without degradation.

The resultant Mini-Rad 30 HD camera series, incorporating the special fixed focus lens developed by Resolve Optics, is about 100 times more radiation tolerant than most currently available standard nuclear colour HD cameras. These new radiation-hard inspection systems have been developed to replace old tube camera technology.

Providing true HD quality images, the 5mm fixed focus radiation resistant lens developed and supplied by Resolve Optics enables Mini-Rad 30 HD camera systems set a new standard for safe, high quality inspection of monitoring of hot cells, belt lines and close up inspection of baffle bolts.

**Want to discuss a nuclear inspection project? – [click here.](#)**

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## HOT OFF THE PRESS

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

### Smarter



## Working Initiative

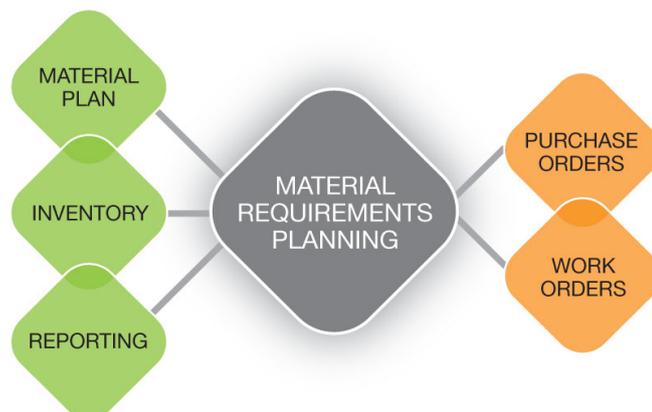


As of 1st February 2021 – we have implemented a 4-days on, 3-days off, work pattern to improve the work life balance of our employees. The global COVID-19 pandemic forced Resolve Optics to look at how we work and how we stay connected and best serve our customers. It has shown us that we can work smarter, more efficiently and most importantly more productively as a motivated team.

Read interview in full: [click here](#).

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## New MRP System helps Improve Production Planning



Resolve Optics is always looking for ways of establishing and maintaining strong relationships with its customers. As part of this continuous process, we invested in and

implemented a new **Materials Requirement Planning (MRP)** system in 2020. We asked purchasing administrator – Rob Watkinson the key areas that customers were benefiting from the MRP system. He said “Better handling of serial numbers by the MRP makes it easier for us to trace any given serial number back to its sales order and works order. This Improved traceability makes it much easier to trace all of the components that went into any given works order. We now also have better metrics for tracking on time delivery which allows us to keep on top of our purchase orders insuring that goods arrive on time at our customers. In our new MRP set-up, additional warehousing features allowing production and sales staff to create demand for items to be picked, shipped and put away

all from within the system. This has eliminated the need to print out pick lists reducing our environmental footprint as well as increasing efficiency within the company. Finally, we have established a much more comprehensive “bin” system which gives us much more flexibility when storing materials in our stores as well as making it easier to locate them again speeding up the pick and put away process. All in all, our MRP system has improved our efficiency in many areas which has enabled us to improve our customer service despite the restrictions of the COVID-19 pandemic over the last year”.

**Learn More:** [click here.](#)

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## Career Opportunities at Resolve Optics

On the back of continuing strong business throughout 2020 – we have recruited several new staff including Ciara Pontin – who works in purchasing and goods handling and is helping support our growing customer base. We are a fast-growing company and always interested in receiving CV's from dynamic and enthusiastic people who want to go into the future with us.

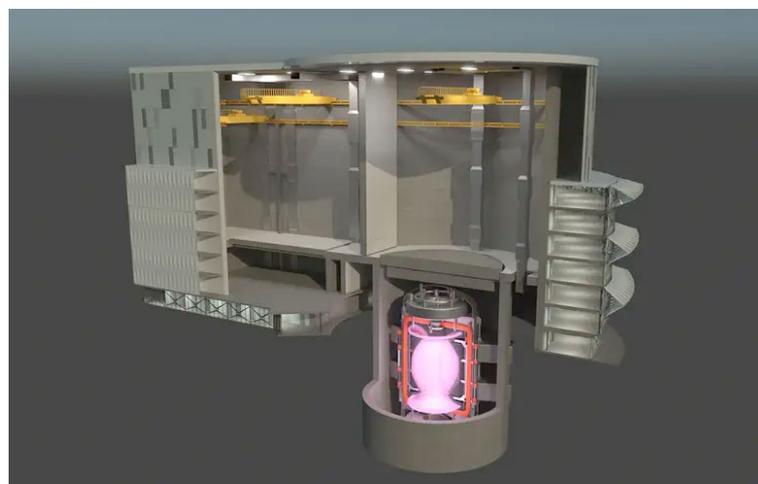


**Learn more:** [click here.](#)

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## THE LAST WORD:

**UK  
takes  
step  
towards  
world's  
first**



## nuclear fusion power station



The UK has embarked on an ambitious development program to build the world's first nuclear fusion power station, by launching a search for a 100-plus hectare site where it can be plugged into the electricity grid. The UK government has pledged committed an extra £200 million to flesh out the possibility of building the project, known as the Spherical Tokamak for Energy Production (STEP). The UK Atomic Energy Authority (UKAEA), the UK government body overseeing STEP, hopes construction could begin around 2030, with the plant operating as soon as 2040.

**Read article (in full):** [click here.](#)

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