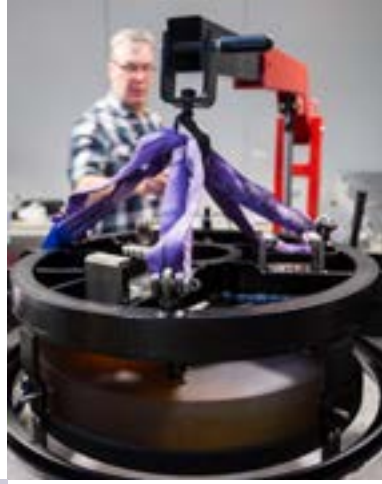
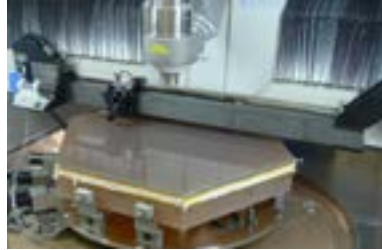
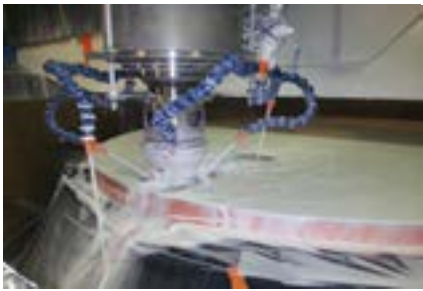
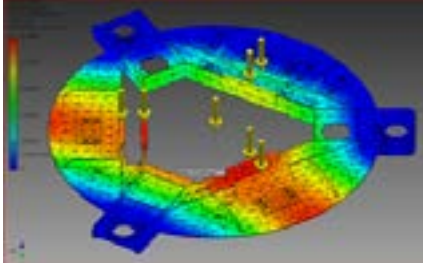




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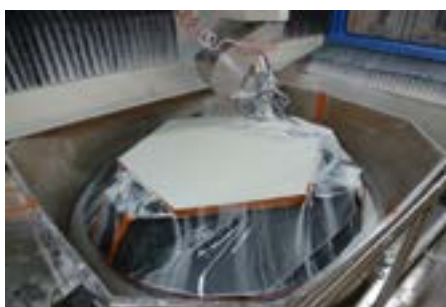
Opto-Mechanical Design

Precision Optical Polishing

Surface metrology

Case Studies

Glyndŵr Innovations Ltd is a technology company, located in the OpTIC Centre, a large scale purpose built R&D facility in St Asaph, North Wales and is a wholly owned subsidiary of Wrexham Glyndŵr University. Glyndŵr Innovations provides a range of technical services to Industry and technical institutions, including engineering support, surface metrology, optical fabrication as well as business and conference services. The OpTIC centre is also home to Research and Development projects for Swansea and Huddersfield Universities.



- The Precision Optical Components and Systems Group has specialist skills in the fabrication of large and complex free form optics and supporting mechanical systems for telescope mirrors and other projects that require precision optics.

These are complemented with advanced optical surface metrology capabilities including a extensive suite of test instruments, reconfigurable optical test tower and optical test design and modelling.



- The Engineering Team provide design, integration and commissioning services to a wide range of industry sectors including aerospace, defence and automotive.

- The OpTIC Technology Centre offers a number of business services to local industry.
 - Incubation units for start-up companies
 - Conference facilities for up to 200 people
 - Exhibition space
 - Business and funding support

The OpTIC Technology Centre is part of the UK Space Agency incubator network. Working in partnership with the UK Space Agency as a Specialist Incubation Centre for start-ups in the space sector in the UK.



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Precision Optical Systems and Components

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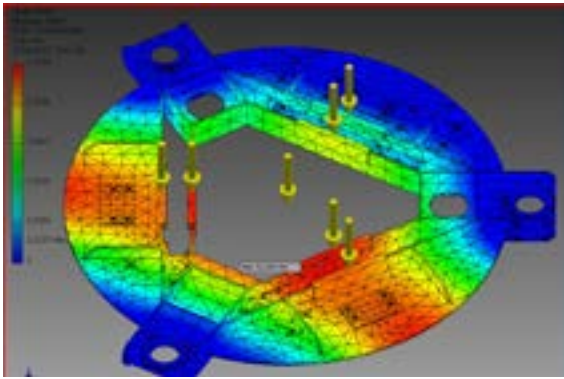
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Both large and small optics require mounting mechanisms, the opto mechanical design team has a proven track record of producing designs for the mounting of optics from small consumer systems to large mirrors.

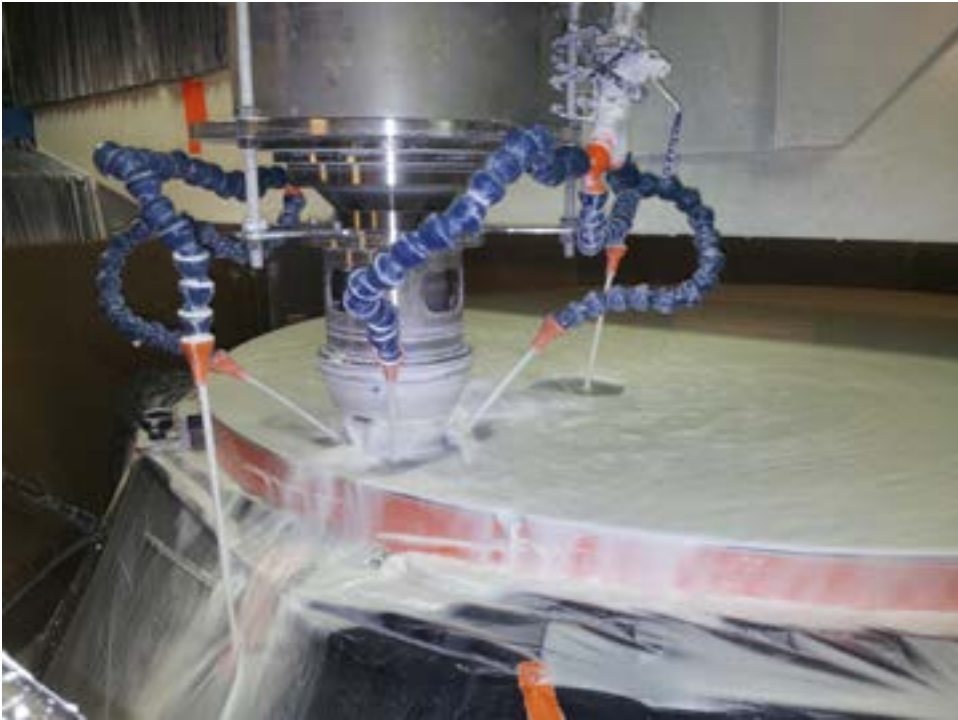
Mounting systems are designed to support the optic without introducing distortion or error. These mounts can be static or have precision actuation in many axes of movement.

Using this knowledge we have:

- Custom designed optical test equipment including interferometric instrumentation
- Design and production of optical and support systems for a wide variety of industries and applications
- Design of light-weighted optics for airborne and space applications



Precision Optical Polishing



Glyndŵr Innovations designs and produces nano precision, complex optical components and assemblies. We are highly experienced in the production of precision optical components. The team are able to process a variety of materials, up to 1.6m diameter.

Capability exists to produce a range of surfaces including convex, concave, flat, spherical, aspheric or freeform.

Using a new process that overcomes some of the disadvantages of traditional polishing methods, the newly developed technology involves CNC polishing techniques and in-situ measurement.

This enables us to produce symmetrical, aspheric or freeform optics required in high specification projects. The result is a high level of process flexibility, shorter production times and improved quality.

Supported by fully equipped metrology capabilities including reconfigurable 10m and 3m optical test towers and dedicated optical test benches.

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Surface Metrology



Metrology is an intrinsic part of any production process: in order to meet the requirements of the customer, parts and assemblies must be measured throughout processing.

Glyndŵr Innovations has specialist skills and equipment for the metrology of precision components, including optical components.

The facility boasts a range of contact-based surface metrology equipment, including a FARO Ion laser tracker (accuracy better than $40\mu\text{m}$), a Pioneer CMM (measurement accuracy $5\mu\text{m}$) and a Taylor Hobson Extended Form Talysurf profilometer (accuracy $<1\mu\text{m}$).

In addition, Glyndŵr Innovations has specialist metrology equipment designed for the precision measurement of optics. This includes several high-end optical interferometers (three 4D Phasecam interferometers and one Fisba), a Nikon white light interferometer for the measurement of surface texture (accuracy 0.5nm) and an NT-MDT atomic force microscope (accuracy 0.5nm) and a NOM (Nano-metric Optical Measuring Machine) a non contact 2D profilometer with an accuracy of 350nm .

The nature of working to ultra-precision tolerances means that each surface must be assessed as part of the measurement process.

Glyndŵr Innovations has the specialist metrology skills to design both contact and optical testing methods.

This includes opto-mechanical support tooling created to match large optics being made, ensuring that the metrology matches the final optical support mechanism. Our design engineers have experience in creating tooling that will ensure both the production and the testing of precision components meet specification.

In addition, we can develop bespoke tests for third-party metrology applications.

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The team at Glyndŵr Innovations has undertaken many projects , some of these are highlighted below.



Prototype Segments for ESO E-ELT

Production of 4 prototype segments for the E-ELT telescope. These units were to develop processes and techniques for the production of the extra large optics ESO will require. Each optic is 1.4m across and was polished to a surface accuracy of 9nm rms.

The team has gone on to polish the reference optics that will be used in the final manufacturing process.

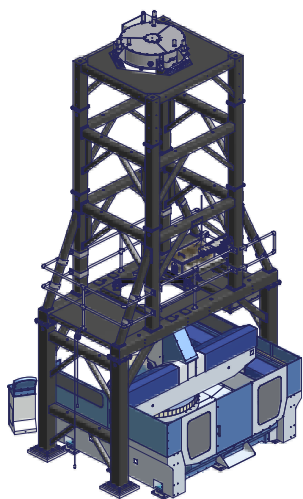
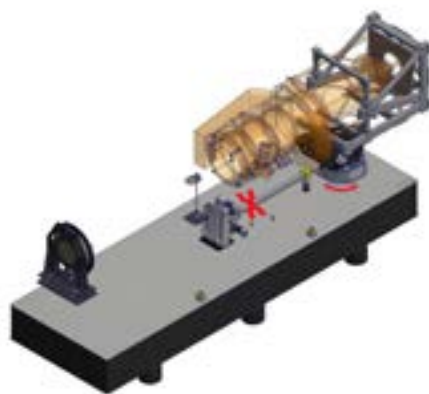
Satellite Optics Test System

To design and build a modular transfer function test system for the Imaging system on an earth imaging satellite.

The Imaging system for the satellite comprises an arrangement of lenses, mirror, camera and optical imaging components. The complete assembly weighs over 400Kg.

The test system would be used to perform a verification test on the assembled imaging system to verify the alignment of all the optics and prove the system was working to specification before being assembled into the main satellite.

Whilst complete motion of the unit was only in the order of 4 degrees, each movement had to have sub-minute of arc accuracy with no hysteresis. This was achieved with the use of flexures and a servo based actuators.



Interferometric Test Tower

In order to produce the 1.4m segments for ESO , the company had to develop a number of the systems and instruments that would be required. These included a 10m high test tower that is situated directly over the polishing system, so that large optics could be tested without being moved.

The tower can be configured for use on optics with varying radii of curvature. There is an interferometer mounted on the platform halfway up the tower and a series of mirrors, including a 1m mirror mounted face down at the top of the tower give an optical path reproducing

The whole structure was designed to a high level of accuracy and had to be rigid enough to not allow any movement that might affect the interferometric tests of the surface form of the optic. The tower was also designed to compensate for vibrations in the building.

Other optics that have been produced by Glyndŵr Innovations include:

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