An Introduction to ESR Technology and NCT

ESR Technology provides independent and specialist technical consultancy, products and services to the Oil & Gas, Space, Industrial and Transport markets.
1966

NCT
In 1966 the ‘Jost Report’ was published, commissioned by the UK government, which led to the development of Tribology as an inter-disciplinary study of friction, wear and lubrication and the establishment of three tribology centres in the UK. The National Centre of Tribology (NCT) was one of them.

1967

NNDTC
The National Non-Destructive Testing Centre (NNDTC) was created at UKAEA’s Harwell research establishment in 1967. The centre’s formation created a central NDT research base in the UK.

1971

SRD
Techniques such as Quantified Risk Assessment (QRA) were transferred from the nuclear industry and applied within the wider non-nuclear major hazard industries such as petrochemical, process and oil and gas. The UKAEA’s Safety and Risk Directorate (SRD) was at the forefront of these developments and, working closely with The Health and Safety Executive (HSE).

1972

ESTL
In the early 1970’s a visionary decision was made by the European Space Research Organisation (now the European Space Agency) to create a Centre of Excellence in Space Tribology to support Europe’s young and developing space industry. In 1972 NCT bid for and won the contract and the European Space Tribology Laboratory (ESTL) was born.

1982

HOIS
HOIS was formed in 1982 from within the NNDTC as a Joint Industry Project to improve the effectiveness of in-service inspection for the oil and gas industry.

1996

AEA Technology
Formed in 1996 as the privatised offshoot of UKAEA, with expertise in a wide variety of areas, including tribology, non-destructive testing and quantified risk assessments.

2005

ESR Technology
ESR Technology was formed out of a divestment by AEA Technology in 2005, creating an Engineering (NCT, ESTL and HOIS) and Safety & Risk business.

2016

ESR Technology becomes an owner-managed small and medium sized enterprise (SME).
ESR Organisation

70 Technicians, Scientists, Engineers and Consultants, operating out of Warrington (HQ), Oxfordshire and Aberdeen.
Areas of Expertise

- Industrial Tribology and Materials Engineering
- Space and Vacuum Tribology
- Non Destructive Testing Good Practice
- Safety & Risk Management

NCT - Engineering in Motion
ESTL - Keeping Space Moving
HOIS - Advancing NDT in Oil & Gas
ESR Technology - Quantifying Risk, Maximising Performance, Delivering Safety
Space and Vacuum Tribology

• Since 1972 ESR Technology has operated the European Space Tribology Laboratory – ESTL, a centre of excellence in the science and engineering of friction, lubrication and wear in the vacuum environment of Space

• ESTL provides its customers with a combination of:
  • Tribological consultancy, support and training
  • Tribometer-based friction and wear studies
  • Bespoke, mission-orientated tribological research & development programmes
  • Solid lubrication of precision components for Space and vacuum applications
  • Independent thermal vacuum testing for development, life and qualification

• For Space and other high-end engineering applications, ESR Technology also offers a range of services from consultancy and support through to the design, manufacture and test of reliable mechanical systems
Non-Destructive Test Good Practice

- ESR Technology manages HOIS, a joint industry project aimed at improving non-destructive testing (NDT) in the petrochemical industry.
- HOIS provides independent guidance on the capabilities and effectiveness of different NDT methods for specific demanding applications, based on rigorously controlled blind evaluation trials.
- ESR Technology offers consultancy on:
  - Material behaviour and failure analysis:
  - Inspection of composite materials and composite repairs
  - Probability of detection estimation and assessment
  - Inspection method validation and qualification
  - Independent recommendations on the selection of optimum non-destructive inspection technology for a particular application
  - M-skip training courses, software licences and expert review of data/results
- ESR Technology offers expert witness and due diligence activities in NDT, materials and asset integrity.
Safety and Risk Management

• As one of the UK’s leading engineering, safety and risk consultancies, ESR Technology provides essential advice to operators, designers and contractors to ensure safety and reliability in high hazard industries.

• Working in partnership with our clients, we deliver a specialist consultancy service employing state-of-the-art tools, techniques and software, many developed in-house by our internationally recognised experts.

• Our core services include:
  • Major hazard quantified risk assessment
  • Consequence Modelling including Computational Fluid Dynamics
  • Technical safety assessment
  • Fire Engineering, including 3D fire and gas detector mapping
  • Workshop Facilitation (HAZID, SIL, ALARP, Bow Tie)
  • Reliability Assessment
  • Development and Review of Safety Cases
  • Ageing plant management
  • Independent Review & Expert witness
An experienced team of Engineers, Metallurgists and Tribologists.

>4000 technical reports relating to engineering, materials & tribology.
Typical NCT Projects

- **Bearing failures;** cruise ships, trains, aerospace, bridges
- **Tribology testing;** downhole materials, wear
- **Transportation;** bearings, suspension, gears, derailment, IGBTs
- **Nuclear;** test rig design, corrosion, fretting, metrology
- **Food production;** corrosion, materials selection, design
- **Bridges;** suspension wires, pad bearings, supports
- **Buildings;** failures, cladding
- **Medical devices;** failure, development
- **Oil & Gas;** pipelines, valves, corrosion, cracking, integrity
- **Power generation;** pumps, shaft failures, pipeline assessments
- **Renewables;** Wind-turbine bearings, biomass corrosion
- **Industrial;** Conveyor systems, redesign, operational reliability
Facilities
ESEM / EDX / Optical / Profilometry / Mech. Testing / Tribology / Chem. Analysis
Materials Assessment

Our Forensic Engineering and Metallurgy team has been described by customers as ‘Engineering CSI’. Our investigative techniques determine the cause of metallic and non-metallic failure.

• Metallographic preparation
• Non-destructive metallographic replication
• Optical microscopy
• Scanning electron microscopy (SEM)
• Materials selection
• Surface topography
• Chemical analysis
• Mechanical testing
• Corrosion assessment
Engineering Assessment

Providing engineering experience, independence and confidentiality to solve engineering problems.

- Gears and gearboxes
- Bolts and bolting
- Bearings
- Key deliverables:
  - Failure analysis
  - Condition surveys
  - Metrology
  - Life extension
  - Bearing selection
  - Bearing design
  - Statistical modelling
  - Lubrication analysis
  - Sealing
Instrumentation

Gaining a better understanding of operational performance and mechanical failure.

- Laboratory and on-site capabilities
- Full instrumentation package
  - Pressure
  - Temperature
  - Vibration / noise
  - Fluid Flow
  - Displacement
  - Rotational speed
  - Strain
- Up to 120 channels of data
- Vibration monitoring
- Ultrasonic bolt stretch
- Rail vehicle testing
- Mobile / Remote power / UPS
Nuclear Heritage

NCT was born out of the UK Atomic Energy Authority and continues to serve the industry.

- Design of bespoke test rigs
- Controlled water & gas environments
- Fretting expertise
- Waste transportation
- Lead screw technology
- Water lubrication
- Valve material selection
- Gas corrosion testing
- Component reliability testing
Transportation

NCT use engineering know-how to improve reliability, reduce downtime and keep things moving.

- Railways
  - Bearings, bogies, brakes, transmission, traction
- Automotive
  - Valves, dampers, seals, springs
- Marine
  - Rolling element and plain bearings
  - Condition monitoring
- Aerospace
  - Landing gear, lubrication
Design Engineering

NCT’s unique design capability is based on our tribology consultancy background.

• Innovation
  • New Materials (coatings, functional materials)
  • Tribological technologies (lubrication systems, measurement)
  • Bespoke mechanisms and high precision design

• Design
  • Centered on tribological systems for demanding environments
  • Mechanical design and development
  • Lightweight ‘Vacuum’ Spacecraft engineering core expertise
  • Rotating equipment – Extreme and hard loading operations
  • Reverse and redesign engineering

• Analysis
  • Structural, thermal, impact, contact and fluid flow analyses
  • Correlating in field failure with test rig and FEM/CFD analysis
Assembly, Test & Integration

Providing innovative design solutions to solve complex engineering challenges.

• Assembly, Test & Integration
  • Cleanroom and industrial laboratory facilities
  • Experienced engineering staff and technicians
  • Partnership with local machinists
  • Support to on-site integration and inspection
  • Build to print assembly
Industrial Testing

Flexible facilities simulating service conditions and accelerating damage.

- **Tribological testing**
  - High speed reciprocating rigs
- **Bespoke test rigs**
  - Design & commission
- **Mechanical testing**
  - Tensile
  - Fatigue
  - Hardness
  - Charpy
  - Rotating bending
- **Surface profilometry**
  - Contacting (Stylus)
  - Non-Contacting (WLI)
Tribology Expertise

Our business is built on sharing our expertise and tribology know-how

• Expert Witness
• Research & Development
  • New materials
  • Coatings and substrate development
  • Tribological testing
  • Industrial applications
• Collaboration
  • Access to extensive high end academic facilities in the UK and overseas
  • Knowledge transfer partnership with Universities
  • European Space Agency (ESA)
• Training Courses
  • Forensic engineering, Tribology, General engineering best practice
## Contacts

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Department</th>
<th>Phone Number</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Steve Gill</strong></td>
<td>Technical Director</td>
<td>National Centre of Tribology</td>
<td>+44 (0)1925 843428</td>
<td><a href="mailto:steve.gill@esrtechnology.com">steve.gill@esrtechnology.com</a></td>
</tr>
<tr>
<td><strong>Rory Taylor</strong></td>
<td>Senior Engineer</td>
<td>Transportation</td>
<td>+44 (0)1925 843459</td>
<td><a href="mailto:rory.taylor@esrtechnology.com">rory.taylor@esrtechnology.com</a></td>
</tr>
<tr>
<td><strong>Hugues Renondeau</strong></td>
<td>Senior Consultant</td>
<td>Nuclear &amp; Testing</td>
<td>+44 (0)1925 843469</td>
<td><a href="mailto:hugues.renondeau@esrtechnology.com">hugues.renondeau@esrtechnology.com</a></td>
</tr>
<tr>
<td><strong>Eirwyn Davies</strong></td>
<td>Principal Metallurgist</td>
<td>Industrial Applications</td>
<td>+44 (0)1925 843417</td>
<td><a href="mailto:eirwyn.Davies@esrtechnology.com">eirwyn.Davies@esrtechnology.com</a></td>
</tr>
<tr>
<td><strong>Grant Munro</strong></td>
<td>Principal Consultant</td>
<td>Design &amp; Build</td>
<td>+44 (0)1925 843507</td>
<td><a href="mailto:grant.munro@esrtechnology.com">grant.munro@esrtechnology.com</a></td>
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