HEALTH

CHECKING THE INTEGRITY OF ENCAPSULATED ELECTRONICS IN A SURGICAL TOOL

CareTag Surgical develops full solutions for the efficient management of surgical and other hospital equipment, based on the use of new technologies, such as RFID.

THE CHALLENGE

During the development of a connected surgical clamp, CareTag needed to assess the integrity of the encapsulation surrounding an electronic device (Fig 1). The company used X-ray imaging to investigate their product but a full assessment of gluing integrity between the polymer and steel parts was not possible.

THE EXPERIMENT

CareTag was advised on the use of neutron tomography to complement X-ray imaging. When the steel surgical clamp was scanned on a neutron imaging beamline, bubble-like structures were identified on the radiographic and tomographic images (Fig 2).

THE RESULTS

The measurements confirmed that a quantitative evaluation of the number and size of the pores is feasible despite the presence of a high X-ray- and neutron-absorbing material within the electronics.

> **The information provided by the neutron scan gave significant insight into the glue of the RFID-tag. We are pleased to see that there are no defects or irregularities between the metal and the chip, suggesting that the current adhesive procedure is satisfactory. We were delighted to be given the opportunity to use this advanced characterisation technique, and we hope we can return to perform a comparative test of another process.**

Søren Bilsøe
Co-founder of CareTag Surgical

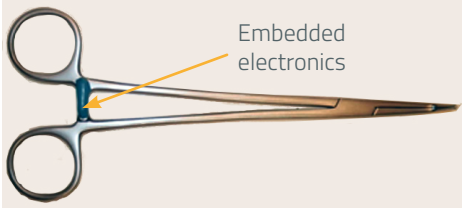

Fig 1. Surgical clamp with embedded electronics.

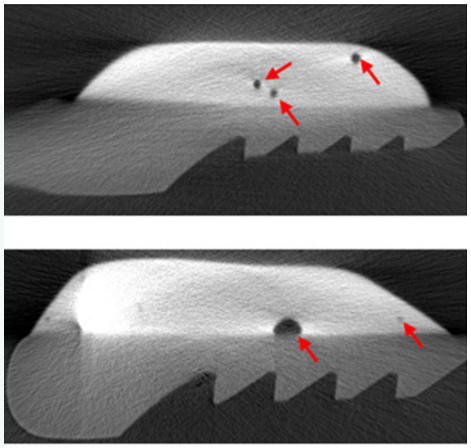

Fig 2. Selected slices of the tomographic reconstruction from neutron measurements. Red arrows indicate bubble-like structures within the encapsulation.

INDUSTRIAL APPLICATIONS OF NEUTRON SCIENCE

LENS LEAGUE OF ADVANCED EUROPEAN NEUTRON SOURCES

For decades, European neutron facilities have established productive collaborations with a diverse range of industrial users. Such partnerships have delivered important results for industry, providing insights into materials and methods that have driven process optimisations and technological innovations.

WHY USE NEUTRONS?

STUDY STRUCTURE

Neutron wavelengths are comparable to the spacings of atoms and molecules.

STUDY DYNAMICS

Neutron energies are comparable to the time scales of molecular diffusion, vibrations and rotations.

STUDY MAGNETISM

The neutron's magnetic moment can be used to study the microscopic magnetic properties of materials.

PENETRATION POWER

Neutrons can penetrate deep into matter (including many different metals) enabling the study of large samples - even within complex sample environments.

NON-DESTRUCTIVE

As a non-destructive, non-invasive probe, neutrons are suitable for the characterisation of delicate and precious samples.

VERSATILE SAMPLE ENVIRONMENTS

Sophisticated sample environments enable measurements under operating conditions - including extreme temperatures, pressures, etc.

SENSITIVITY TO LIGHT ELEMENTS

The neutron scattering power of nuclei varies in a quasi-random manner such that lighter atoms (e.g. H, Li) can be studied in the presence of heavier ones.

ISOTOPIC CONTRAST

Neutrons are sensitive to different isotopes of the same element, so isotopic substitution (e.g. H/D) can be used to highlight specific structural features.

COMPLEMENTARITY

Neutron scattering is highly complementary to other techniques, such as X-ray scattering, electron microscopy, magnetic resonance and computational methods.

HOW CAN INDUSTRY USERS GET ACCESS TO NEUTRON FACILITIES?

European neutron facilities provide industrial users with access to advanced instrumentation for R&D. No prior experience is needed – expert scientific and technical staff provide support for users to get the most from their experiments.

Neutron facilities offer a variety of mechanisms to access their infrastructure, including proprietary access, academic partnerships and public beamtime.

For more information, email contact@lens-initiative.org