RACE lends a hand to Sellafield robotic dog trials

UKAEA's robotics team RACE was at Sellafield recently to advise and support on how canine-like robots could help the clean-up of Western Europe's largest nuclear site.

Sellafield Ltd held a three-day trial of Spot, the agile mobile robot developed by Boston Dynamics, at the Calder Hall nuclear power station, which is now being decommissioned.

The building offers challenging terrain in a risk-managed environment, providing ideal conditions to test Spot's agility, scanning and radiation detection capabilities.

If successful, Spot could be deployed at locations across the Sellafield site to carry out routine tasks like inspections, mapping, data capture and characterisation. The four-legged robot is able to perform autonomous missions and can be controlled remotely via an operator, which significantly improves safety by allowing the robot to enter hazardous, contaminated areas in lieu of a person.

Spot is also expected to speed up inspection times, as robots do not require as much personal protective equipment, and help save money by ensuring more frequent data collection and better predictive maintenance.

RACE – the Remote Applications in Challenging Environments centre at UKAEA's Culham site – owns two Spot devices and has been working on applications for them in industrial locations where it's difficult or unsafe to send humans. One of its Spots last year carried out a radiation mapping project at Chernobyl for the University of Bristol.

RACE's Guy Burroughes commented: "We've been using Spot for over a year in our work to develop robotics for challenging environments like nuclear facilities. We were delighted to bring this experience to support the trials at Sellafield and hope it can lead to safer, more efficient decommissioning."

The demonstration of the Spot unit was held in conjunction with Cumbria-based engineering consultant Createc and UKAEA. If the trial phase proves successful, Createc would be Boston's Dynamics' preferred UK partner for Spot operations at Sellafield and UKAEA would continue its role of providing expertise on robotics deployments in nuclear environments.

Demonstrating quadrupedal robots for nuclear applications

Guidance: Object to an application to register, change or cancel a geographical food or drink name

How to object to an application to register for UK geographical indication (GI) protection, change or cancel a product specification and how to appeal against a decision.

Teaching a new dog nuclear tricks

Spot the robot dog has been going through its paces at Sellafield as part of an active demonstration.

Sending robots into hazardous environments is nothing new at Sellafield.

A fleet of land, air, and underwater vehicles are already contributing to the site's decommissioning and clean-up mission.

Using robots for routine tasks in hazardous environments removes people from harm's way and frees them up for more urgent tasks.

But before technology can be deployed on the site it must be rigorously tested.

Spot underwent 3 days of trials at Calder Hall, the former nuclear power station which is now being decommissioned.

VIDEO – Demonstrating quadrupedal robots for nuclear applications

The demonstration was held in conjunction with US manufacturer Boston Dynamics, Cumbria-based engineering consultant Createc, and the UK Atomic Energy Authority (UKAEA)

Calder Hall's former turbine hall provided the perfect tricky terrain to test Spot's agility.

If successful, Spot could join Sellafield Ltd's fleet of robots, carrying out tasks like inspections and data capture across the site

Rav Chunilal, head of robotics and artificial intelligence for Sellafield Ltd, said:

> Our mission is to create a clean and safe environment for future

> generations.
>
> Robots like Spot are an integral part of our future.
>
> They offer us a way of getting jobs done in hazardous environments while keeping people out of harm’s way.
>
> Robots are excellent at performing repetitive and time-consuming tasks. This allows us to free up our people to undertake more fulfilling work contributing to our purpose: creating a clean and safe environment for future generations.
>
> Spot’s active demonstration has given us great insight into its capabilities. We’ll now study the findings before we take a decision on whether to deploy this technology at Sellafield.

Guy Burroughes, senior control systems engineer at UKAEA, said:

> We’ve been using Spot for over a year in our work to develop robotics for challenging environments like nuclear facilities.
>
> We were delighted to bring this experience to support the trials at Sellafield and hope it can lead to safer, more efficient decommissioning.

Will Newsom, head of nuclear at Createc, said:

> Spot is the ideal tool to deploy equipment into industrial environments which have been designed for bipedal human exploration only.
>
> It will be an important part of the toolset to add to Sellafield Ltd’s remote-operations capability.
>
> We are working with Boston Dynamics as their preferred partner for nuclear applications to deliver this cutting-edge technology and integrate new capabilities, making the solution business-as-usual for our customers.

Research: COVID-19: reported SARS-

CoV-2 deaths in England

Monthly report presenting the latest data on COVID-19 mortality in England in people with laboratory-confirmed SARS-CoV-2.

UK Fusion Materials Roadmap will boost progress in developing fusion power plants

The UK Atomic Energy Authority (UKAEA) and The Henry Royce Institute for advanced materials (Royce) have today published a roadmap for developing materials for fusion energy.

The roadmap, developed with the input of over a hundred materials experts from the UK research community and industry, highlights five major areas of work required to enable the materials for future fusion power plants.

UK Fusion Materials Roadmap

Fusion – the same principle by which the sun creates heat and light – has the potential to be an abundant, low-carbon and safe part of the world's future sustainable energy supply.

Recent advances in the technology mean that prototype fusion power stations are now being designed, with the UK's STEP plant due to go online in the early 2040s.

The leading contender for fusion power plants is the 'tokamak' – a ring-shaped machine in which fuel is confined with powerful magnets and heated until particles fuse together. The fusion process produces high-energy neutrons that can be turned into electricity, but which could also significantly damage and irradiate materials within the device.

Identifying, developing and qualifying the right materials is key to delivering commercial fusion for two reasons. First, plant efficiencies, safety and availability often hinge on the quality of the component materials. Second, a sustainable fuel cycle requires highly productive fuel breeding materials. Both plant components and fuel breeder materials will need to withstand a highly challenging combination of neutron bombardment and thermal, magnetic, electric and mechanical loads in a tokamak power plant.

The five priority areas identified by the UK Fusion Materials Roadmap are:

- Novel materials to minimise the amount of activation in the structure of the fusion power plant;
- Compounds that can be used within the power plant to optimise breeding of tritium fuel to sustain the fusion process;
- Magnets and insulators that are resistant to irradiation from fusion reactions – especially under cryogenic conditions;
- Structural materials able to retain their strength under neutron bombardment at high operating temperatures (over 550 degrees C);
- Engineering assurance for fusion materials – providing irradiated sample data and modelled predictions such that plant designers, operators and regulators have confidence that materials are suitable for use in future commercial power stations.

Dr Amanda Quadling, Director of Materials at UKAEA said:

“This roadmap is a national tool that aims to give UK materials researchers common themes to collaborate around. We hope to generate momentum in the testing, mechanistic understanding, and surmounting of, irradiation damage from fusion.

“The roadmap is also a teaching document for those who wish to learn more about fusion materials from a supply chain and regulatory point of view.

“It will help to form new partnerships across a wide range of materials stakeholders so we can bring fusion electricity to the world as quickly as possible.”

Professor David Knowles, CEO, Henry Royce Institute, said:

“The technological challenges of delivering fusion energy into practical application demand the development of materials which can withstand the extremely severe operational conditions of fusion power plants. We now need to pursue, as a matter of urgency, the development of novel materials which engineers can use to reliably withstand fusion plants demanding environments such high temperatures, severe irradiation and rapid thermal cycling gradients.

“This important materials roadmap published by Royce and UKAEA sets out what we need to do to ensure we can deliver on one of the most challenging technological missions we have ever faced; the controlled exploitation of fusion using a tokamak technology has the potential to deliver low-carbon fuel abundance to the benefit for millennia to come.”

The UK Fusion Materials Roadmap is available from The Henry Royce Institute website at:
https://www.royce.ac.uk/collaborate/roadmapping-landscaping/fusion/

For media enquiries and further information about this report please contact: