Reaching the unreachable

LaserSnake2

Snake-arm robot and high-power laser integration

DEFINE

LS Feasibility Study: Integrated laser head ad snake-arm robot

Video of LaserSnake Feasibility Study

Objectives & Business Case

Building on the LaserSnake feasibility study, LaserSnake2 is a collaborative R&D project running from 2013 to 2016, combining robotics and lasers to create safe, cost efficient tools for nuclear decommissioning.

LaserSnake2 will develop two types of robot integrated with high power lasers – one for open access spaces (ex-situ) and one for confined spaces (in-situ).

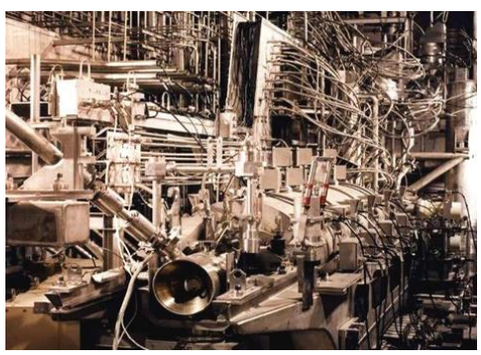
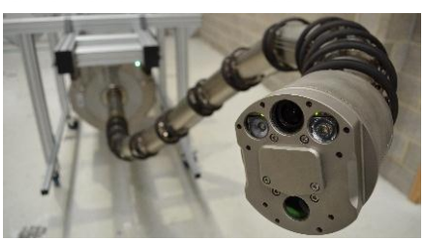


Image courtesy of Sellafield Ltd

Nuclear cell to be decommissioned

DESIGN

Snake-arm Robots



OC Robotics' snake-arm robot

Snake-arm robots are highly flexible robots ideal for working in confined and hazardous spaces.

Snake-arm robots can be integrated with off-the-shelf or custom-designed tools to conduct a range of activities.

Laser cutting head

Laser technology offers significant economic, technical and operational benefits compared to competing decommissioning technologies.

Cuttings tools can be small, light weight, apply no contact force to the material being cut and are highly suitable for remote deployment.

Multi-pass laser cutting

Diffractive Optical Elements

Diffractive Optical Elements are computer-generated holographic devices that can be used to transform high powered laser beams into virtually any shape.

Diffractive Optical Elements

DELIVER

Trials & Demonstrations

LaserSnake2 trials and demonstrations will be world firsts, enabling substantial engagement with end users in the UK and in export markets.

- Under-water laser cutting trials
- Submerged snake-arm robot trials
- An active demonstration of LaserSnake2 in a First Generation Reprocessing Plant at Sellafield
- Ex-situ laser cutting with an industrial robot, deployed in an active facility at Windscale

Submerged snake-arm robot trials

Integration trials

LaserSnake2 is led by OC Robotics, and includes as partners TWI, the National Nuclear Laboratory, ULO Optics and Laser Optical Engineering.
The project is part funded by the Technology Strategy Board, the Department for Energy and Climate Change, and the Nuclear Decommissioning Authority.

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LaserSnake2

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DEVELOP

LaserSnake2 – In-situ Laser Cutting of Nuclear Infrastructure

Objective: Develop an 'in-situ' cutting tool, LaserSnake2 – combining a 4.5m (14.7') long snake-arm robot with a fibre delivered laser process head.

- Identified materials with optimum properties for a snake-arm robot with 4.5m (14.7') horizontal reach and 10kg (22lbs) payload.
- Extensive operational testing to prove the integrity of snake-arm robot hardware and software to validate the LaserSake2 safety case.
- 4.5m (14.7') LaserSnake2 system designed and built.
- Laser process head integrated with 4.5m (14.7') snake-arm robot developing the motion requirements for positioning the laser.

Laser process head integrated with snake-arm robot

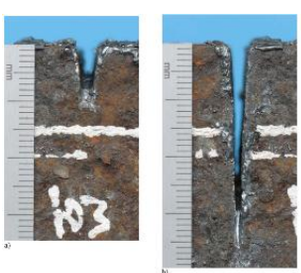
Vertical deployment of LaserSnake2 system

Laser Cutting R&D

Objective: Develop a versatile laser cutting technology suitable for nuclear decommissioning.

- Development of bespoke laser process heads for nuclear decommissioning applications.
- Characterisation of fume to understand the effects on ventilation filters.

Developed laser process head for LaserSnake2



Gouge cutting results

- Effects on different materials, of 'stray' beams which have diverged beyond the focal point, have been analysed.
- Diffractive optical elements (DOEs) designed to provide extended depth of focus for the cutting beam, allowing thicker materials to be cut and a greater stand-off tolerance achieved.

Ex-situ laser cutting facility scheme design

Ex-situ Size Reduction Facility

Objective: Integration of an industrial robot and laser process head for an 'ex-situ' size reduction facility.

- Development of systems to allow operators to easily specify, simulate and execute robot cutting paths.
- Ventilation solution designed to remove fume and dross following cutting.
- Integrated testing and further development of system prior to commissioning in 2016.

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