A vegetable alternative to toxic transformer oil

A CSIRO-led research team has developed a vegetable oil-based fluid that could replace the estimated 40 billion litres of toxic mineral oil currently used in power and electricity distribution transformers across the world.

Major oil spills, associated with transformer failures, have prompted governments and environmental protection agencies to enact increasingly strict laws and regulations. The new low viscous fluid will meet current as well as future environmental requirements.

Funded by an ARC linkage grant, the research to develop the oil was jointly done by CSIRO Petroleum's Principal Research Scientist, Dr Mohammed Amanullah, a drilling fluid specialist, with Curtin University of Technology's Professor Syed Islam, Master Student Samer Chami, and Testing and Commissioning Services (Australia) researcher Gary Ienco.

Dr Amanullah said the new fluid was readily biodegradable and would improve the safety of power and distribution transformers, the occupational health and safety of power workers and the protection of habitats around electricity facilities.

'Another driving force behind this innovation was to find a sustainable source of base fluid in dielectric fluid formulation, given the finite supplies of mineral oil,' Dr Amanullah said.

Dr Amanullah (right) and co-researcher Samer Chami discuss the new fluid's applications. Mohammed Amanulla/CSIRO Petroleum

'Our work has also broken new ground in the processes used to develop a low viscous vegetable oil-based dielectric fluid, with all the required characteristics.'

A provisional patent application has been filed to protect the project's intellectual property and a new company – Biolectric Pty Ltd – has been formed to take the product to the market after testing in a field transformer.

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Radioactive waste technology is locking up interest

Construction is underway of a new plant that will transform liquid radioactive waste into a unique, synthetic rock product – known as 'synroc' – developed in Australia. The technology is drawing international interest for its capacity to safely and permanently lockup nuclear waste.

The late Professor Ted Ringwood, of the Australian National University, originally invented 'synroc' in 1978. Over the last ten years, researchers at the Australian Nuclear Science and Technology Organisation (ANSTO) have further developed and tailored different forms for a wide range of radioactive wastes.

The new plant at ANSTO will be the world's first facility to turn liquid waste from molybdenum-99 radioisotope production, used in medical research, into synroc. The technology will be in operation within the next three years.

'Just like in nature, where some minerals trap radioactive materials in their crystal structure, such as uranium and thorium, synroc is designed to do the same with radioactive waste,' said Dr George Collins, ANSTO Chief of Research.

The ceramic synroc was first developed as a way to dispose of surplus weapons plutonium. ANSTO

'If nature's rocks can contain radioactive substances for millions of years then so can synroc,' he said. 'This will ensure radioactive waste stays safely locked up until radioactive levels have died away, a process that can take thousands of years.

'It also means that if water did come in contact with the rock the water would not become contaminated.'

Once synroc is produced, it is placed in cans and safely stored in a waste repository either above or below ground. Although the radioactive molecules are locked away in the synroc and cannot get out, the rock still emits radioactivity.

In April this year, ANSTO negotiated a deal with British Nuclear Fuels Group company, Nexia Solutions, to ensure that up to five tonnes of legacy plutonium waste residues currently stored at their Sellafield site will eventually be permanently locked up in a solid, glass-ceramic form of synroc.

'The success of this technology will demonstrate to other holders of dangerous wastes that they too can have a tailor-made permanent immobilisation solution,' said ANSTO's Executive Director, Dr Ian Smith. 'For the nuclear industry, materials that could potentially be used for weapons manufacture may be safely immobilised forever.'

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