



# Industry Case Study

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## Micronclean

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# Identification of Unknown Liquid Using Nuclear Magnetic Resonance Spectroscopy

## Challenge

Micronclean are a leading global supplier of clean room equipment and garments based in Lincolnshire, UK. Due to the challenging and highly-regulated environments Micronclean's products are required to operate in, product quality and process control are paramount to Micronclean.

During a washing process carried out by Micronclean, a residue was detected which Micronclean were keen to identify to understand origin and any potential implications.

## Approach

Since this project required identification of organic molecules, Nuclear Magnetic Resonance (NMR) spectroscopic analysis was deployed. This approach enabled rapid analysis of the sample with subsequent data analysis performed by an NMR specialist within the Bridge to identify the spectroscopic signature present. The concentration and nature of any potential contaminants could also be determined in tandem.



Figure 1: NMR instrumentation at the University of Lincoln.

NMR spectroscopy is an analytical technique in which a wide range of chemicals can be studied and is particularly well-suited to organic compounds. The technique works by exposing chemicals to a powerful magnetic field, causing certain atomic nuclei to spin. Careful analysis of the speeds at which the nuclei spin can elucidate both specific chemicals and broad groups of chemical compounds (e.g., sugars, aromatic hydrocarbons etc.) present in the sample.

NMR analysis on the sample revealed the identity of unknown residue compound, along with an indication of its molecular weight. In addition, an accurate determination of the concentration in the sample was performed. The analysis also provided further insight into the composition of the sample by identifying other classes of chemical compounds such as aromatic and saturated and unsaturated aliphatic compounds.

## Outcomes

The identification of this unknown compound has allowed Micronclean to alter its processes to make them more efficient but more importantly to make them safer. The identification confirms the unknown compound is not unique to Micronclean and therefore has benefits for the wider laundry industry.

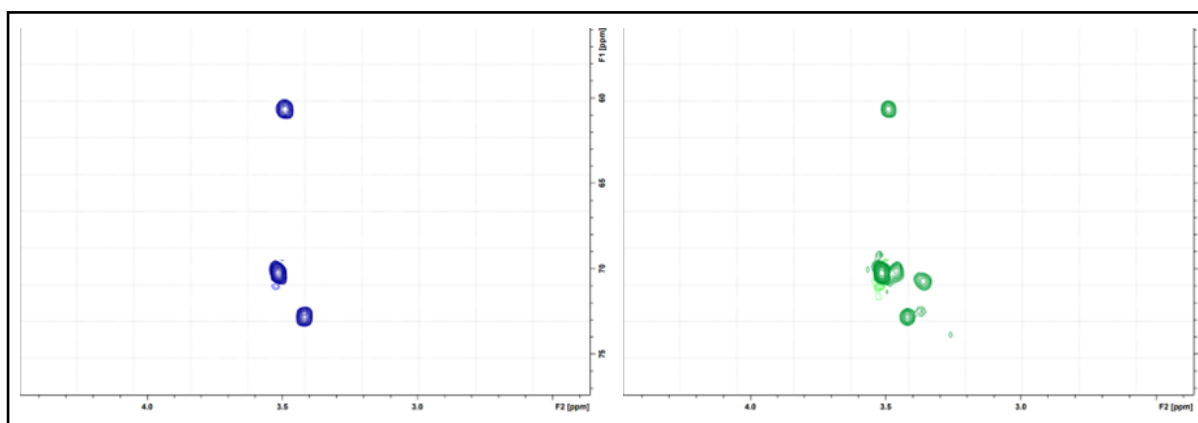


Figure 2: NMR spectra of the unknown compound. The left spectrum (blue) is the spectrum of a reference sample. The right spectrum (green) is that obtained from the unknown sample provided by Micronclean. The presence of the same three peaks in both spectra categorically proves the identification.

# Summary

This case study highlights how the use of specialist NMR instrumentation and in-house expertise by the Bridge can readily characterise the composition of unknown samples and confirm the presence of suspected chemical species. NMR is a powerful chemical identification technique which can be applied to a wide range of molecules and sample matrices to help our industry partners develop their understanding of new and existing products and processes.

The collaboration between the Bridge and Micronclean has allowed Micronclean to improve its processes making them significantly safer. The access to NMR instrumentation and the expertise at the Bridge has meant quicker and more accurate resolution of the investigation than would have otherwise been possible.

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## Bridge

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