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## The role of accreditation in ensuring sampling quality

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Accreditation has proved effective in ensuring the quality of analytical measurements but is now increasingly being applied to primary sampling, as the first part of the measurement process. Several international standards relevant to accreditation of sampling are available, either for organisations undertaking the sampling (ISO/IEC 17025 or 17020), or for the certification of the sampler (*i.e.*, the person who takes the samples) (ISO/IEC 17024). Achieving and demonstrating the fitness-for-purpose of chemical measurements requires a holistic approach to ensuring the quality of the sampling, sample preparation and analytical measurement. Accreditation provides the framework within which both samplers and analytical chemists can demonstrate appropriate quality.

### Introduction

Most chemical analysts will be familiar with accreditation and its requirements. Accreditation ensures that the background systems absolutely essential to the successful conduct of an analysis are in place, completely documented, and carefully checked. Accreditation does not in itself *guarantee* that the result of the analysis will be fit for purpose—that depends also on the skill and integrity of the analyst. However, given these two

constituents, accreditation and analytical professionalism, results with fit-for-purpose uncertainty should result from the analysis of any particular sample, but that is not the whole story.

Customers ultimately want information not about the sample but about the ‘target’—the mass of material that the analytical result is supposed to describe. They need to make rational decisions about the target, such as whether it is within specification, or how much they should pay for it. However, we introduce some extra uncertainty—sometimes quite large in relation to analytical uncertainty—when we take a sample. From this point of view, fit-for-purpose sampling is just as crucial as appropriate analysis, so it is clear that sampling should be subject to accreditation as well. The logical step to improve measurement quality overall, therefore, is to extend the role of accreditation to the organisation that either undertakes the sampling or certifies the individual sampler.

This document aims to explain how such accreditation and certification is already in place in certain application sectors, and the potential benefits it can bring as it is applied to new sectors. The accreditation is usually conferred by a national accreditation body. The United Kingdom Accreditation Service (UKAS) has been involved in accrediting sampling activities in some sectors for some years. Accreditation of sampling has to be undertaken against a particular

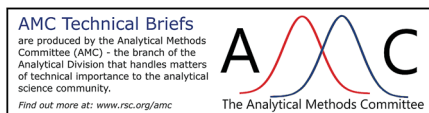
international standard, which is usually either ISO/IEC 17024,<sup>1</sup> 17025,<sup>2</sup> or 17020.<sup>3</sup>

### Certification of samplers (under ISO/IEC 17024)

Under this standard, within the UK, samplers are not certified directly by UKAS. Instead, samplers are certified by a certification body that is itself accredited by UKAS to ISO/IEC 17024. Consequently, certified samplers can take the certification qualification with them when they change employment. Sampling requirements are listed in a ‘scheme’ against which the samplers are certified.

Accreditation of the certification body involves an assessment of its competence to certify the samplers and an assessment of the certification body’s management system. This will involve a review of the certification scheme’s requirements. Key elements—the scope of certification, the competence required, a code of conduct—are developed by the certification body in conjunction with the relevant regulatory authority or the scheme owner.

The knowledge and competence of the sampler seeking certification will be partially assessed by examinations. These examinations can include written, oral, practical, observational or other means, together with procedures to ensure the comparability of the assessment results between different rounds of the examinations. When a sampler is certified in



this way, the certificate is valid for a fixed period (typically 2 to 5 years) after which the sampler would need to re-certify. The duration of the certification is fixed by considering many factors such as regulatory requirements, changes to the relevant standards, changes in the industry, risks resulting from sampling by an incompetent person, and ongoing changes in technology.

Examples of the use of ISO/IEC 17024 for sampling in the UK include the MCERTS stacks scheme<sup>4</sup> and the DWI Private Drinking Water sampling scheme (currently in development).

## Accreditation of organisations performing sampling (under ISO/IEC 17025)

Accreditation to the standard ISO/IEC 17025,<sup>2</sup> is held by the organisation by which the sampler is employed rather than by the individual sampler.

Two key requirements are to take a sample that is both sufficiently close to being representative of the target and to have it collected by a competent sampler who is aware of the purpose and requirements (including regulatory requirements) of the sampling.

This standard describes the need for: (a) a sampling plan; (b) a sampling method; (c) a description of the records required; (d) details of the management of sampling equipment; (e) the validation of processes; (f) the sample handling; and, (g) the training of samplers. The sampling plan can either be devised by the organisation holding or seeking accreditation, with a statistically-based rationale, or designed and specified by the regulator.

As samplers often work in isolation, they are typically audited annually for quality assurance purposes. This auditing is more frequent than that usually required for analysts who are more closely supervised in a laboratory. Proficiency testing (PT) and quality control of sampling are relatively new concepts that can provide both the sampler and the assessors with quantitative evidence of the quality of the sampling actually being achieved. Some examples, and the

advantages and limitations, of this type of PT have recently been discussed.<sup>5</sup> The competence of a sampler can be demonstrated using a combination of suitable training records containing objective evidence, such as satisfactory internal audit performance, quality control<sup>6</sup> and satisfactory PT performance in sampling or *in situ* testing.

In the UK, ISO/IEC 17025 is used mainly to accredit sampling undertaken for regulatory purposes, although sampling for other purposes can be accredited. Currently accredited sampling organisations include those undertaking the sampling of drinking water, raw water, seawater and waste water, and sediment, vegetation and biota associated with the environmental impact monitoring of the nuclear industry.

## Accreditation of inspection bodies performing sampling (under ISO/IEC 17020)

Organisations that undertake sampling for inspection purposes can be accredited for their sampling using a different standard, ISO/IEC 17020. An example of this approach is Crime Scene Investigation (CSI), applied alongside ILAC-G19,<sup>7</sup> undertaken in the forensics sector.

The requirements for CSI sampling are often different from those used in other types of sampling. In forensic science, the term “sample” is used to describe physical objects collected according to principles other than conventional statistical criteria. That gives rise to minor modifications to the definitions of the terms sampling strategy, plan and procedure, in this sector.

Accreditation of CSI to this standard<sup>3</sup> is a relatively new area in the UK, but is fast growing because organisations undertaking this work have to be accredited by 2020. The requirements for technical competence, management of equipment, control and retention of sampling records and sample management are very similar to those for accreditation to other standards. However, there are additional challenges

in this sector in that it is often difficult to undertake an independent technical assessment of the samplers in real crime scenes. Proficiency testing using simulated crime scenes falls short of realism but may still be preferable to the absence of any PT, as has been demonstrated in the food sector.<sup>8</sup>

## Conclusions

The need for fitness for purpose in the quality of routine field sampling, a critical factor in measurement quality, is widely accepted, but has previously proved difficult to achieve or demonstrate. The accreditation of sampling organisations, and the certification of samplers, offers an invaluable additional approach to ensure the quality of measurements. There are several international standards against which accreditation can be made. The choice between these standards depends on the particular sector where the sampling is being undertaken. Proficiency testing of sampling can be an important tool in ensuring appropriate quality in sampling, and thence in results of chemical measurement across many different sectors of application.

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## References

- 1 ISO/IEC 17024 – Conformity assessment – General requirements for bodies operating certification of persons.
- 2 ISO/IEC 17025 – General requirements for the competence of testing and calibration laboratories.
- 3 ISO/IEC 17020 – Conformity assessment – Requirements for the operation of various types of bodies performing inspection.
- 4 Environment Agency, *Personnel Competency Standard for Manual Stack-Emission Monitoring*, 2016, <https://www.gov.uk/government/publications/mcerts-personnel-competency>

- standard-for-manual-stack-emission-monitoring.
- 5 AMC Technical Brief, Proficiency testing of sampling, No. 78, *Anal. Methods*, 2017, 9, 4110–4111, DOI: 10.1039/c7ay90092a.
- 6 *Eurachem/EUROLAB/CITAC/Nordtest/AMC Guide: Measurement uncertainty arising from sampling: a guide to methods and approaches*, ed. M. H. Ramsey, S. L. R. Ellison and P. Rostron, Eurachem, 2nd edn, 2019, ISBN (978-0-948926-35-8), available from <http://www.eurachem.org>.
- 7 ILAC-G19:08/2014, Modules in a Forensic Science Process International Laboratory Accreditation Cooperation, [https://ilac.org/latest\\_ilac\\_news/ilac-g19082014-published/](https://ilac.org/latest_ilac_news/ilac-g19082014-published/).
- 8 P. Robouch, M. H. Ramsey, J. Paepen, B. de la Calle and B. V. Robouch, *The first e-Sampling Proficiency Test in the area of food quality and safety*, JRC Technical Notes 47846, Joint Research Centre – Institute for Reference Materials and Measurements, European Communities, Belgium, 2008.

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