



## Confidence in your results with LANGE cuvette tests

Round robins are an important element of **analytical quality assurance**. For more than 20 years, HACH LANGE users have performed well in these tests. Irrespective of whether the round robins are organised by the manufacturer (ADDISTA) or by **an independent institute**, the quality of the results is always excellent. This was recently demonstrated by the **2007 international round robin** held by Kiwa, an independent Dutch organisation. **More than 94 %** of the LANGE cuvette test results were correct! For individual users, these documented results are proof of their good working practices and properly functioning analysis system. Their measured values are also **officially recognised**.



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# Round robins: analytical quality



Fig. 1: ADDISTA for laboratory analysis: round robin solutions A and B for free participation in HACH LANGE round robin tests, and combined standard and spiking solution for internal quality checks

## Why use a round robin test?

Round robin tests are organised to enable users to check their working practices and their analysis systems under real conditions. In a round robin test, identical samples are analysed by the participants independently of each other (external quality control). In this way, the analysis system and the working practices are checked and any errors are identified. Official recognition of measured values also requires regular participation in round robin tests.

## HACH LANGE round robin tests

HACH LANGE has offered its users the opportunity to participate in round robin tests **free of charge since 1986!** Today, ADDISTA solutions are available for more than 50 different cuvette tests, for both internal and external quality control.

The results of the round robins verify the good working practices of the users and the quality of the total analysis system. In the past 10 years, **an average of almost 90 % of all submitted results were correct!**

When users obtain significantly or repeatedly flawed results, HACH LANGE works together with them to identify and eliminate the cause.

AQA round robin (Baden-Württemberg)	Number of correct cuvette test results				Reference method
	2004	2005	2006	2007	2005
Parameter					
COD	89 %	90 %	88,5 %	90 %	92 %
NH <sub>4</sub> -N	91 %	93 %	91,5 %	95 %	91 %
NO <sub>3</sub> -N	92 %	89 %	91 %	91 %	93,5 %
TN	87,5 %	88 %	88 %	89 %	88 %
P <sub>tot.</sub>	89 %	89 %	90 %	91 %	92 %
TOC				90 %	89 %

Table 1: Comparison of the quality of the results obtained using operational analysis and reference methods; results of the official round robin of the Institute for Sanitary Engineering of the University of Stuttgart

## Independently organised round robins

In view of the importance of external quality checks, a growing number of European Institutes offer a variety of sector-specific round robins. Eg, the Institute for Sanitary Engineering of the University of Stuttgart Deutschland has carried out special round robins for operational analysis in sewage treatment plants for a number of years. Here, too, HACH LANGE users always obtain very good results in comparisons with both reference analysis methods and its competitors (see Table 1 and Fig. 2). The Vorarlberg environment institute obtained almost identical results in 2006 when it carried out a sewage treatment plant round robin for the parameter COD.

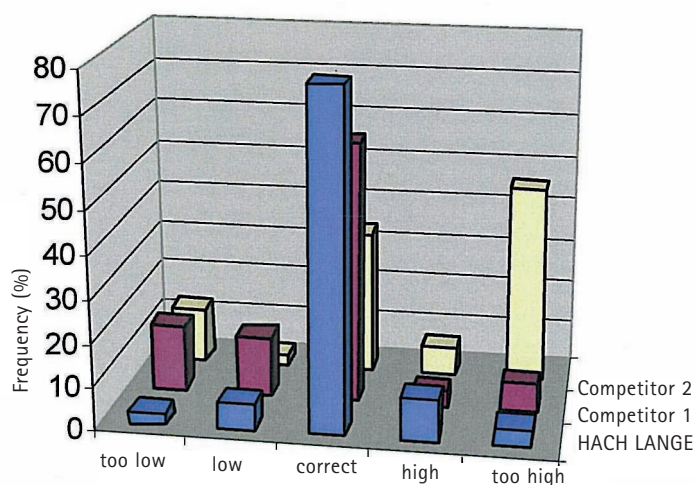


Fig. 2: 2002 round robin of the Institute for Sanitary Engineering of the University of Stuttgart (comparison of COD methods); LANGE cuvette tests clearly outperformed the competition.

The results of the official laboratory performance test of Italy's national ISO agency **UNICHIM** are equally unambiguous. Its comparison of standard methods and LANGE cuvette tests showed:

- **the good comparability of the average values of both methods**
- **the higher precision of the results obtained using the LANGE cuvette tests**

### 2007 round robin test: quality control at an international level

In November 2007, Kiwa Water Research, an accredited Dutch institute, organised a round robin involving 300 participants from 18 European countries. The analysed parameters were COD (high + low), NH<sub>4</sub>-N, NO<sub>3</sub>-N, TN, ortho-PO<sub>4</sub>-P and P<sub>tot</sub>.

The tests were carried out on real wastewater samples, which were spiked with two different concentrations of the analysis parameters. Per parameter, the round robin test participants determined two measurement results which differed by a known amount. This (Youden) concept simplifies rapid error analysis whether differences are attributable to systematic or random errors.

### Round robin documentation and quality

All the users of municipal sewage treatment plants, research laboratories and industrial companies contributed to the success of the round robin test through their cooperative and professional working methods: **More than 94 % of all submitted measurement results were correct!** (see Table 2)

Evaluation of Kiwa round robin 2007		
Parameter	Number of measured values	Number correct
Total	2,640	>94 %
Low COD	358	93 %
High COD	274	>95 %
NH <sub>4</sub> -N*	430	85 %*
NO <sub>3</sub> -N	402	>95 %
TN	382	>95 %
Ortho PO <sub>4</sub> -P	370	>93 %
P <sub>tot</sub> .	424	>95 %

Table 2: Quality of the results obtained by HACH LANGE users in the international Kiwa round robin 2007

\* The result for NH<sub>4</sub>-N is a good example of how user errors can be revealed by a round robin. Many users carried out the analysis with a cuvette test for the wrong measuring range. Their deviating measurement results stood out immediately when the round robin test was evaluated.

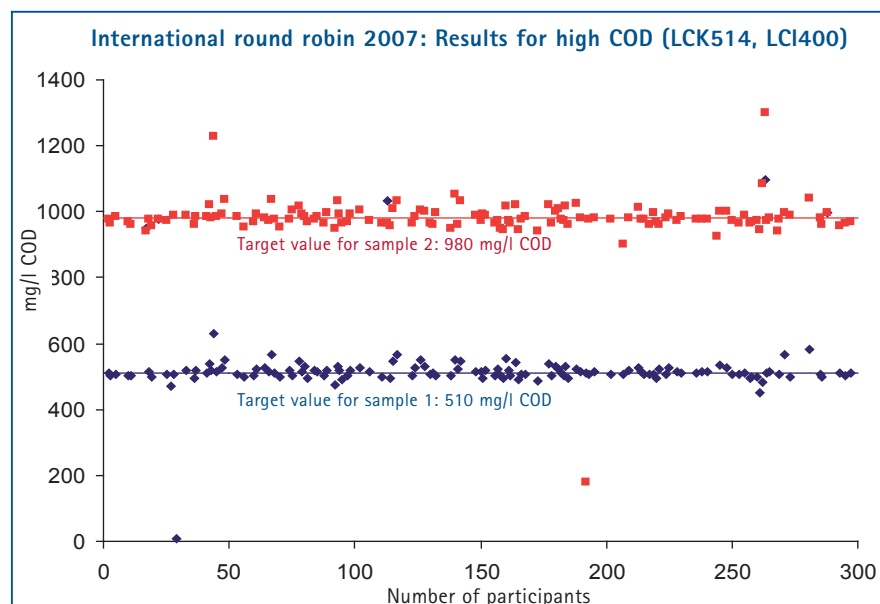


Fig. 3: COD measurement results from international round robin test 2007, organised by Kiwa Water Research Institute, Netherlands

The results for the COD cuvette test are better than the average, as more than 95 % of them are correct!

Fig. 3 shows that the values, with the exception of isolated outliers, are all distributed closely around the target value (the continuous line). The very low average scatter widths of 2.2 % (sample 1) and 1.4 % (sample 2) document the excellent quality of the working practices and analysis system!

# General

## Literature

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- HACH LANGE Praxisbericht "Das LANGE Küvetten-Test-System, 40 Jahre Berufserfahrung", 2007



"Waste Recycling Group Ltd is a leading UK waste management company. We provide a range of processing, recycling, disposal and energy recovery services for local authorities and commercial customers.

We have three laboratories which test gas, water, leachate and effluent samples.

The Bedford lab was delighted to be able to participate in the international round-robin because it supplemented our own internal quality assessment and control procedures.

Participation was not expensive and the procedure was easy to follow.

Importantly however, the results indicated that we are producing good results from our HACH LANGE DR 2800 Spectrophotometer in conjunction with the pre-filled bar-coded cuvettes."

Angie McDonald  
Analyst  
Waste Recycling Group Limited



Fig. 4: Preparation of the round robin samples for the international round robin 2007 at the Dutch Kiwa Water Research Institute



Fig. 5: AQA poster; this user aid can be requested free of charge from HACH LANGE