Third-party study demonstrates not all ATP systems produce stable, consistent results.

When you make the high risk decision to start food production, you must trust the data from your ATP testing system. If you make 'the go-ahead decision' using results that are unstable or inconsistent, you could start production when an area may not be properly cleaned or lose valuable time re-cleaning when it is not necessary.

You also have to rely on data from your ATP monitoring system to proactively manage risk in your operation, by identifying areas that are most likely to be contaminated, showing results of cleaning over time and preparing for audits.

However, not all ATP systems produce results that are both stable and consistent.

Impacts of time and temperature on ATP test results

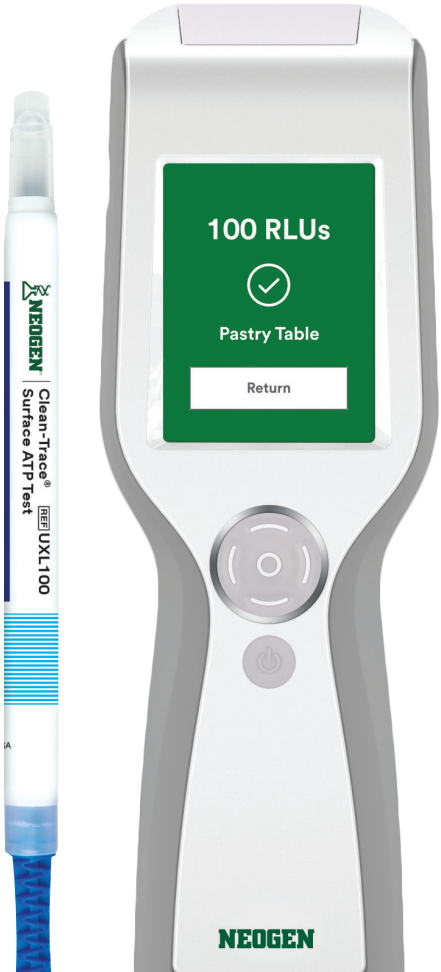
The time it takes to complete an ATP test can differ when testing the same site from day to day or even between shifts, due to time delays or differences in technique. Once a test is activated, time delays can occur when technicians are distracted, have unexpected conversations or need to navigate around equipment in the plant. Also, experienced technicians may work faster than newer personnel.

In addition, food manufacturers operate in a variety of temperatures, depending on the foods they produce. However, some ATP systems perform inconsistently, providing stable results at some temperatures but unstable results when operating temperatures increase or decrease.

Therefore, it is critical for an ATP system to provide stable and consistent results despite time delays taking readings or variations in operating temperature.

Studies comparing ATP testing systems

Neogen commissioned a study[1] by the Zero2Five Food Industry Centre to compare the Neogen® Clean-Trace® Hygiene Monitoring and Management System's performance to that of seven consumables across five systems. The study evaluated the impact of time and temperature on the stability and consistency of results produced by the ATP systems.



A study of stability and consistency

Methods

To test the stability of results produced by each system, a known amount of ATP was applied on swabs and read repeatedly over two minutes to determine how much results varied. Tests were conducted at 10°C, 20°C and 35°C. System stability was measured as percent signal decay per minute.

Interpretation of results

Desired results will be both stable and consistent. In Figure 1, an ATP system that produces stable results over time at different temperatures will show a nearly horizontal line at each of three temperatures. In the targets, an ATP system that provides consistency will have results grouped closely on the target while stability in ATP system will cause the results to hit the center of the bullseye. In Table 1, a signal decay of less than 10% per minute was considered to demonstrate stable and consistent results.

Results

As shown in Table 1:

- The Clean-Trace Hygiene Monitoring System was the only ATP system that produced stable and consistent results at all times and temperatures.
- One ATP testing systems produced results that were unstable and inconsistent at all temperatures:
  - Hygiena EnSure™ SuperSnap™
- Five systems produced unstable results, with inconsistencies at some temperatures used in the study:
  - Biocontrol MVP ICON™ Surface Sampling Device
  - Charm NovaLUM FieldSwab® Plus
  - Charm NovaLUM PocketSwab® Plus
  - Hygiena EnSure™ UltraSnap™
  - Kikkoman® PD-30 LuciPac
- Three systems had signal decay rates as large as 97% per minute at some of the temperatures tested.
  - Charm NovaLUM FieldSwab Plus
  - Charm NovaLUM PocketSwab Plus
  - Hygiena EnSure UltraSnap

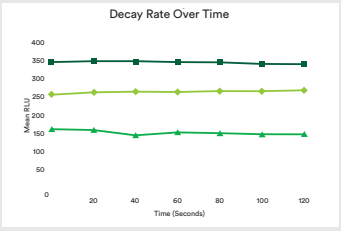
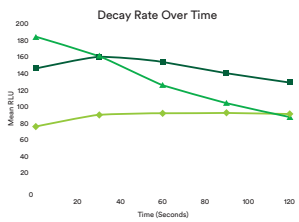
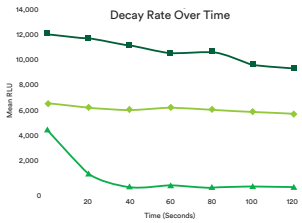
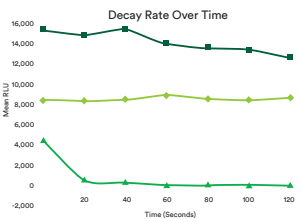
Neogen® Clean-Trace® Hygiene Monitoring and Management System	BioControl LIGHTNING MVP ICON™ System	Charm NovaLUM FieldSwab®	Charm NovaLUM PocketSwab® Plus
			
High stability High consistency	**Low stability Low consistency**	**Low stability Low consistency**	**Medium stability Medium consistency**
			
• Generates stable and consistent results across time and temperature variables • Results are consistent and vary by less than 10% over the 2 minute assessment period at all temperatures • Reliable results can increase food safety and production efficiencies	• Generates unstable and inconsistent results at all temperatures • Results at 10°C vary 20% within 1 minute with an increase in signal, and vary by 52% within 2 minutes at 35°C showing a decrease in signal • Rapid signal changes may lead to false results	• Generates inconsistent and unstable results that are time and temperature dependent • At 35°C, the signal decayed by 96% over the first 60 seconds, and nearly 100% by 2 minutes • Rapid signal decay may lead to false negative results	• Generates results that are time and temperature dependent • At 35°C the signal decayed by 100% in under 1 minute • Process environment operating temperatures should be considered to ensure the validity and consistency of results

Figure 1. Interpretation of results

Stability/Consistency
High – Acceptable results in all conditions
Medium – Acceptable results in half or more conditions but not all
Low – Acceptable results in less than half of conditions

Temperature
10°C
20°C
35°C

Definitions of stability and consistency

Stability

An ATP hygiene monitoring system should be able to provide stable results over time and at different temperatures.

Consistency

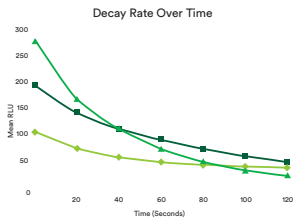
An ATP hygiene monitoring system should be able to provide the same results for the same ATP sample consistently and repeatedly at each temperature.

Table 1: Percentage signal decay per minute

Hygiene Monitoring ATP Test System	Temperature variable					
	10°C		20°C		35°C	
Time (minutes)	**1**	**2**	**1**	**2**	**1**	**2**
Neogen Clean-Trace Hygiene Monitoring & Management System	+3.56%	+5.13%	-0.40%	-1.93%	-6.02%	-8.66%
BioControl LIGHTNING MVP ICON System	+19.73%	+18.23%	+5.57%	-11.68%	-31.41%	-52.17%
Charm NovaLUM FieldSwab	-4.84%	-11.19%	-12.18%	-22.22%	-96.55%	-99.43%
Charm NovaLUM PocketSwab Plus	+6.12%	+3.30%	-9.20%	-18.11%	-100.00%	-100.00%
Hygiena Ensure SuperSnap	-55.41%	-65.84%	-53.62%	-76.08%	-74.28%	-92.50%
Hygiena Ensure UltraSnap	+97.04%	+73.96%	+3.60%	-19.41%	-27.50%	-45.24%
Kikkoman Lumitester PD-30	+3.85%	+4.57%	+3.42%	+1.18%	-9.75%	-14.33%

Hygiena Ensure™ SuperSnap™

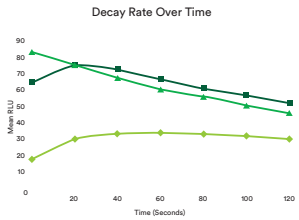
Low stability
Medium consistency



- Generates inconsistent and unstable results that are highly time dependent
- Results vary by a minimum of 53% within 1 minute at all temperatures
- Rapid signal decay may lead to false negative results

Hygiena Ensure™ UltraSnap™

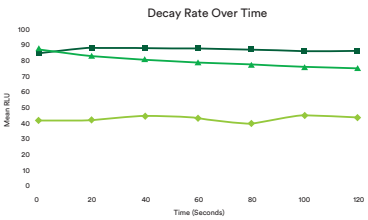
Low stability
High consistency



- Generates results that are time and temperature dependent
- Results vary 97% at 10°C within 1 minute with an increase in signal, and vary by 45% at 35°C within 2 minutes showing a decrease in signal
- Rapid signal changes may lead to false results

Kikkoman® Lumitester PD-30

Medium stability
Medium consistency



- Generates stable results consistently at most temperatures
- Results vary by a maximum of 14% at all temperatures within 2 minutes
- Process environment operating temperatures should be considered to ensure the validity and consistency of results

Conclusions

Seven ATP test systems for the monitoring of hygiene standards were evaluated. The study demonstrated that not all ATP systems provide the same quality of results. Three ATP testing systems produced inconsistent results at all temperatures. Four systems produced unstable results, with inconsistencies at some temperatures used in the study. Three systems had signal decay rates as large as 97% per minute at some of the temperatures tested. The only system that produced stable and consistent results across time and temperature was the Clean-Trace Hygiene Monitoring and Management System.

In their report, the Zero2Five scientists stated **"It is paramount that the hygiene monitoring system provides reliable results. This will provide the manufacturing and hygiene teams with insight and information to manage the hygiene processes and practices within the organization effectively."** They also warned that **"interpretation of inaccurate data may impact food safety and have a significant commercial impact on the business."**

The ATP system you rely upon must produce results that are both stable and consistent so you can confidently make the high-risk decision to start food manufacturing and proactively manage risk in your operation.

Food Industry Centre
Cardiff Metropolitan University
ZERO2FIVE
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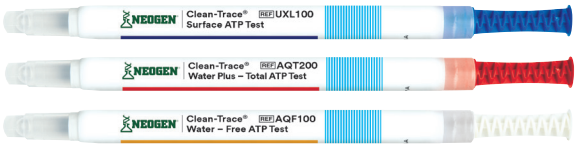

Learn more about hygiene monitoring at **info.neogen.com/Clean-Trace**

[1] Evaluation of ATP Detection Systems, 2017. Zero2Five, Food Industry Centre Cardiff Metropolitan University, Cardiff United Kingdom.

NEOGEN®

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