Comparing the Performance of ATP Hygiene Monitoring Systems

Hygiena® vs Neogen®

ATP Hygiene Monitoring

ATP hygiene monitoring is a simple, rapid and quantitative testing method to verify cleaning effectiveness. For a surface to be verifiably clean, all food debris and other organic matter must be removed. Food debris, organic matter, and microorganisms contain ATP. Microorganisms are very tiny and individually contain only small amount of ATP. Thus, large numbers of microbes (~10,000) are required to be detectable by ATP test systems, which measure ATP residue in Relative Light Units (RLU). Systems are highly sensitive and can detect extremely low levels of ATP molecules, which means they can detect extremely small amounts of organic matter or food debris on surfaces. Effective cleaning removes both microbes and food residues. This means the lower the ATP reading is, the higher the cleaning standards are, resulting in a lower risk of microbial contamination.

What Has Changed?

Over the past 10 years, some systems have been re-designed, and some have received 3rd party certification by AOAC-RI under the *Performance Tested Methods℠* Program.

Hygiena® Changes

- Hygiena released the EnSURE Touch® to complement its SystemSURE™ Plus and EnSURE® luminometers.
- UltraSnap® Surface ATP Test pre-moistened swab device with liquid-stable luciferase reagent remains the same and is fully compatible with all three luminometers.
- UltraSnap is an AOAC-validated method when used with EnSURE and EnSURE Touch.

Neogen Changes

- Neogen replaced AccuPoint® systems with AccuPoint Advanced System and AccuPoint Advanced Sampler (reagent test device).

Critical Performance Characteristics of ATP Hygiene Systems

Sensitivity
The smallest amount of ATP and food residues detectable

Consistency
The variation of result from repeated tests of the same sample

Accuracy
The measured ATP value compared to the true value

Precision
The repeatability of the test to produce the same result

These parameters are determined using samples containing several different concentrations of ATP, including a sample without ATP. Ten replicates at each concentration level are tested. The data generated is used to calculate the limit of sensitivity, consistency, accuracy and precision. All systems showed excellent linear response to all sample types ($R^2 > 0.98$).

Sensitivity

The table below shows the smallest amount of ATP detectable by each ATP hygiene monitoring system. The data represents the values provided to AOAC by each manufacturer (Hygiena AOAC certificate #101803 and Neogen AOAC certificate #091601). Hygiena systems have shown a continual improvement and have maintained their performance with UltraSnap swabs. Hygiena ATP systems are 10x more sensitive than the Neogen AccuPoint Advanced systems. There is no significant difference between the original AcccuPoint and the newer AccuPoint Advanced systems. If greater sensitivity is required for high risk operations, then Hygiena's SuperSnap® High-Sensitivity Surface ATP Test provides an additional 5-fold increase in sensitivity (not shown in table).

	Hygiena UltraSnap			Neogen AccuPoint Advanced Sampler	
Lowest amount of ATP (fmols) detected = greater sensitivity	EnSURE Touch	EnSURE	SystemSURE Plus	AccuPoint Advanced	AccuPoint
	<1.0	**1.0**	**1.0**	**10.1**	**10.0**

*Data provided by Hygiena AOAC certificate #101803 and Neogen AOAC certificate #091601.

Key Factors Affecting Sensitivity

Each detection system will generate a response when there is no ATP in the sample. This is called background noise and is caused by impurities in the chemistry. If not removed, these impurities significantly affect the performance of the system. The Neogen instrument has a built-in bias that does not display results at low RLU. While this approach allows the system to hide the variation at low ATP levels, it eliminates its ability to detect ATP at low levels (10 fmol vs Hygiena 1 fmol).

Hygiena's liquid-stable chemistry remains active and impurities are removed, greatly reducing background noise. Low background noise means more reliable and sensitive measurement, particularly at low level detection required for cleaning verification. The AOAC data shows the background noise for ATP detection by Neogen AccuPoint Advanced is 0-10 RLU; whereas Hygiena's systems are 1-2 RLU.

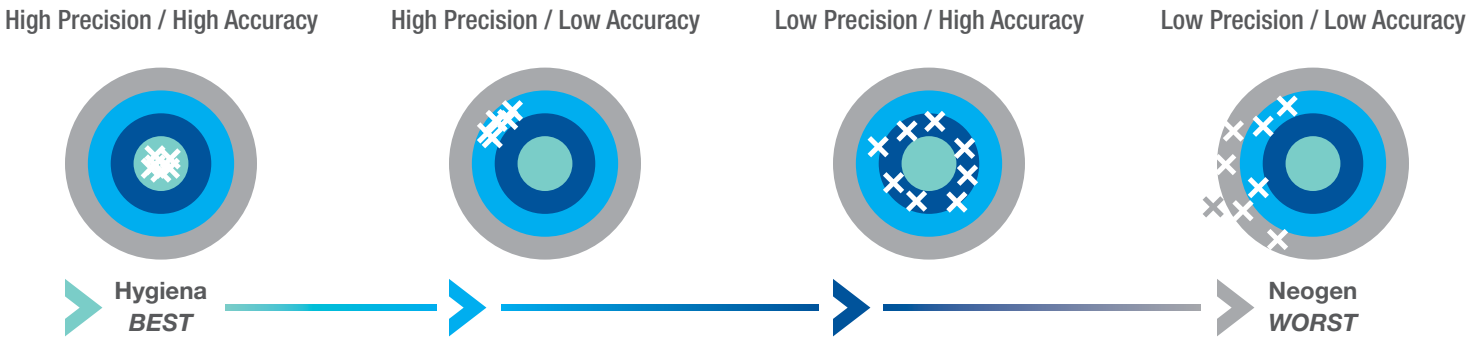
In food residue and bacteria studies, the background ranges for Neogen AccuPoint Advance range from 0-72 RLU while Hygiena's system range is 1-5 RLU. This means that for the detection of food residue, an average result on the Neogen AccuPoint Advanced < 32 RLU is meaningless and anything between 32-72 RLU is questionable.

Accuracy and Precision

The calculated variation and accuracy for both Hygiena and Neogen systems were similar at high ATP levels; however at typical Pass levels of 10 fmols of ATP, Hygiena's system was more consistent and precise.

- Neogen AccuPoint Advanced system has a variation of 33% and accuracy of 56%.
- Hygiena EnSURE Touch and UltraSnap swab has a variation of 17% and accuracy of 78%.

Hygiena systems deliver the most consistent result closest to the expected value. Accordingly, Hygiena systems have greater precision and accuracy.



Detection of Food Residues and Microbes

AOAC data* shows Hygiena's system was more sensitive by detecting smaller amounts of food residues on surfaces compared to Neogen AccuPoint Advanced. In the earlier Siliker study, different foodstuffs and experimental design was used but similar results were obtained. The AOAC study* showed that both systems were able to detect bacteria and yeast. The smallest number of microbes detected by Hygiena's system was ~50,000 bacteria and 1000 yeasts. This was similar to the Siliker study of 2010.

The ATP surface cleaning verification test is not intended to be a surrogate bacteria test because it does not have the required sensitivity (typically 250/100cm^2 swab area).

Food residues on surfaces	ATP System	
	Hygiena EnSURE	Neogen AccuPoint Advanced
Cooked meat	< 1 in 50,000	<1 in 1,000
Raw meat	1 in 10,000	1 in 1,000
Orange juice	<1 in 100,000	1 in 100,000
Yogurt	1 in 1,000	<1 in 100,000

*Data provided by Hygiena AOAC certificate #101803 and Neogen AOAC certificate #091601.

Lot Variation and Stability

The Neogen AOAC study (certificate #091601) comments that:

> *"It is likely that the lot-to-lot differences contribute to statistical differences observed with the newest sampler lot during stability testing. Collectively, the data support the sampler's shelf life up to 9 months."*

Hygiena swabs are consistent and robust with a shelf life of 15 months.

Summary

- Hygiena systems are the most sensitive, accurate and consistent. EnSURE Touch shows continual improvement of Hygiena systems.
- Neogen AccuPoint Advanced is less sensitive, more variable and has a shorter shelf life than all Hygiena ATP systems.
- Neogen AccuPoint Advanced has the same performance than the previous AccuPoint model (2010).

*Data provided by Hygiena AOAC certificate #101803 and Neogen AOAC certificate #091601.