Replacement of a conventional ATP tests with ATP Test (Kikkoman A3) to Perform More Accurate Hygiene Inspections

Nikken Foods Co., Ltd.

Interviewees

Quality Control Section,
Quality Assurance Department

Manager
Ryu Miyashita　　Honoka Suda

The Quality Control section has a total of 15 employees.

Information

Year established	1964	Number of employees	274 (as of April 2020)
Address of head office/ factory	723-1 Haruoka, Fukuroi-shi, Shizuoka	Sales	15.3 billion yen (as of March 2020)
Business	Production, sales, research, and development of natural seasonings extracted and processed from livestock, marine products, and agricultural products, powdered instant tea for professional use, health food products, etc.	Website	https://www.nikkenfoods.co.jp/en/

Exterior view of the factories in head quarter

Since its establishment, Nikken Foods Co., Ltd. has been developing its business activities based on the corporate philosophy of "contributing to global health through a food business focused on natural flavors". In 2011, they obtained ISO 22000 and FSSC 22000 certifications, and are constantly striving to achieve high world-class hygiene management and safety assurance. As part of this effort to improve hygiene, they had been using a conventional ATP tests (a test method used to confirm the cleanliness) in their factories since 2015.

In 2019, for further improvement of their hygiene management program, they decided to replace the conventional ATP tests they had been using with Kikkoman Biochemifa's ATP Test (Kikkoman A3). Kikkoman's A3 test differs from conventional ATP tests that can only measure ATP, but can also measure ATP as well as ADP and AMP (the degradation products of ATP). Nikken Foods Co., Ltd. chose to introduce the Kikkoman A3 Test because they wanted to implement stricter and more accurate testing, continue to invigorate their existing hygiene management system and enhance the effectiveness of their environmental monitoring and food allergen management programs.

We interviewed Mr.Ryu Miyashita and Ms. Honoka Suda of the Quality Control Section of the Quality Assurance Department about their decision to introduce the Kikkoman A3 Test and the effects of data management using the new app for the test.

POINT

ATP Test (Kikkoman A3)

Background/Subjects

❶ Instead of only measuring the amount of ATP with a conventional ATP test, they wanted to increase the level of their hygiene management.

❷ In response to an Environmental Monitoring Program (EMP), they wanted to introduce "preventive hygiene control" to insure the cleanliness of food contact surfaces.

❸ They required a stricter inspection system that takes allergen management into account was needed.

Effects of ATP Test (Kikkoman A3)

❶ It led to the recognition of the risk: The ATP test shows that even though a surface is visually clean, if the result is high, there may be residual contaminants.

❷ If there are any deviations from the threshold criteria, improvement activities such as re-cleaning can be performed on the spot, which has a great effect on hygiene awareness within the manufacturing sites.

❸ Using the included software reduces the time required for inputting and compiling data and preparing reports.

Threshold criteria and inspection frequency

Threshold criteria: They started with 1,000 RLU in the factories and 3,000 RLU in cafeteria. These are revised, as necessary.

Inspection frequency: About 70 locations are inspected monthly (after re-cleaning conducted before the first production of the first full-week of the month), and 50 locations out of them are inspected weekly (before the first production of the week) as well.

Introduction of ATP Test (Kikkoman A3) to achieve a higher level of hygiene management

First of all, please tell us about your decision to use the ATP Test (Kikkoman A3).

Miyashita: This is our sixth year of using conventional ATP tests but we had three main reasons why we switched to Kikkoman A3.

First, while we had established the conventional ATP test as a method of checking the cleanliness after cleaning, and we were getting consistently passing test results. Because we felt we are getting used with such good results too much, we felt the need to get out of the rut. We had heard from people involved that the ATP Test (Kikkoman A3) is much more sensitive than conventional ATP tests, and therefore we must review and revise the current criteria. That's what we desired.

Second, we needed to comply with our EMP. We had been operating a system called environmental inspection for a long time, but with the revision of FSSC 22000 to Version 5, we decided to adopt EMP to improve the system. We also saw from overseas trends that the EMP concept will become mainstream. In the past, environmental inspections were mainly about food contact surfaces. In EMP, however the concept of so-called “preventive hygiene management” is used to check the cleanliness of a wider area, including the “zones” around food contact surfaces. Our EMP uses both ATP Test (Kikkoman A3) and microbiological tests to accomplish these checks. The ATP Test (Kikkoman A3) is mainly used to check the cleanliness of food contact surfaces while microbiological tests can test for specific microbial contamination including total plate count and presence of *E. coli*, coliform bacteria, *Enterobacteriaceae*, *Salmonella* spp., *Listeria monocytogenes*, etc.

Third, we wanted to strengthen our allergen management program. FSSC 22000 (Ver. 5) emphasizes allergen management more than ever. There is no doubt that strict management of allergens will become an international trend in the future.

Can you give us an overview of the EMP?

Miyashita: The EMP verifies that our hygiene procedures adequately prevent contamination of our products from the manufacturing environment. Monitoring is conducted from the perspective of food safety in four categories as shown in Table 1 (monitoring targets all production lines with HACCP plans). Based on the monitoring results, if the hygiene management procedures are not appropriate, they will be reviewed and corrected.

Table 1 Overview of the environmental monitoring program

Target zones	Target categories	Indicator bacteria	Inspection frequency
ZONE1	Product contact surfaces (manufacturing surfaces that come in contact with products), equipment used in manufacturing, etc.	Total Plate Count, *E. coli*, coliforms bacteria, mold/yeast	Once a week
ZONE2	Manufacturing equipment areas, equipment switches, working tables, aprons, sealers, sewing machines, etc.	Total Plate Count, *E. coli*, coliforms bacteria, mold/yeast, *Salmonella spp., Listeria monocytogenes*	Once a week
ZONE3	Floors, drains, air conditioners, pallet truck, etc.	*Enterobacteriaceae, Salmonella spp., Listeria monocytogenes*	Once a month
ZONE4	Hand-wash stations, doorknobs, etc.	*Enterobacteriaceae, Salmonella spp., Listeria monocytogenes*	Once a month

The factory manufactures natural seasonings, fermented seasonings, and health-conscious foods, such as tea products.

ATP Test (Kikkoman A3) following thorough disassembly/cleaning of the lines before starting work at the beginning of the week

What are the inspection areas and timing for ATP Test (Kikkoman A3)?

Suda: The inspection areas are located on 15 lines in 7 factories. The inspection areas include, 13 lines in 5 factories in production which handle natural seasonings, health-conscious foods, etc., one in the R&D department, and one in the cafeteria kitchen. 70 areas are inspected monthly, and 50 out of them are inspected weekly before starting the first production of the week, as well,

In our case, in addition to cleaning at the time of production changeover, we perform a more detailed disassembly cleaning of the lines at the end of production on weekends. Before starting work at the beginning of the week, we re-clean and reassemble the lines, and then we use ATP Test (Kikkoman A3) for inspection.

Who conducts the inspections?

Suda: Sampling is done by the operator who conducted cleaning in the manufacturing site, but the swabs are not allowed to react with the reagent at the manufacturing site. Samples are brought to the Quality Control section where the measuring instruments are stored and reacted with the reagent and measured. The results are compiled by the Quality Control section and feedback is sent to each department.

However, to eliminate any variation between test swabs, the reagents in each test are mixed for 15 seconds in a vortex mixer (Photo. 1). Before establishing this testing procedure, we validated a number of process steps such as vortex agitation time and reagent storage temperature.

Is the manufacturing site proactively working on ATP Test (Kikkoman A3)?

Miyashita: We believe that “a good product is born from the awareness of quality control and hygiene management of the employees in charge of manufacturing”. In order to maintain a high-level of hygiene management awareness, the operators who conduct cleaning check the cleanliness of the location by themselves. Based on the results, the manufacturing site may review and revise the sampling areas.

What is the basic approach to determining the inspection areas?

Miyashita: There basically are three points to consider: 1) the results of the microbiological testing, 2) areas that are difficult to clean, and 3) where cleaning water tends to remain and stagnate. In the beginning, we had about 20 candidates of inspection areas, but after actual operation for a while, we narrowed them down to 5 or 6 locations. Some companies may stop the inspection of the area where good results were consistently obtained.Whereas, we review and determine the necessity of continue fixed monitoring based on the level of importance and other factors.

Basically, we have a yearly plan for swabbing areas, but there are times when we conduct spot inspections. Also, we may add an emergency inspection when we detect the possibility of a quality abnormality.

For each area that is selected based on these ideas, we consider “how can we collect the most contaminants by swabbing?” It is important to swab the object evenly.

Photo. 1
The reagent is stirred for 15 seconds with a vortex mixer.

Updates of cleaning procedures/ threshold criteria through the PDCA cycle

You had been running a conventional ATP test for five years. How effective had it been?

Miyashita: The first year, the factories and the Quality Control section worked together to repeat a trial and error process. Factors that cause microorganisms to multiply are nutrient, water, and temperature. It was not difficult to control water and temperature, but as for nutrient, we had to visually check to make sure there was no food residue on line after cleaning. In addition, since visual inspections rely heavily on individual's eyesight and their subjective assessment, it was difficult to get everyone on the same page. Microbiological testing is used for hygiene education, but it takes time to culture the samples and we have to tell the operator a few days later even if cleaning was inadequate. This will inevitably weaken the educational effect as the memory of the person in charge at the manufacturing site will be vague.

On the other hand, the ATP test can give you an objective numerical value right on the spot. The ATP test shows that even though the surface may be visually clean, if the result is high that is an indication that there may be residual contamination remaining and this immediate feedback leads to better recognition of the risk. If there are any deviations from the criteria, remedial actions such as re-cleaning can be performed on the spot. The ATP test has had a significant effect on hygiene awareness in our manufacturing sites. In the first year, we focused on awareness, and in the second year, we began to implement the PDCA cycle, specifically reviewing cleaning procedures.

What is your approach to setting the threshold criteria?

Suda: In the beginning, the threshold criteria were based on the manufacturer's recommendations. We then gradually changed them as we implemented the PDCA cycle. For example, in the first year, we started with 500 RLU and gradually tightened it up to 300 RLU in the second year and 100 RLU in the third year.

Consideration of allergen management with a stricter inspection system

In the sixth year, you replaced the conventional ATP test with the ATP Test (Kikkoman A3). How did this happen?

Miyashita: After a few years of using the conventional ATP tests, deviations from the threshold criteria no longer occurred. This caused our teams to become more complacent about the test results.

When the ATP test was first introduced to those in charge at the manufacturing sites, they had, and they still have, a sense of crisis that if they were not careful the result may deviate from the reference value. However, our new staffs were only aware of the current stable hygiene results. It became quite difficult for those new staffs to understand the meaning of the results for the ATP test, since it had been a normal for them to see only results that were low.

We, therefore, wanted to break out of that rut and, in 2019, when Kikkoman Biochemifa launched the ATP Test (Kikkoman A3) kit (Photo. 2) , we decided to try it. Since it measures ATP, ADP, and AMP, it is more sensitive than conventional ATP tests and we had hoped it would help us in our efforts. In fact, when we switched to the ATP Test (Kikkoman A3), some of the readings were one-to-two orders of magnitude higher than what we had seen with the conventional readings.

Photo. 2
The measuring instrument Lumitester Smart and the measuring reagent LuciPac A3

Was there a drastic revision of your threshold criteria when you switched from the ATP test to ATP Test (Kikkoman A3)?

Suda: This was a big concern for us when we switched to using ATP Test (Kikkoman A3) in our factories and cafeteria (Photos 3, 4, 5 and Tables 2, 3). At the factories, we started with criteria of 1,000 RLU. Kikkoman Biochemifa has published reports on swabbing tests for the control of allergens using ATP Test (Kikkoman A3), so we referred to those as well. For the cafeteria, we started with 3,000 RLU but we also set stricter threshold criteria for surfaces that come in contact with raw food, such as knives and cutting boards.

We have only recently introduced the ATP Test (Kikkoman A3) and we will continue to monitor our results and revise our criteria as necessary in the course of actual operation.

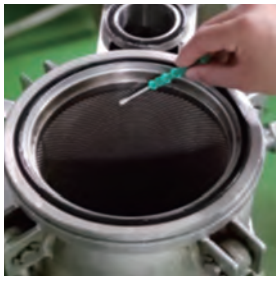
Table 2 Example of measurement results of a natural seasoning (powder) production line using ATP Test (Kikkoman A3)

	November 4,2019 (Mon)		November 11,2019 (Mon)		November 18,2019 (Mon)			November 25,2019 (Mon)		December 9,2019 (Mon)			December 16,2019 (Mon)		December 23,2019 (Mon)		
	A3 Test	TPC	A3 Test	TPC	A3 Test		TPC	A3 Test	TPC	A3 Test		TPC	A3 Test	TPC	A3 Test		TPC
Inspection Areas	Limit <1,000 RLU	Limit <100	Limit <1,000 RLU	Limit <100	Limit <1,000 RLU	re-examination	Limit <100	Limit <1,000 RLU	Limit <100	Limit <1,000 RLU	re-examination	Limit <100	Limit <1,000 RLU	Limit <100	Limit <1,000 RLU	re-examination	Limit <100
C 01: Service tank valves	11	0	5	0	10	-	0	11	0	1,335	6	0	4	0	8	-	0
C 03: High pressure pump outlets	10	0	8	0	4	-	0	5	0	7	-	0	5	0	5	-	0
C 04: Strainer housings	8	0	2	0	18	-	0	4	0	5	-	0	87	0	4	-	0
C 05: Powder conveying lines	13	0	8	0	139	-	0	14	0	30	-	0	16	0	13	-	0
C 06: Transfer fans	805	0	11	0	222	-	0	3	0	8	-	0	4	0	64	-	0
C 07: Dehumidification lines	7	23	77	0	14	-	0	8	0	11	-	0	2	0	16	-	0

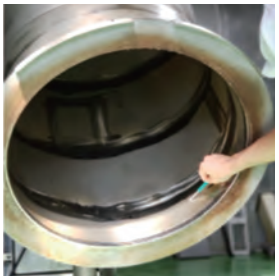
Photo. 3 Examples of swabbing areas on a natural seasoning (powder) production line.

Service tank valves

High-pressure pump outlets



Strainer housings



Powder conveying lines

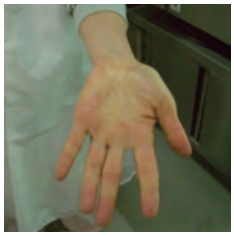
Transfer fans

Dehumidification lines

Table 3 Examples of measurement results in the cafeteria using ATP Test (Kikkoman A3)

	October 28, 2019 (Mon)		December 2, 2019 (Mon)		January 6, 2020 (Mon)		February 3, 2020 (Mon)		March 9, 2020 (Mon)	
	A3 Test	TPC	A3 Test	TPC	A3 Test	TPC	A3 Test	TPC	A3 Test	TPC
Inspection Areas	Limit <3,000 RLU	Limit <100	Limit <3,000 RLU	Limit <100	Limit <3,000 RLU	Limit <100	Limit <3,000 RLU	Limit <100	Limit <3,000 RLU	Limit <100
Cafeteria 01: Cook's hand	37	0	91	0	28	0	38	0	5	0
Cafeteria 02: Kitchen table	742	0	116	0	8	0	260	0	102	0
Cafeteria 03: Grater cutter	99	-	13	-	90	-	39	-	100	-
Cafeteria 04: Vegetable cutter blades	103	-	60	-	54	-	12	-	24	-
Cafeteria 05: Nail brush	3	-	12	-	6	-	4	-	5	-
Cafeteria 06: Inside of dehydrator	646	-	11	-	17	-	19	-	28	-
Cafeteria 07: Basket	11	-	23	-	10	-	5	-	4	-
Cafeteria 08: Sponge	4	0	8	0	31	0	5	0	8	0
Cafeteria 09: Knife (<1,000)	67	0	9	0	38	0	12	0	5	0
Cafeteria 10: Cutting board (<1,000)	38	1	54	0	193	0	25	0	88	0
Cafeteria 11: Upper part of scale	100	-	11	-	101	-	8	-	264	-
Cafeteria 13: Apron	199	1	45	0	102	0	30	0	7	0

Photo. 4 Examples of swabbing areas in the cafeteria.



Cook's hand

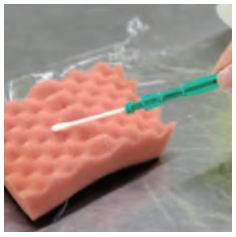
Kitchen table

Grater cutter

Vegetable cutter blades

Basket

Inside of dehydrator



Sponge

Knife and cutting board

Upper part of scale

Photo. 5 They also operate an in-house cafeteria.

Organic vegetables, fruits and other crops harvested from their own farm on their premises are served in a buffet style.

Data management through apps: effective in raising awareness and promoting communication

The Lumitester Smart can process data in conjunction with the dedicated application software. What did you try in the process of introducing the app?

Miyashita: Initially, the Quality Control section visited the manager of each department/section to explain and demonstrate the use of the application. We asked them to use it casually as if it were a game, so that they could learn it firsthand. We also created our own instruction for our manufacturing site personnel so that they would not have any problems operating the measuring instruments and using the app (Photo. 6).

How do you manage your app data?

Suda: The daily trends of our measurement results are analyzed by the app. Apart from that, once a month, we download the data stored in the could storage and use Excel to compile, manage and further evaluate that data (the measurement results data can be downloaded in CSV format).

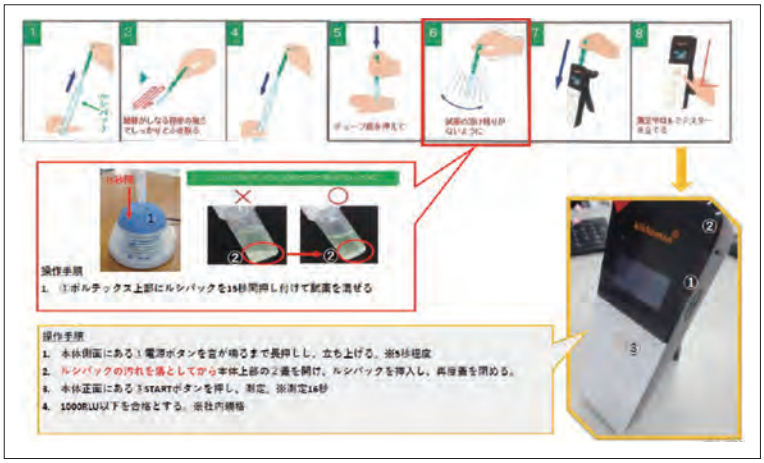
What are the rules for setting 'inspection areas' and 'set of inspection areas' in the app?

Suda: The name of each inspection area contains three pieces of information: 1) the name of the line, 2) serial number of the inspection area and 3) the name of the inspection area (Tables 2 and 3). The name of the set of inspection areas also includes the name of the factory.

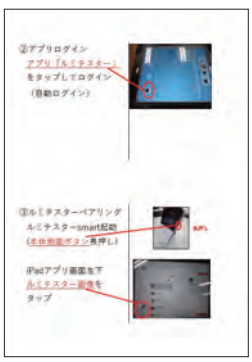
Miyashita: In addition, through the process of entering inspection areas, we found out that similar items may have different names depending on the factory (for example, an item called "otama (ladle)" in Factory A is called "shaku (scoop)" in Factory B). For this reason, the Quality Control section conducted hearings and unified the names that we used for data input to the application.

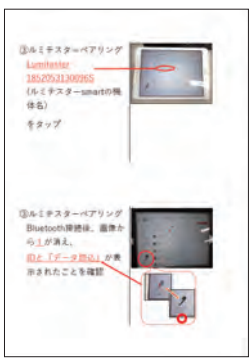
Suda: As a side note, the function of registering a photo to each inspection area in the app is very useful and easy to understand.

Photo. 6 Their ATP instruction



Lumitester Smart can be linked to the dedicated app.





B6 A4

They created an ATP Test (Kikkoman A3) implementation instructions for the field. It is laminated and stored/posted with the measuring instruments so that it can be viewed at any time (15 B6-size sheets/A4 poster format).

What do you feel are the effects of using the app?

Miyashita: In the past, the measurement results were written on paper and the Quality Control section typed them into Excel. In other words, we used to do the transcription twice, but by using the app, the workload has been reduced along with the risk of transcription errors, and the loss of paper files has been eliminated. Also, we were able to reduce the amount of time used to input and compile data and prepare reports. This process used to take about an hour weekly but now, thanks to the app, we reduced this workload.

From an administrator's point of view, I feel that it is very beneficial in terms of both cost and time performance. For companies with a high frequency of inspections and report writing, the benefits will be even greater.

Suda: The app allows users to easily review past data, and link various information such as inspection locations and personnel. Using this function, we have had more opportunities to hear feedback from manufacturing site personnel with comments such as “Last week's result looks high, what happened?” or “I am relieved to see that the values become lower compared to last time”. It has definitely led to improved hygiene awareness at the manufacturing site and better communication with those in charge.

So, the app also has a function as a communication tool?

Suda: Yes. For example, if the shifts are split into day and night, and this can make it difficult to communicate with those who worked the shift before yours. However, by sharing data via the app, we can always see the status of the cleaning done by the worker on the previous shift. I think the app has been very effective as a support tool for sharing information.

Miyashita: From an administrator's point of view, data can be checked anytime, anywhere by downloading the app to a smartphone or PC. The keywords these days are “work style reform” and “social distancing". and I think this will meet those needs as well.

Their hope to link ATP Test (Kikkoman A3) to aggressive quality assurance

Lastly, please give us a few words about the future use of ATP Test (Kikkoman A3).

Miyashita: We also operate factories in China and Thailand, and we are considering introducing ATP testing to the Chinese factory and have already introduced it to the Thai factory. We hope to share the results of the introduction of ATP Test (Kikkoman A3) in Japan with overseas factories to build a better hygiene management system in the future.

We have a policy of proactive quality assurance, rather than defensive quality assurance which leads to acting after the production is finished or when a problem occurs. We will continue our quality assurance activities with a focus on preventing problems before they occur by effectively using ATP Test (Kikkoman A3) and so.

kikkoman
Kikkoman Biochemifa Company

2-1-1 Nishi-Shinbashi, Minato-ku, Tokyo 105-0003, Japan
E-mail: biochemifa@mail.kikkoman.co.jp
URL: https://biochemifa.kikkoman.com/e/