

Kitty II Makes Petri Dishes Fly

The new plating machine developed for SGS for processing microbiological analyses is ready for use in Spijkenisse. Thanks to 'Kitty II', the Petri dishes will be handled at full speed in the new lab, where microbiology and chemistry meet.

Kitty II is truly a working horse. The plating machine just became operational and is remarkably compact. Its footprint is a mere 1.5 x 4 metres, no bigger than a lab table. And yet Kitty is able to take on the full microbiological analysis load of SGS Netherlands. With a storage capacity of 560 empty Petri dishes, eight medium pumps and ten sorter and stacking units the machine can run for two hours without pause with one operator present. Today, with analyst Robbert Huijbregts in charge of the machine, the automatic magazine loader needs to be restocked a bit earlier than usual. No interruption of the process is needed though. Huijbregts enjoys his work. When replacing the pipette tip, his hands move so quickly that the photographer can hardly capture it. With equal routine he automatically stirs the sample, scans the test tube barcode, takes in sample with the pipette and doses according to the on-screen instructions. Mr Huijbregts tips the knee pedal in motion. While the selected medium flows into the Petri dish, he adds the sample, disposes the pipette tip and sticks on a new one, all in one continuous motion. In less than 20 seconds the next tube is in his hands. How do you mean, efficient? "I started working with Kitty three weeks ago, but still improve my dexterity.

With simple samples I can easily reach up to 350 Petri dishes per hour."

All-rounder

Kitty could not have imagined, fifteen years ago in what was then the Van der Sprong Laboratory, when she took her maternity leave. "Kitty was an all-rounder," recalls Ed van Meurs, lab manager. "As head analyst she was indispensable." She still works here, by the way. Today, many analysts have a single specialisation, but Kitty was able to accurately write codes on Petri dishes, organise the log, take on reporting ... When she temporarily left, we were looking for a solution. We found it in a dilution plating machine, tailor-made for our purposes, co-developed with PK Machinebouw. The result was Kitty I, completed in '92/'93. All those years it functioned without problems. Now that we as Microbiological department resettled to Spijkenisse with the Chemical department, the time was right for this new lady." The old version was disposed of on a Saturday, not long

Analyst Robbert Huijbregts receives exact instructions via the screen on what operations to perform. The inset shows the pipetting.



ago, PK Machinebouw director Peter Krul tells us, smiling. “The upgrading took nine months. The design was made with a 3D design package and the software was written in cooperation with a partner. We didn’t really have test runs here. Kitty entered the place via the lift; the modules were composed afterwards. She was connected on Monday and the testing

started on Tuesday. Not Kitty, but he analysts had to get used to it.”

Spectrum of Analysis

A 15-year life span is high for a automated laboratory module. This is especially true given the developments in electronics and mechanical engineering. The new version is fully equipped to facilitate extension of the microbiological analysis package in the last few years. This changed a lot, Mr Van Meurs observes. “In ’92 it was just about limited to *bacterial count*, *Enteros*, *Lactobacillales*, *fungi* and *yeasts*, and *Staphylococcus aureus*”. *Salmonellas*? Then, sporadically. Now at least 10,000 per year! The same holds true for *Legionellas*. This really took off since the Bovenkarspel accident, when 34 people died after being exposed to *Legionella*. Furthermore, *E. coli* O 157 (the notorious ‘hamburger bacteria’, ed.) increasingly makes its presence

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felt in the meat industry, *Vibrio* in the fish industry, and *Listeria* as a result of eating soft-ripened cheese. Also, the Marketing Board deemed analysis of *Campylobacter* and *Salmonella* mandatory. The Marketing Board for Livestock, Meat and Eggs now also asks type specification when the result is positive. Hence, the spectrum of analysis became both broader and deeper.”

Dilution Series

This development does not make automation of microbiological analysis any easier. “We sometimes refer to it as switching from a microbiology lab to a microbiology factory. We might have started this back in ’92, but you should realise that the extent of



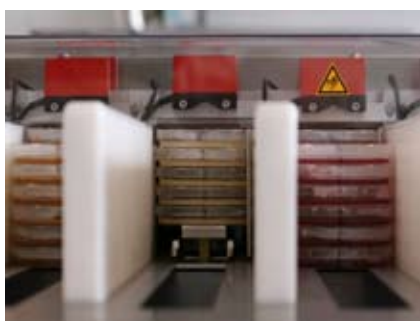
Lab manager Ed van Meurs: “Kitty was an all-rounder”

automation in microbiology is small. Just compare it with chemistry. That is more of an exact science, while microbiology offers possibilities of a more subjective interpretation. Are less than 10 seeded colonies per gram acceptable or is 10,000 fine just as well? In the latter case, everything over 10,000, say, 100,000 or 200,000 is no longer relevant, but simply too high. Our customers should carefully decide about how to interpret these analytical data in a practical way and we should continuously work on adapting our process accordingly. All kinds of stuff enters here as samples: from fish, raw meat and pie to UHT chocolate milk and croquettes. Depending on the sample, the dilution series alone shows huge differences, which requires a smart approach in order to keep prices competitive. How about automating such a process? Handling gets Giga challenging. The only thing which is the same for all samples is their size, being 9 cm. Anything solid we turn into a fluid. So if one is not careful, sample preparation can become a bottleneck.

LIMS Controlled

According to Mr Van Meurs the development of a dilution plating machine under direct supervision was opted for because this best suits the purposes of SGS. Existing solutions





Kitty Specs

Kitty II has the following specifications:

- 1.5 x 4 metres; 1.4 metres high (monitor top)
- Mechanical speed 7.5 sec per tact (theoretically approx. 480 dishes per hour)
- Heated dosing arm
- Storage unit with processing area
- Shaking conveyor
- Cooling conveyor
- Sorter and stacking unit

Capacity:

- 560 empty Petri dishes
- 8 medium pumps (6 for Kitty I)
- 10 sorter/stacking units for *bacterial count*, *Enteros*, *Staphylococcus aureus*, *Lactobacillales*, *fungi* and *yeasts*.

Particulars:

- 1 operator
- Optionally LIMS controlled
- Petri dish coding with unique barcode
- Sorter machine both sorting media and stores special samples separately

offer too many options, he explains. SGS has no need for bells and whistles that still need to be paid for and render the analysts' work needlessly complicated. Furthermore, the development under direct supervision has turned out to be exceedingly robust, as Kitty I demonstrated. Kitty II is operated by a single analyst, who receives exact instructions about the operations he or she should perform after scanning the sample. Control takes place via a connection to the LIMS. A robot could take care of this part as well, but it was decided not to do so. "First, someone should supervise the system. Once a person is present, one might just as well make him or

her do some work. Also, this allows us an individual approach for each sample. The variation in samples is so large that an XY robot making dilution series would be much slower than an analyst. We are not a water laboratory, where one knows what to expect."

Knee Switch

Peering over Robbert Huijbregts' shoulder confirms this view. The analyst is offered a broad range of samples which he still is able to process. The moment the red beam on screen indicates 'scan', Mr Huijbregts brings the test tube to the scanner. While the hose pump doses the right medium in the automatically supplied dish, he prepares the automatic pipette for injection. All steps are visible via the monitor. For emergency stops a red button is available as well. "I order the start and determine speed with my knee. That is how I operate the knee switch. In principle, nothing can go wrong here." That's right; Kitty is infallible. But analyst might mix up a medium, isn't it? "When that happens,

1. Adding Petri dishes to operating machine
2. Cooling in compact, snaking module
3. Sorting and stacking
4. The 'frying pan'
5. Top view Kitty II, with manager Peter Krul of PK Machinebouw looking over analyst Robbert Huijbregts' shoulder

we instantly notice the irregular colour in the dish,” Mr Van Meurs replies. Of course the preparatory trajectory requires utmost concentration as well. Preparing the samples is and will always involve the human factor. Still, the indication of the client on the barcode offers some certainty in the pre-analytical phase. By now everyone knows that red beetroot juice is not supplied by a producer of chocolate milk.

Flexible

Automated devices have difficulty with deviant samples. Kitty is no exception, but still offers a flexible solution. When working on separate microbiological analyses, the operator can switch to manual or semi-manual control by pushing a button. We have the ‘frying pan’, for example. With it, the analyst can place a dish that is to be manually fed to the device in a bracket, add warm medium and store

it somewhere else. Later, a colleague is able to continue the analysis. The other way around is also possible. Mr Van Meurs: “Take *Lipolytic* – fat-splitting – organisms, or *Halophiles* living in salt water or cheese baths, for example. Of them we have only two or three a day. For these the medium is to be added manually. The analyst adds water to

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the dish, without the system adding medium. These kinds of plates are given a barcode and go to a separate compartment in the sorter unit, and are processed manually after that.”

Serpentine

Kitty II’s compact stainless steel design catches the eye. For cooling, buffer zones are used in some dilution plating machines. Not in this system. Dishes are led through a snaking track in the cooling unit, spending a lot of time in a confined space. Arriving at the sorter unit, they have reached a temperature of 10 °C. Here they are identified by their barcode, ejected and stacked, waiting to be incubated.

*Vincent Hentzepeter
Photography: Foodnote*

On www.pkmaschinebouw.nl a short film can be viewed, demonstrating global operation of this machine.