

Holland Innovation: Skalar's smart skills

'Custom automation is our strength'

What began as a Delft University of Technology spinoff has blossomed into an international supplier of continuous flow analyzers, robot platforms and TOC/TN analyzers. Skalar's equipment for (wet) chemical analyses has found its way across the globe and is praised for its high degree of automation.



Kas Goedschalk, lab technician at Skalar, checking a robot software application for a customer.

Anything that Skalar manufactures is a product of its own technological design department. Managing Director René van der Wagt is proud of it: "Mechanization, electronics, software and chemistry are the four disciplines we bring to every piece of equipment. That goes for all three of our product groups: continuous flow analyzers, robot platforms and TOC/TN analyzers. Based on the blueprints, our production department builds all the hardware from scratch. Then we add the software, program it, and test the application either in our robot test room or in our chem lab."

The whole process is characterized by thoroughness, says Rob van Turnhout, sales manager for the Netherlands and Flanders. "We check all our equipment for stability, linearity and repeatability. Sometimes we analyze samples from the buyer. Then we prepare the Factory Acceptance Test (FAT) certificates and ship the equipment off. The whole testing procedure takes up to a full week. There's no way around that, no application is the same."

Evolution

Skalar moved to Breda in 1995 to concentrate all its operations in one

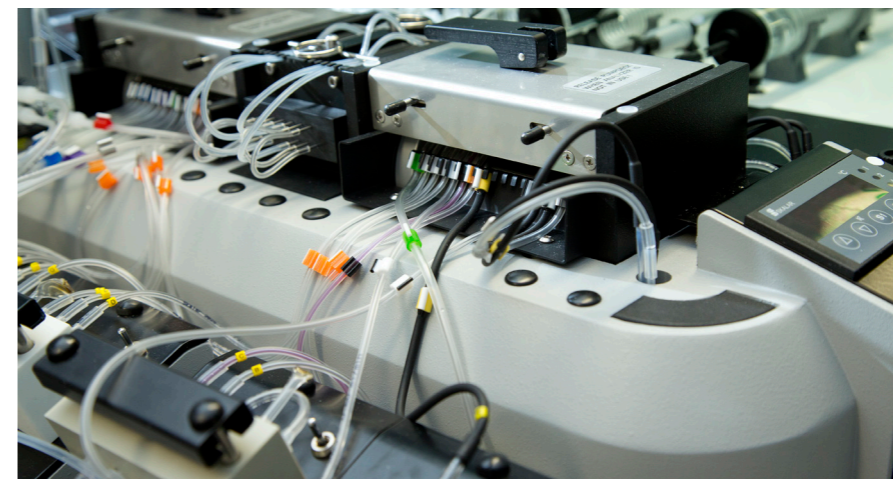
location. Earlier, production was located in Delft, where the company had originally spun off from Delft University of Technology in 1965, while sales and after-sales, R&D and application development were housed in Breda. Over the course of 50 years, the manufacture of stand-alone photometers, the company's very first product, has evolved into semi and fully automated systems that are sold worldwide. The most recent SAN++ line of continuous flow analyzers is now the company's flagship product. Skalar introduced another core activity, robotization of wet chemical lab processes, in the mid 1980s. Robotics saw such rapid growth over the past few years that the company found it needed more space to develop customized applications. So Skalar expanded to another building right across the street, where it now builds and tests robotized solutions for its customers. Here, software and hardware engineers work together closely. The third and most recently added core activity at Skalar is TOC/TN meters. The first instruments were completed in 1992. The equipment is suitable not only for analyzing liquid samples, but can also handle solid samples on a fully automated platform.

By Vincent Hentzepeter
Translation: Word's Worth
Photography: Foodnote

Young and old

'Made in Holland' is stamped on all the boxes in the shipping department. The Benelux countries have always been an important market, but as the company grew in the 1980s it needed to expand its sales area. Since then, Skalar has been working hard to build an international distribution network and has even opened subsidiaries in several countries. Breda headquarters remain the largest location by far, with 130 of the company's 170 employees. From this office, Skalar serves Belgium and Scandinavia too, but there are separate sales offices in Germany/Austria, the UK and France. Outside Europe, Skalar has subsidiaries in the US, Canada and India. With the help of 60 distributors, Skalar can serve any lab in the world.

The Netherlands has an aging population, but at Skalar the average age keeps dropping. "We have a great mix of young and old here," says Van der Wagt. "That creates a positive balance. When we need to hire due to expansion, we take on highly-educated young engineers. But many of us, including Rob and myself, have been here for twenty or thirty years. We bring the experience. This is one of those companies where you can really grow and develop. Both of us started out in the lab. We built our own modules for our equipment, tapped it ourselves, tested the applications."



Chemical analytical testing of a SAN++ analyzer.



All equipment is tested extensively in an application lab before it is released for shipment.

You take that technological know-how with you when you rise through the ranks. This is a great place to develop a long-term career. That's why people like to stick around."

Rationalization

Skalar sees a growing demand for automation in laboratories. According to Van der Wagt this is mainly due to the current consolidation trend in the laboratory market, where rationalization is on the increase. "More and more labs are collaborating, or being bought up or consolidated. As a result, more and more samples are being processed at a given location and this puts pressure on processing times. You can no longer guarantee one-day returns. That's why there's great interest in automation." Automation is focused increasingly

on sample preparation, the part of the modern lab process where time can be saved, Van Turnhout explains. "At high throughput – and our analyzers are capable of that – sample preparation tends to become the bottleneck. Take distillation for the extraction of phenols and cyanides, for example. Technicians can process at most 2 x 5 samples a day. If you don't automate this step, that's going to be the limiting factor in your throughput. That's why we've added inline distillation to our SAN++. The whole thing is also in full compliance with national and international standards like NEN and ISO. Our equipment enables labs to do 25-30 cyanide and phenol extractions and determinations per hour. That's real added value for our customers. Just imagine how much that helps them increase productivity."

Simmering kettles

Assembly of the SAN++ is always custom work. Van Turnhout explains the assembly process. "We start with the basic components: sampler, housing with built-in peristaltic pump and photometers. Then we add the chemical modules that are built to the customer's specifications. The configuration depends on the span. We can build about 300 different applications." The workbenches sport simmering kettles. Van Turnhout explains this curious sight. "We use the steam to bend the

tubing and connectors for the analyzers. The great thing about continuous flow analyzers is that they enable you to simultaneously measure all the relevant parameters in a single sample."

Freedom of choice

Users want robotics solutions to be flexible, not dedicated, Van der Wagt asserts. Therefore, Skalar's robot platform technology is manufacturer-independent. Engineers can build various configurations for users. "When our customers order a cuvette test automation platform they don't want to be limited to a particular kit supplier. We can build the application in a way that allows them freedom of choice." To illustrate, Van der Wagt points to two robot applications being tested in the test room. One application is using Macherey Nagel kits and UV VIS photometry, the other is using Hach (formerly HachLange) kits. Skalar can even integrate an automated Biochemical Oxygen Demand (BOD) analysis into this automation solution. "And it's not just the actual BOD analysis that we can automate, but also the preliminary process: pH setting, filling the BOD bottles, adding reagents. Everything is automated now, so much more is possible than in the past. Our robot is becoming ever more versatile and flexible."

No two platform applications in the test room are the same. Skalar has abandoned fixed dimensions in favor of modular design. This allows their engineers to use the same principle to build xyz robot systems with lengths varying from 1 to 3.5 meters. Grippers and rack configuration are adapted for particular applications. While one robot caps and decaps large square flasks, another processes pint-sized flasks, a third handles small vials and a fourth cuvettes. Customers who want extra flexibility can opt for a system with robot bridges.

Fully automated

One robot platform is processing

metal cups filled with a dark, watery mass. This installation automatically measures the clay fraction in soil samples and sludge, Van Turnhout explains. "We developed this robot application specifically for clay fraction analysis. For this, you need to prepare the sample with peroxide and acid, then transfer it to a graduated cylinder where you add water, stir the suspension and pipette it into small dishes, where it is evaporated. All these steps are fully automated. Even the preliminary steps, the weighing of samples to remove organic compounds and carbonate, and the heating, cooling and decanting of

beakers, are fully automated. Another reason we sell this application is to make lab work safer. In most cases, our application lab initially develops a new application for one particular end user, thinking we may be able to sell the concept more widely later on. But sometimes we build one specific application to order for a single customer. Custom-built automated solutions are our strength, particularly in robots and the SAN+++. For those, every end user has their own special demands."

Faster and cleaner

Technological innovation is often



Assembly of a SP2000 robot analyzer.

standards-driven. The new standards for measuring Total Organic Carbon (TOC) and Total Nitrogen (TN) in solids were the driving force behind Skalar's development of the 'Primacs^{SNC-100}' carbon and nitrogen analyzer. This new analyzer is based on the 'DUMAS' catalytic combustion technology that Skalar used before in its Formacs line of carbon and nitrogen analyzers for surface water and industrial effluent. Van Turnhout explains why this technology is so well-suited to total nitrogen/protein determination in soil, food products, chemical fertilizer and animal feed. "Traditionally, those analyses were

done using the Kjeldahl method, but ours is more environmentally friendly," says Van Turnhout. "It's much faster and cleaner than Kjeldahl. We burn the sample, so we only use some oxygen. Since it has become a standard test method, there's been a shift from Kjeldahl to DUMAS."

But what about companies that want to continue using the Kjeldahl method due to customer demands or to avoid interrupting their series of measurements? DUMAS is suitable for these companies too, according to Van Turnhout. "You can still determine Kjeldahl protein using DUMAS, only it's a two-step

'Our technology is much faster and cleaner than Kjeldahl'



Managing Director René van der Wagt and Sales Manager Rob van Turnhout.

process. If your sample contains organic nitrogen – that is, Kjeldahl protein – then you'll have to determine the nitrite and nitrate values separately in order to calculate Kjeldahl nitrogen." German companies active in the environmental field have shown great interest in using the Primacs^{SNC-100} to detect different compounds of carbon. It allows waste management companies to quickly determine whether their samples are contaminated with organic carbon. "False positives of organic carbon content often result from elemental carbon, which is not a pollutant. Our furnace first burns organic carbon at 400 °C, then elemental carbon at 600 °C and finally inorganic compounds at 900 °C. The different compounds are detected using infra red detection. And the whole process is in compliance with a German DIN standard. The waste management industry is very keen, because lower pollution levels – due to high elemental carbon levels, for example – means permission to landfill. We added this option to our Primacs^{SNC-100} in 2014 and since then, we've been flooded with requests."

Applicability

Asked about the three product lines' applicability, Van der Wagt sums up Skalar's applicable industries. "Our

equipment is found in the environmental, surface water, drinking water and waste water

'We have a great mix of young and old here'

industries, which test for an-ions like nitrites/nitrates, sulfates and chlorides. But our equipment is also used to analyze soil, plants and animal feed, where protein values play a key role. Many of our customers are in the food and dairy industries, where quality control requires determination of sugars, nitrite/nitrate, butyric acid, urea and so on. They need to test large numbers of samples at high throughput, for which flow analysis is ideal. The tobacco industry uses our DUMAS combustion technology to determine total nitrogen. Beer brewers also use our equipment for analyzing malt for nitrogen and bitterness, and for analyzing beta-glucans. You can also find our equipment in wine labs, where it is used to determine parameters like sulfites, volatile and total acids, and sugars. And let's not forget the pharmaceutical and petrochemical industries, which use our equipment to analyze their effluents." According to Van der Wagt, Skalar is "good at analyzing the same parameters in large numbers of samples. In situations where there are large volumes of samples that need

analyzing for several parameters. Where high throughput is required. That's what you need us for. We see the volumes growing and we're adjusting our platforms accordingly. Where you used to have 50 sample positions, you now have almost 300. This increase is reflected in larger robotic systems and larger sample racks."

Product launch

Despite the economies of scale, labs continue to use chemical analyzers for small batches. Skalar's R&D department showcases a prototype of a discrete analyzer that meets this demand. It is part of the BluVision line that already boasts an application based on the xyz robot platform. This new, compact analyzer enables labs to rapidly detect

parameters like phosphate, chloride, nitrate and sulfate in just a few samples. The new analyzer will be launched in 2016, Van Turnhout says. "This automated colorimetric analyzer is based on our SAN+++ technology. It can detect about 10 parameters. The robotized system pipettes the samples into cuvettes and adds a reagent. Then it makes colorimetric analyses. The difference with the SAN+++ is that the determinations are consecutive rather than simultaneous. This is convenient if you have only a few samples, or want to measure different parameters in a single sample. This equipment is ideal for labs that need flexibility. We see it as a complement to the continuous flow analyzers that many of our customers use in their labs." LM



Skalar Analytical bv
Tinstraat 12, 4823 AA Breda
+31 76-548-6486
nl.skalar.com
info@skalar.com