

MILLIDROP

Revolutionised microbial analysis

We make ideas flow.

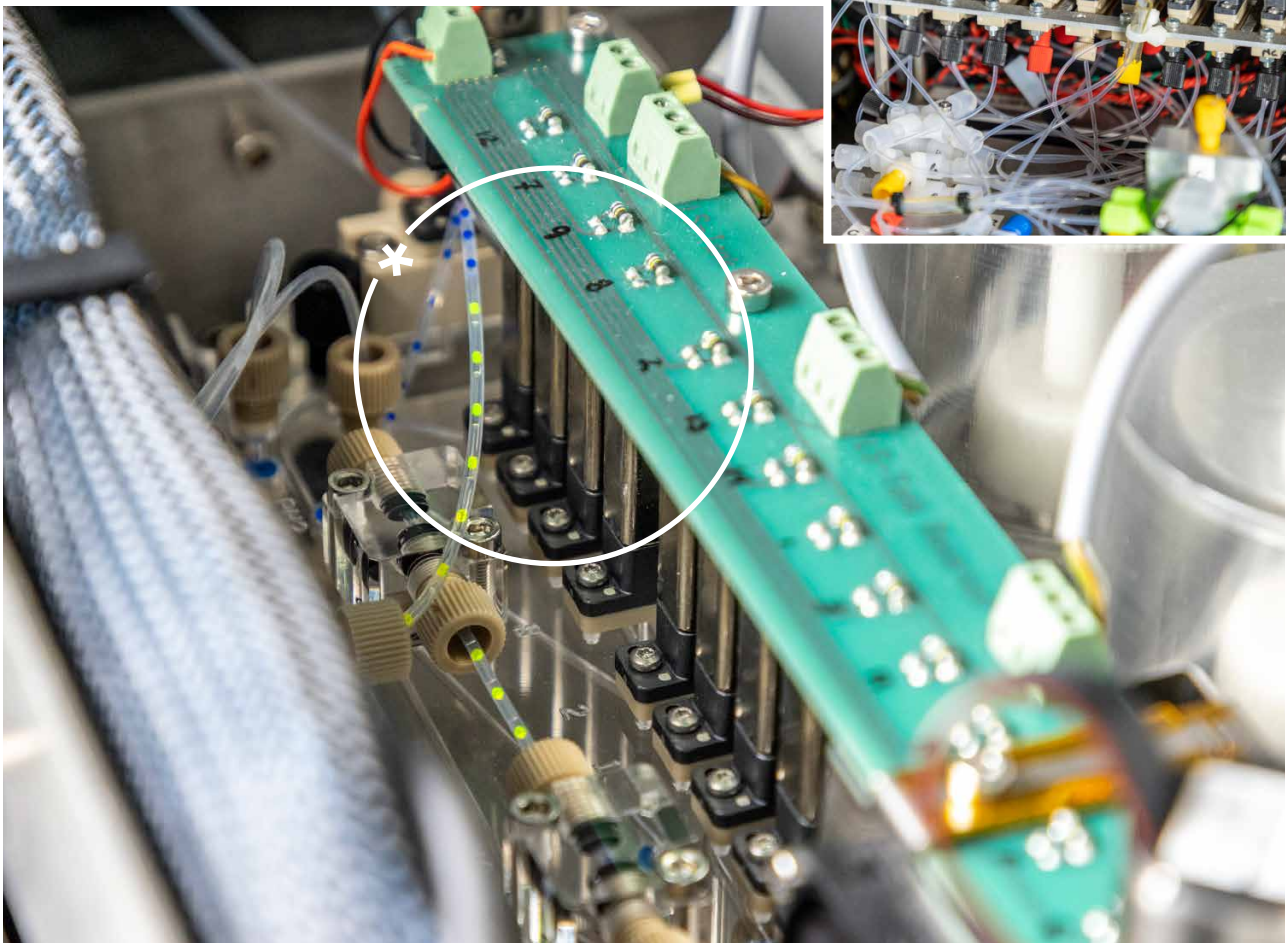
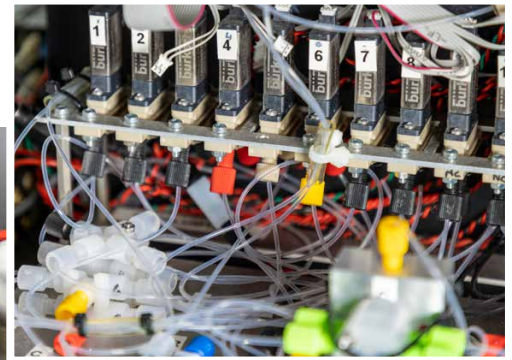
bürkert
FLUID CONTROL SYSTEMS

INDUSTRIALISING A REVOLUTION

COOPERATION WITH MILLIDROP

With their breakthrough technology, MilliDrop meets the growing need for high-throughput, cost-efficient microorganism culture and analysis in research laboratories. The analyser of the Paris-based company benefits all areas of microbiological research in both the public and private sector: healthcare, agriculture, energy, environment, and biotechnology. With Bürkert, MilliDrop found the ideal development partner to industrialise their innovative instrument.

Initial 'spaghetti' design



Industrialised design

Did you know?

The setup of MilliDrop's first prototypes is called 'spaghetti' design internally. It won the 'Trophy of Innovation' in 2017 at the Forum Labo exhibition in Paris. To set the course for efficient international industrialisation of the instrument, a more reliable and easy-to-service design was needed, though. Thanks to the close collaboration with the fluidic experts from Bürkert, MilliDrop found a tailored and future-proof solution with a pneumatic and a fluidic manifold. The latter includes the **type 6724 whisper valves***, which have already been known and highly appreciated at MilliDrop.

Next-level microbiology

Preparation, incubation, analysis, and high-throughput sorting operations are done by the MilliDrop Analyzer. A droplet of a hundred nanolitres to a few microlitres replaces a Petri dish or an incubator to grow bacteria, fungi, algae or yeast. Because of the high number of droplets, many reactions with homogeneous growth conditions can be observed in parallel, without cross-contamination between cultures or evaporation. This saves both time and reagents, and eventually reduces costs and waste.

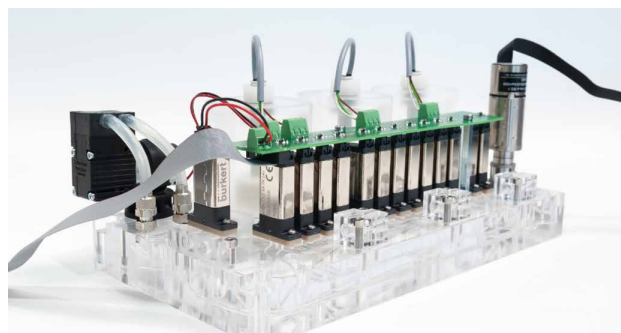
"With our technology, we shorten the time required for bacteria to reach the mandatory numbers to study their phenotypes compared to conventional processes. In addition, the disruptive technology reduces the required volume by a factor of 100. In a study where we analysed soil microorganisms, for example, our system needed 38 hours, whereas the conventional method took 12 days," Laurent Boitard, co-founder of MilliDrop, calculates.

Design deviations and leakage risks

After ten years of development, the registration of eight patents, and assembly of several prototype systems, MilliDrop was in search for a more robust system, which could be produced at scale with constant performance. "Our initial 'spaghetti design' was prone to failure. Every connection represented a leak potential," Jairo Garnica, co-founder and technical director at MilliDrop, explains. Leakage of air can compromise the function of the machine. On top of that, outpouring of a sample during an experiment can create health risks for the instrument user.

The perfect partner to unlock new markets

It was clear to Jairo Garnica to go into the industrialisation process with Bürkert equipment: "For the first machines, we used fluidic components from different manufacturers, but they were not robust enough in terms of performance and life expectancy. Then, we decided to work with the 6724 whisper valves from Bürkert. The Bürkert ones last for ages: We operated them constantly for extended time periods and under very tough conditions – and we never experienced a failure which would have required us to change them. After five years of operation, the valves are still working perfectly. Therefore, we have always been confident that we don't need to fear failures in the fluidic system when we use Bürkert components for our machine."



With only 8.9 mm width and very low power consumption, the type 6724 2/2 way solenoid whisper valves used for the liquid manifold guarantee highest chemical resistance, high back-pressure tightness, as well as very fast and almost silent switching.

“Bürkert gave us a whole new experience by enabling us to customise our system in this way.”

Jairo Garnica, technical director and co-founder of MilliDrop

Super-silent flow control

MilliDrop started with a first study to optimise the liquid manifold design together with Bürkert. As the fluidic part is the core of the MilliDrop technology, the manufacturer needed to have confidence in the fluidic system. “Since we were facing experts at Bürkert, it was very easy to design a reliable liquid manifold,” Laurent Boitard, co-founder of MilliDrop remembers.

Bürkert did a material and chemical compatibility analysis for MilliDrop. After providing the used liquids, a tailored solution was created with maximum resistance against chemicals and mechanical stresses, as well as optimised economics. “It was a completely new experience for us to see that it is possible to customise our systems at this level of detail,” Jairo Garnica mentions.

A true game changer for the validation of the liquid manifold was the transparent bottom plate developed by Bürkert. “This was a fantastic idea of the technical staff at the Systemhaus, which is super useful for us. With the transparent plate, we can not only see if the fluids behave correctly, but we have also been able to design manifold inspection and maintenance procedures,” the technical director illustrates.

Highly reliable pressure control

The initial goal of MilliDrop was to industrialise the system and to reduce the number of ‘spaghetti’. During the exchange, though, MilliDrop quickly realised that Bürkert has a very broad know-how, not only in fluidic management, but also in pneumatics. “So we gave it a try and redesigned more and more parts together,” Laurent Boitard explains. A “priceless collaboration from the very beginning”, as Jairo Garnica calls it:

“Thanks to the frequent and reliable support of the Bürkert team, we learned a lot about pneumatics and how to properly dimension the system to satisfy our technical specifications. In the end, we co-developed a compact and high-performance pneumatic system with a very low risk of failure. What is key as well, though, is transparency. As engineers, it is important for us to understand how our system works exactly. Luckily, with Bürkert we received this transparency as well.”



Pre-tested solution

MilliDrop is now supplied with pre-assembled manifold kits, which are already tested before installation. Currently, testing follows a two-step approach: Bürkert conducts a primary test to assure gas hermeticity. After verification, MilliDrop completes the testing procedure with oil to survey the fluidic performance. "It becomes apparent that the gas tests at Bürkert are actually sufficient. The system performs reliably. As soon as the practices for assembly are validated, our goal is to only conduct the tests that Bürkert has customised for us," Jairo Garnica adds. In the industrialisation phase of the instrument, this approach will save MilliDrop several weeks of validation tests for each manifold kit.

Flexible basis

Thanks to Bürkert, MilliDrop is now equipped with a stable platform which can be used as reliable basis for future developments in new markets, Laurent Boitard is sure: "Bürkert continuously develops its portfolio and does not remain static. Due to this, we are confident to be able to also meet the requirements of industries where stricter regulations apply, like diagnostics. We will not develop these solutions by ourselves anymore. With Bürkert, we have the right partner on board."

How you benefit

from future-proof flow and pressure control technology



Long-term partnership:

open and transparent collaboration enables a better understanding of system behaviour and builds know-how for future developments.



System competence:

extensive knowledge of fluidic and pneumatic applications secures optimum system economy and maximum resistance against chemicals and mechanical stresses.



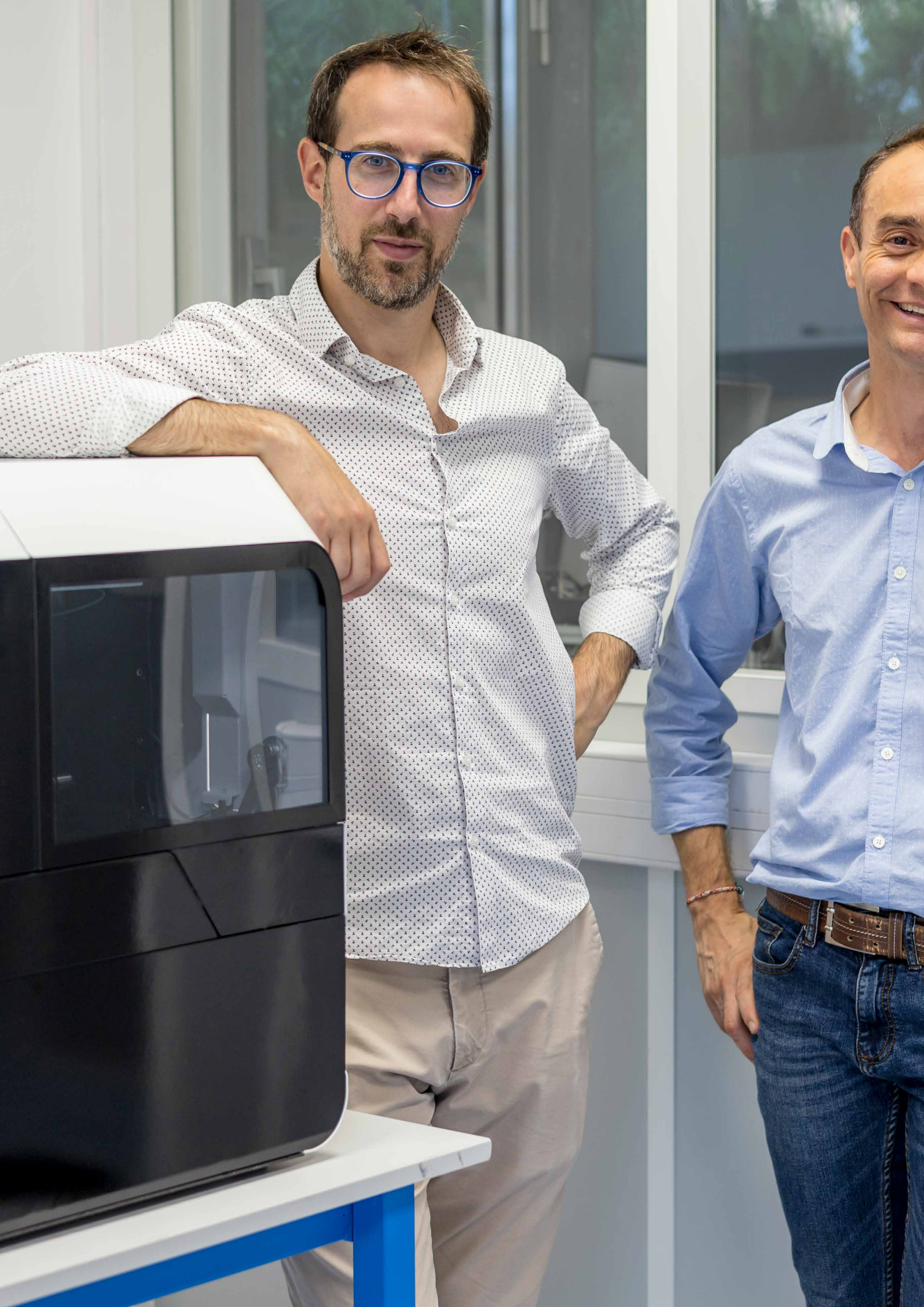
Increased reliability:

fluidic systems with low leakage potential reduce health risks and ensure reliable and safe industrialisation.



Customisation:

tailored pneumatic and fluidic manifold designs with consistently high performance form the flexible basis for a wide range of applications.





“The Bürkert experts truly are open-minded risk takers. It was very encouraging to see that a major industry player is willing to do a co-development with a small start-up like ours. They really took a lot of efforts, not only on the technical, but also on the human side. This is something which is often missing today. During our visit at the Systemhaus at the latest, we recognised what differentiates Bürkert from other companies.”

Laurent Boitard, co-founder, and Jairo Garnica, technical director and co-founder of MilliDrop



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