CUSTOMER

BJS Biotechnologies

INDUSTRY

Medical technology

CHALLENGES

DNA replication is typically very time-consuming. Moreover, its complexity often means very few lab technicians are trained in its use, further slowing the process.

SOLUTION

The AMD Embedded G-Series APU allowed for a friendly and more intuitive user interface meaning that xxpress can be run by DNA lab technicians with minimal experience and training, leading to round-the-clock use and faster DNA replication.

RESULTS

- Easy-to-use graphical user interface (GUI) means lab techs with little to no training can use the xxpress system
- System can be run 24x7, helping eliminate DNA replication backlogs
- GUI can be run on PCs
- DNA replication cycle times reduced from 90 minutes or more to just 10 minutes[i]
- Allows for more timely testing of diseases
- Opens the door for more field testing of patients, at the point of need

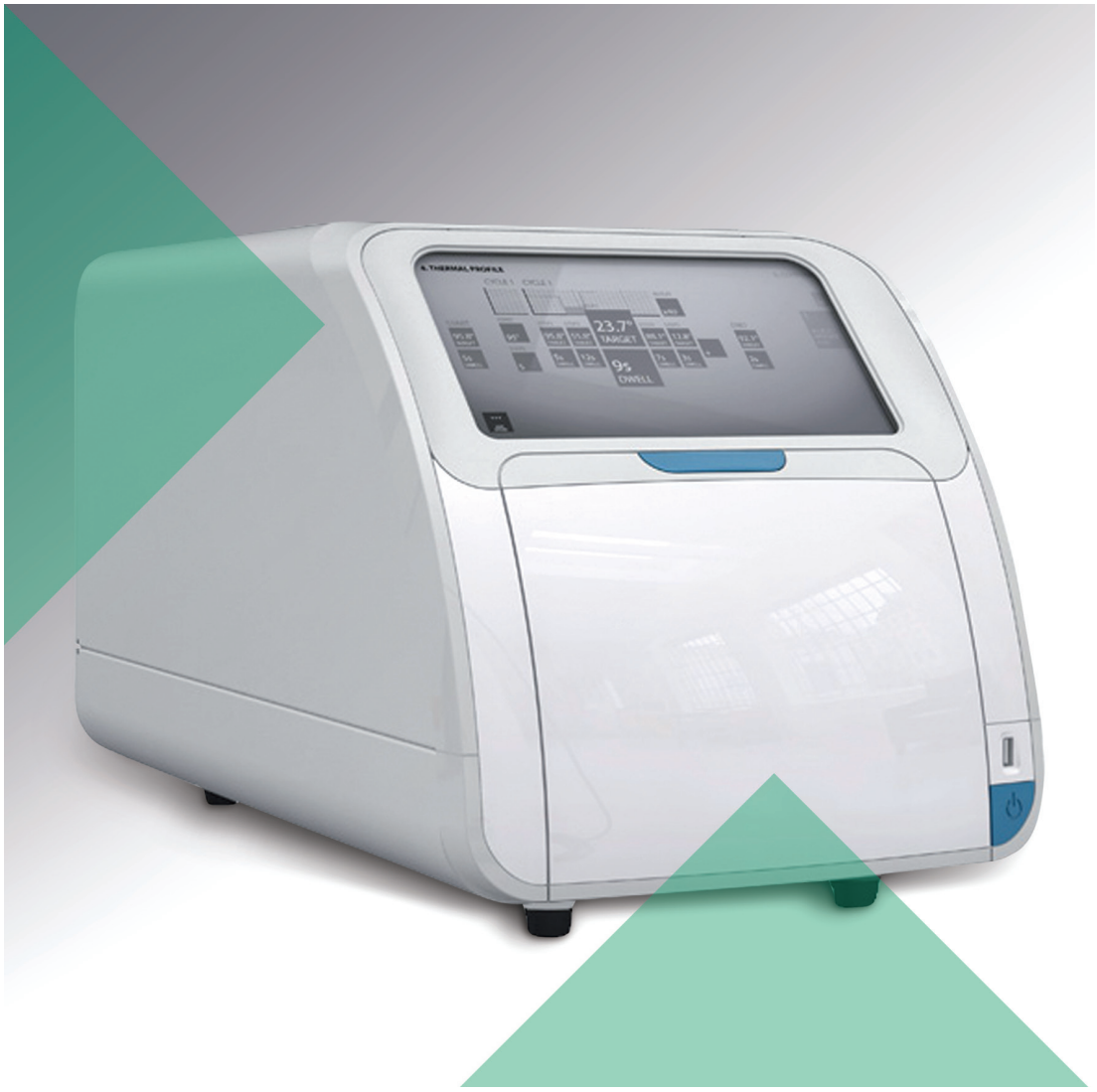
AMD TECHNOLOGY AT A GLANCE

AMD Embedded G-Series APUs

"We wanted a solution that was as simple to operate as a good TV – you should instinctively know how to operate it and it should support you in delivering good results. In normal operation we never want the user to open the manual; if they have to, then we would have failed!"

Nick Burroughs

Chief Operations Officer, BJS Biotechnologies



BJS Biotechnologies Makes DNA Replication More Intuitive Using AMD Embedded G-Series APUs

Solution provides high-speed process for thermal cycling of DNA within a platform so simple nearly any lab technician can use it

DNA analysis has gone from mere theory to a heavily relied upon analytic and diagnostic tool in just a few short decades. But as invaluable as DNA can be, its longtime drawbacks have been the time required to replicate enough of it from very small samples to conduct thorough analyses, and the bottlenecks in labs where too few workers are trained in DNA replication techniques.

BJS Biotechnologies, a London-based firm specializing in technology for the medical field, recently set out to change all that with the help of the AMD Embedded G-Series APU. Its solution – called xxpress®, is a proprietary machine that speeds up DNA replication. It also employs AMD's embedded technology to fuel its intuitive graphical user interface that can help step lab technicians through the DNA replication process with little-to-no training.

A HISTORY OF INNOVATION

BJS Biotechnologies made its first foray into DNA testing by making traditional thermal cycler blocks for a number of other biotechnology companies. "For such equipment, you need highly conductive thermal blocks to guarantee an even

temperature," says Nick Burroughs, Chief Operations Officer for the company. BJS Biotechnologies makes its thermal blocks from silver, which it "electroforms" into the complex shapes required by the thermal cycling process for DNA replication.

That knowledge turned into a prototype for a full-blown DNA replication machine, and ended in xxpress. Thanks to an innovative industrial design with a low thermal mass and a powerful graphical user interface to reduce setup time, BJS Biotechnologies claims that the speed with which researchers can replicate DNA has dropped from hours and days to as little as 10 minutes with xxpress[i].

Burroughs explains that typical DNA analysis can take as long as 90 to 120 minutes to go through 40 cycles, and he says that he often encounters disbelief when he explains that his company's solution can complete that process in just 10 minutes. DNA replication involves heating and cooling cycles, and with xxpress, BJS Biotechnologies claims that they can do the heating and cooling cycles faster than anyone else[i].

THE NUTS AND BOLTS

Because of its design and componentry, the xxpress thermal cycler can enable the world's most thermally uniform PCR tests – and its fastest Burroughs says. He claims that xxpress can handle about the same workload as five standard thermal cyclers[i]. "Our technology uses the consumable as the resistive element within an electrical circuit to provide heating that – along with forced air cooling – delivers rapid thermal cycling."

Mastering the high-speed process for thermal cycling was a major coup, but the BJS team realized that even with faster thermal cycling, xxpress would not be living up to its promise if it weren't also decidedly simple to use.

BJS Biotechnologies conducted market research and learned that often in test laboratories only one person was capable of setting up the DNA thermal cycling equipment. "We wanted a solution that any biotechnologist could use without formal training, and without having to open a technical manual," says Burroughs.

"One of our key requirements was the seamless movement of graphical images that allowed for an interactive feel with the screen." Burroughs said the company looked at a variety of options and chose an AMD embedded accelerated processing unit (APU) as the processor because it combined the speed of a central processing unit with the graphics capability of a graphics processing unit (GPU). "We had looked at other processors, but the graphics were only decent with really powerful PCs. At the time, someone mentioned the APU with better integration of graphics right on the silicon – which was ideal. "

Working closely with a specialist graphical user interface design company, BJS developed a tablet-like touch interface that guided the user through the process. By keeping it simple and intuitive, Burroughs says, "Anyone with a basic understanding of PCR can operate the machine and get results."

Burroughs says the beauty of xxpress is that the APU allowed the GUI designers to create an intuitive touch screen user interface that mimics the way biotechnologists develop their experiments. The software guides the user through the process, selecting PCR types, chemistry choices, plate types, sample volumes and more. The system provides analysis of the results and the ability to export those results in various formats, including RDML and Microsoft® Excel.

Users work the machine like a slide show on a tablet, dragging a finger across to open the next window. Burroughs said seamless movement of graphical images was important to them.

What users see, in part, is a graphical representation of what is happening in each of the DNA replication wells (the machine has 96 individual wells). As DNA strands are doubled, the lab technician can view progress on a graph, compare information, and can zoom in and out to see patterns.

The GUI is powered by a 1.3 GHz, single core AMD Embedded G-Series APU, and Burroughs says it was very important to their success. Its high level of graphics integration, power efficiency, and small form factor met the requirements for xxpress and could also serve well in a variety of other embedded applications requiring strong graphics and an intuitive UI.

MAXIMIZING THROUGHPUT

xxpress provides users with a personal storage and security key and automatically stores their preferences, profiles and results. The data key also enables the GUI to be run remotely on PCs, so additional experiments can be designed and analyzed away from the machine, which helps maximize machine throughput.

With cycle times of less than 10 minutes[i], as many as five experiments can be completed per hour, or more than 40 on a single day shift[ii]. With lab technicians being able to plan and analyze experiments remotely on PCs, the thermal cycler provides greater availability and outstanding return on investment (ROI).

In fact, the xxpress design enhances all-around time-savings – from its GUI to its processes. In DNA analysis, time savings can greatly benefit patients.

Speedier DNA testing also opens the doors for timely testing for diseases and other health problems in third-world countries where patients may have to travel a long way to see the doctor. Testing could be provided in the field, at the point of need, where there are no central labs and refrigeration of samples is not often possible. The xxpress unit is small enough to be portable, and could even be powered by batteries charged by solar energy.

ABOUT BJS BIOTECHNOLOGIES

Founded in 1996 by BJS Company, BJS Biotechnologies was created to create and develop ultra-high speed thermocycling technology and apply it to PCR (Polymerase Chain Reaction) tests. www.xxpresspcr.com/

ABOUT AMD

AMD is a semiconductor design innovator leading the next era of vivid digital experiences with its groundbreaking AMD Accelerated Processing Units (APUs) that power a wide range of computing devices. AMD Embedded Solutions give designers ample flexibility to design scalable, x86- based, low-cost and feature-rich products, and drive energy conservation into their systems without compromising application performance or compatibility, graphics performance or features. For more information, visit www.amd.com/embedded.

[i] *http://www.xxpresspcr.com/technology/*

[ii] *A single work day is assumed to be 8 hours long.*