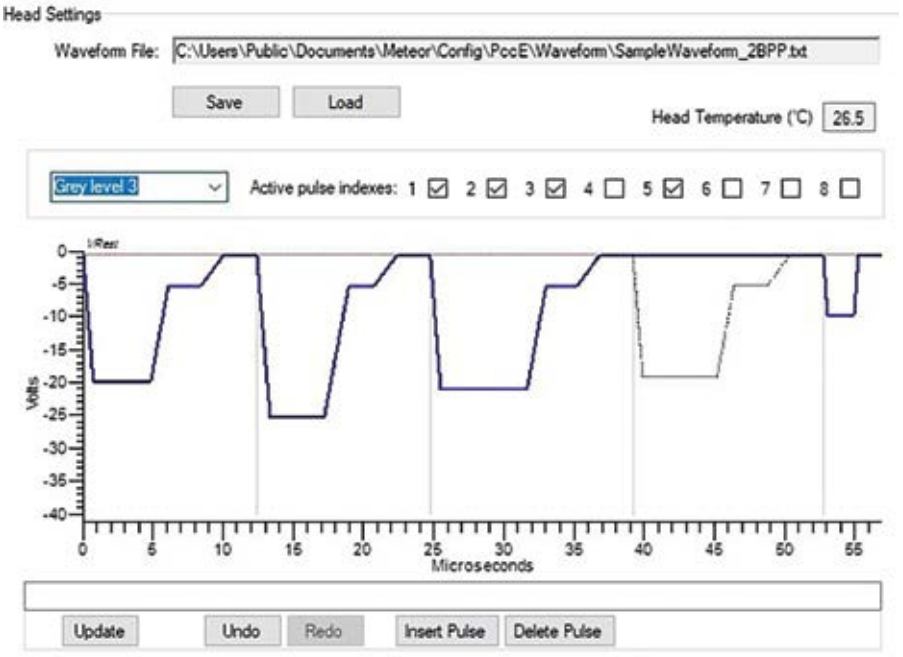
FAST TRACKING A NEW PRINT CONTROLLER CARD

Tracey Brown of Meteor Inkjet describes the company's innovative strategy to combat the worst silicon chip shortage in history in order to continue manufacture and deliver its industrial inkjet systems

Tracey Brown, Vice-President of Strategy and Marketing at Meteor Inkjet



Printed waveform

Starting in 2020, several shocks to silicon chip manufacturing, including facility fires, geo-political conflict, severe weather and Covid-related shutdowns resulted in a dramatic reduction in capacity. This capacity reduction, coupled with increased demand due to a post-Covid economic bounce, culminated in an acute, worldwide shortage of computer chips which continues to this day.

For Meteor Inkjet, a producer of electronics and software used in industrial inkjet systems, a lack of chips means a lack of shippable product. Anticipating that supply issues would continue for some time, Meteor embarked upon an ambitious, fast-track project to fundamentally re-architect a platform central to the company's products. Engineers aptly named the project 'Phoenix' after the mythical creature who rose from the ashes stronger than before.

IN THE BEGINNING

Meteor's products translate the bits and bytes of print data into firing instructions that inkjet printheads understand. Key to Meteor's technology are two types of circuit board. One is a print controller card (PCC), and the other is a head driver card (HDC). The PCC supplies synchronised image data to one or more printhead-specific HDCs which deliver analogue electrical waveforms to the printheads, causing them to eject drops.

Meteor's PCC is an essential partner to more than 20 variations of HDC, each with its own software, firmware and FPGA code, supporting a wide range of industrial inkjet printheads, including those from FUJIFILM Dimatix, Epson, Konica Minolta, Kyocera, Ricoh, SII Printek, Toshiba TEC, Xaar and Xerox. The PCC was designed around a special integrated circuit chip from Intel called the Altera Cyclone V. The Cyclone V is known as a system-on-a-chip field programmable gate array (SoC FPGA). The SoC FPGA is a cost-effective, size-effective, heat-effective, interconnect-effective combination of a microprocessor and FPGA within a single package.

THE CHALLENGE

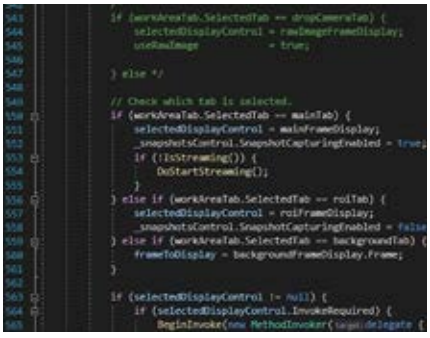
In late 2020, lead times for many silicon chips, especially SoCs, started to increase. By 2021, the situation was alarming, with some suppliers quoting availability at more than a year. The shortage of chips, such as the Cyclone V, resulted in bidding wars, price escalation and stockpiling. Fake after-market offers emerged, testing the patience of even the wariest of logistics professionals. Tracking down parts became a Herculean task.

"Change is not a threat, it's an opportunity. Survival is not the goal, transformative success is"

When it was clear that the Cyclone V would be unavailable indefinitely, Meteor faced a crisis. The PCC platform designed around this chip was stable and trusted. It took six years to develop and had been on the market for 10 years. The Cyclone V has no like-for-like replacement and roughly equivalent chips were also in short supply.

In response to this crisis, Project Phoenix was launched to develop a new print controller card (PCC2) with a formidable list of requirements:

- The PCC2 architecture needed to incorporate a separate, readily-available microprocessor and FPGA, rather than the combined SoC FPGA Cyclone V
- The PCC2 required the same form, fit and function as the PCC, including interoperability and backward compatibility such that print systems



A snippet of FPGA code

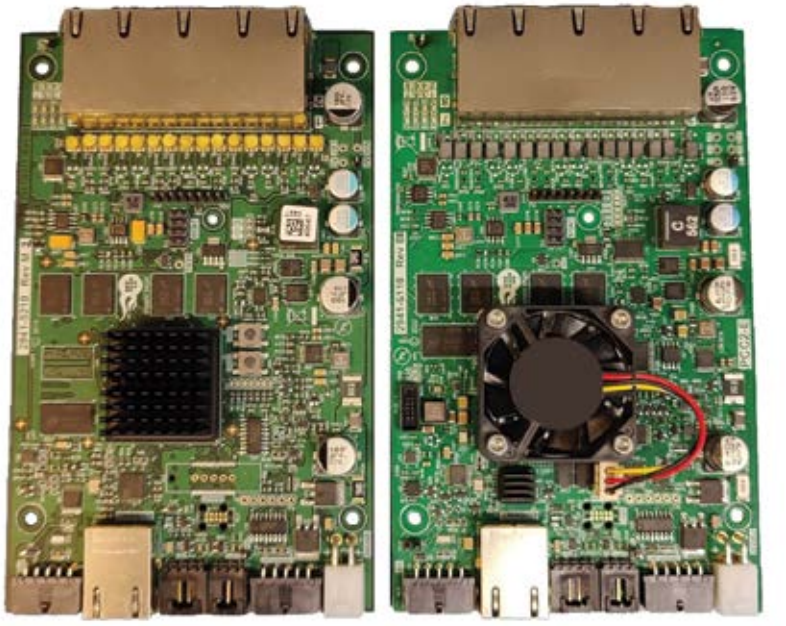
designed to use the PCC can also use the PCC2
- Ethernet functions previously managed so efficiently by the Cyclone V, had to be replicated inside the new FPGA, carefully balancing cost with necessary performance
- All requirements would have to be met in as short a time as possible to keep customer production lines from falling quiet

In addition to intense hardware and software development, the project would include prototype creation, beta testing with willing customers and a production ramp sufficient to satisfy significant backlog as well as a return to normal shipments.

BUILDING A NEW FOUNDATION

Before any technical development could begin, a substantial quantity of readily available chips had to be found. There would be no point in redesigning the board only to again be faced with chip supply issues. Meteor identified a suitable replacement chipset, taking the unusual step of acquiring more than a year's supply before even starting development. After the replacement chipset was sourced, engineers embarked on the formidable task of integrating the new hardware and converting existing code to work with it. The clock never stopped ticking and during particularly stressful times, it was helpful to remember the words of author and entrepreneur Seth Godin, "Change is not a threat, it's an opportunity. Survival is not the goal, transformative success is."

While the technical hurdles were substantial, there were also logistical and project-management challenges. Lead times for prototype-printed circuit board production went from days to weeks. Materials procurement from countries with continuing Covid lock-downs added schedule risk in addition to the impact of Covid on Meteor's own staff. Despite these difficulties, it took a mere three months to go from first design to prototype. Beta testing with customers commenced only six months after the project began.



PCC and PCC2: compatible in form, fit and function

TRANSFORMATIVE PROGRESS

Project Phoenix is now in its final phase with Meteor customers once again able to manufacture and deliver industrial print systems. A project that would typically take years was achieved in months through unwavering commitment by a dedicated team. While extreme change was precipitated by response to a threat, it comes with opportunity. The advanced chipset used in the PCC2 brings with it increased speed and the potential for enhancements in functionality including the ability to implement hardware features such as scaling, rotating and screening of images, capabilities that currently exist in software.

"Project Phoenix was launched to develop a new print controller card"

For now, Meteor's customers and partners are relieved to have once again an abundant supply of print controllers. The industrial inkjet industry, which is accustomed to year-on-year growth in breadth of application and penetration into markets previously dominated by conventional printing, has an essential component back in production. ■

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