

The birth of a machine

IIJ rose to the challenge of building nearly 50 inkjet systems and delivering them in an eight-week time frame.

Like every manufacturer, Industrial Inkjet (IIJ) makes a range of products and always has to give careful thought about the cost, effort and time involved in modifying or changing them to suit a customer's request. IIJ is a little unusual in that much of its work is in creating solutions for new inkjet applications, so most of the systems that are installed have some degree of customisation.

Such modifications tend to consist of ink or configuration changes to an otherwise standard product, rather than a clean sheet design. Inevitably this does mean a degree of compromise – for example as standard IIJ would use the same metalwork for small one-, two- or four-colour machines. This reduces the number of separate designs that are needed to be stocked and serviced, but means that the most basic machines are likely to be carrying a little extra weight and cost. IIJ has always explained to its customers that there is the option to create a design that is without any compromise for them – something that is a perfect fit for the application – but only if they can promise enough sales volume to justify the design work involved.

In late 2019, IIJ had such a request from one of its main customers, which required a very compact, lower cost, single-printhead system for a new security application, and was confident of around 200 units per year. In 2020, the customer notified that it was ready to progress with the project, which was very encouraging for IIJ, considering the then difficult and uncertain times, and what was to come as a consequence to Covid-19. Due to the volume of machine sales the customer was indicating, IIJ was more than happy to design something completely new.

As often happens the customer requirements developed over time, and in fact this resulted in the first batch of machines being something of an intermediate product, consisting of the 'new' printhead unit still driven by IIJ's older standard supplier cabinets. However, a final more radical new design was then agreed, and production changed over to the new design roughly one year after the project started. This machine had the following requirements:



360dpi and 600dpi options, and 72mm or 75mm (pictured) print widths were required for the final machine design

- A very compact printhead unit, with stainless steel case;
- One-colour;
- 360dpi and 600dpi options, and 72mm or 75mm print widths;
- Compatibility with a wide range of security inks and varnishes;
- A very compact ink supply system consisting of 2 x 3U 19in rack modules – a wet module containing the bulk ink tank, and a dry module containing electronics, power supplies and air control;
- A lower price, with the aim to be more competitive than previous pricing; and
- A short lead time/high build rate, with an initial target five system per week.

Manufacturing

Just as important as getting the design right, IIJ faced the challenge of setting up a new manufacturing line dedicated to this new model. Its existing manufacturing line was shaped by the large variation in standard products – from small monochrome units to wide colour systems. In other words, it was optimised for flexibility rather than efficiency. Not just as a way of meeting the manufacturing volume target, but also to meet the challenging cost target, it was vital that the new line was very different, with more of an old-fashioned flow to it rather than a cell structure. It was also clear that the existing production line would be too busy to provide much help, as our other customers hadn't gone away.

With the new line designed on paper, and space marked out on the factory floor, IIJ then entered the inevitable period of waiting and worrying. Waiting for the customer to place the first order. Worrying that – when the first order did arrive – it would not have enough time to construct the new line, hire new staff and purchase the capital equipment needed. There is only so much planning and preparation that can be done in advance and, in the end, IIJ took the decision that it had to get started, even if it was at the company's own risk, without full confidence as to when the order might arrive.

And when the order arrived, these concerns proved well founded when the customer informed that it required IIJ to deliver 45-plus systems in only eight weeks – far faster than had ever been anticipated, and with no allowance or contingency in case of problems. But IIJ rose to the challenge and started to build.

Full steam ahead

As it steamed ahead on the new line, an additional request was raised by the customer as one of the inks needed to be used in the new machine had not been tested by IIJ. This resulted in an urgent need to go through the full test programme for the ink. Luckily, it passed the tests, however, checks to confirm its UV curing performance showed that it was extremely sensitive to any UV light and would be likely to cure in the printhead nozzles, even in normal daylight. IIJ had planned to install a roll-to-roll system at the end of the new production line for testing of the new units, but the need for good lighting for the assembly staff obviously conflicted with the need to keep daylight away from the ink. In the end the roll-to-roll system stayed where it needed to be, but an urgent call to a local carpenter – and the use of several square metres of heavy black plastic – saw a dark-room constructed in short order – now known as 'The Cave'.

Once it became clear that the first purchase order was coming and the customer was pushing IIJ to meet the tight deadlines, then IIJ staff really got to grips with the challenge. Operations and planning staff moved their desks onto the shop floor and took over quality inspection (until the new quality engineer arrived). Staff from IIJ's original line swapped onto the new line to help train new staff and simply to help with the production volume. Soon IIJ was shipping not the five units per week that it had promised the customer, but seven, eight and then nine.

As the last of the intermediate model shipped, IIJ then built, tested and shipped the first of the final design. The customer approved this design just in time for its purchasing team to order 30-plus units – which due to the new production line and after the previous order was no problem for IIJ to fulfil.



A dark room was purpose built by IIJ for a special customer project