



Xaar Ink Delivery Breakthrough

42 Technology has helped to develop an innovative ink delivery system for Xaar that will enable manufacturers to bring the next generation of high speed, commercial digital printing technology to market – faster and at lower cost.

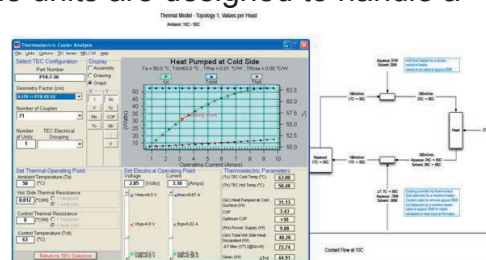
The Hydra recirculating ink supply system has been designed to make it much easier to develop prototype printing systems, based on Xaar's award-winning 1001 print-head, by removing one of the most time consuming, costly stages in the development process. In the past, manufacturers have had to spend time matching their proprietary inks, delivery system and the intended printable surface with the head. Now they can buy an 'off the shelf' unit that supports a wide range of fluid types, viscosities and operating temperatures as well as different print-head orientations.



42T's project managers and engineers worked as an integral part of Xaar's in-house resource. A detailed product specification was agreed, concepts were developed and investigated using advanced hydraulic modelling techniques, before sub-systems were designed and tested. Only once a thorough understanding had been established was a detailed system designed and developed. This was then further optimised by Xaar's product engineers. The resulting compact footprint unit was launched to further strengthen Xaar's position in the fast-growing commercial inkjet printing market.

During the project we also drew on our experience across a variety of markets and took a fresh look at Xaar's new product development process introducing some significant improvements to optimise it.

Hydra delivers ink on demand to four Xaar 1001 print-heads and is easy to operate with just three buttons. It can very accurately control the ink's operating parameters (pressure, temperature, viscosity and flow) across the head, which is essential in delivering high quality, high speed printing systems. Hydra is also scalable allowing manufacturers to rapidly develop large format 1001-enabled printing technologies by using multiple units side by side. The units are designed to handle a full range of fluid types including high viscosity and heavily pigmented inks. Xaar shipped almost 50 Hydra units in the first three months of sales and is experiencing a huge increase in demand for its 1001 print-heads.



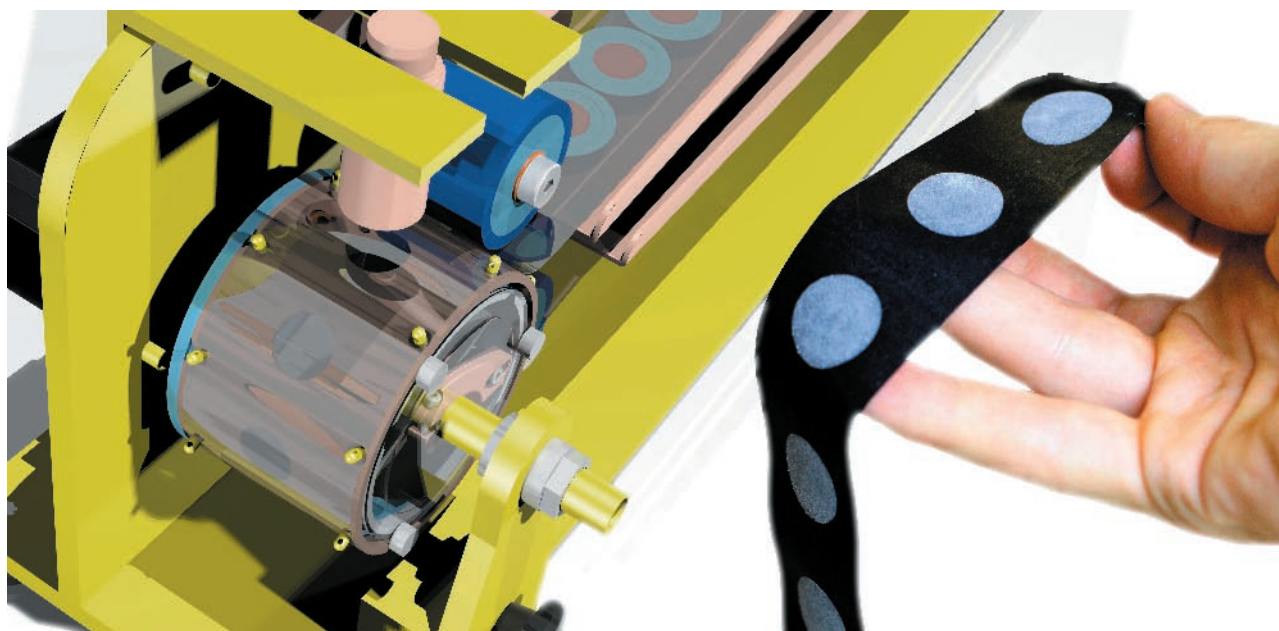
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IP Generation - Sticky Web



In the course of our normal work for clients 42 Technology often devises new intellectual property (IP) that can be in the form of designs, concepts or patents. Our commercial approach to this is straightforward, if it is developed on a client's project then our client owns the IP. We retain rights to use it in non-competing areas. If our client decides not to exploit the technology we request that 42T has access for exploitation in all areas.

An example of how this approach works well for both parties is a solution developed for GlaxoSmithKline (GSK) to devise a new drug delivery system that is suited to high speed, high volume, accurate manufacture. We initially retained the right to exploit the technology in non-pharmaceutical markets. GSK have recently decided that they would like to share the cost of development and has granted 42T worldwide pharmaceutical rights.

Precision dose dispense problem

GSK wanted to precisely meter portions of pure drug doses at high speed for tablet manufacture and Sticky Web started when they asked if we could come up with a novel approach. We started with background research to support our brainstorming which revealed that most current approaches used check weighers or volumetric systems. These

can have issues with different powders as some are free-running, like caster sugar, while others tend to clog. Also pure drug needs to be handled carefully, even in a high volume manufacturing process, otherwise some pharmaceutical preparations can be rendered ineffective.

Sticky Web solution

Our breakthrough approach came from our structured ideas generation process and is based on our discovery that the quantity of powder adhering to a sticky tape is directly proportional to the surface area of the tape. 'Sticky Web' technology can accurately 'print' powdered APIs [active pharmaceutical ingredients] onto edible or inert webs coated with adhesive, without damaging the powder and at high speed. The powdered areas can then be die cut, folded, rolled or further processed into a novel dose form. The approach delivers active dose weights of 1 to 50 mg, with accuracies better than 4% and completely eliminates the need for check weighing – the rate limiting step with all of today's powder dispensing systems. Sticky Web is also perfect for high speed production environments as online inspection systems can be used to validate every powdered area to improve process feedback, increase efficiency and reduce costs.

42 Technology undertook a number of core technology developments. Several commercially available edible/dissolvable webs were investigated. Suitable edible adhesives are not so readily available and to avoid the need for FDA approvals we prepared our own recipes using standard foodstuffs! A high-speed powder dispense drum and production machine concept capable of delivering up to 60,000 doses per hour were also investigated.

The approach works for virtually any powder and can accurately dose onto a variety of webs, such as flat carrier tape and bubbles. As a result, this new technology can significantly shorten pharmaceutical R&D timescales by eliminating or reducing the need for costly, time-consuming formulation and stability studies. A further outcome that will result in improved efficacy is that individual doses of the drug, delivered in the form of a rolled soluble web, were found to have significantly improved solubility in comparison to tablets. The system could also be modified to achieve delayed release or release of different formulations at different times.

Further drug delivery configurations are possible; different doses could be achieved in configurations of the system where the web can be cut to length by the end user; two or more materials can be combined within the same delivery package for point-of-use mixing; and a particular advantage of the process for consumer products is that it allows powders to be printed on the web in the form of a company logo.

42T has the rights to exploit the technology in all markets and we are actively seeking development partners in different industries. Delivery of high-potency drugs and assay development are obvious fits, others may result from the need to meter high value or high intensity powders in small controlled amounts.

It is possible to print gradient doses on increasing areas, which could be used for titration strips, or high volume screening systems where different antibodies could be deposited on the same strip for medical diagnostics. There are also opportunities in fine chemistry, both for adding small amounts of ingredients and also by printing two or more

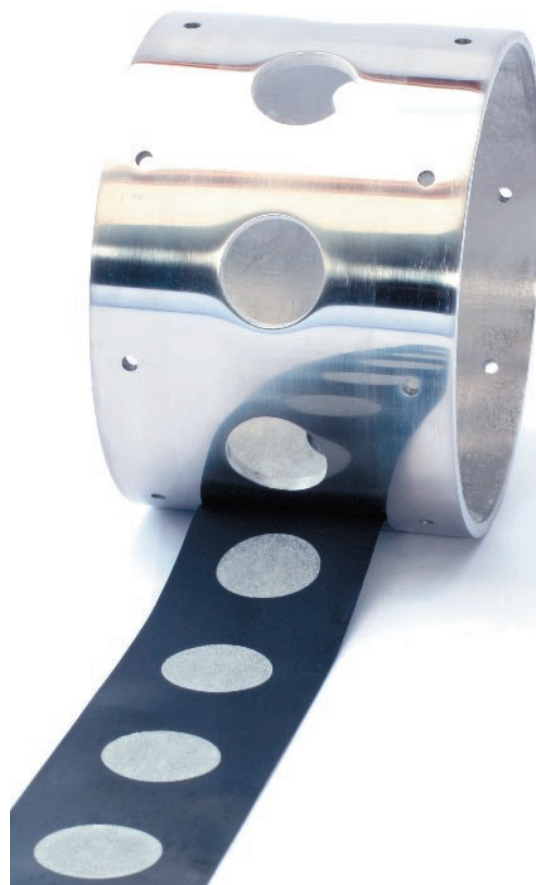
chemicals or pharmaceuticals on the same web. This would enable the use of substances which need to be kept separate until required, because they have a short shelf-life in their reacted form.

In summary - we have a technology for dispensing small amounts of powder at high accuracy and speed. In particular we believe that the technology could potentially be the basis of a new drug form which replaces tablets without using a traditional excipient.

Benefits of our system:

- API dose weights of 1mg to 50mg at accuracies of better than 4%
- API (or any powder) is applied in a high-speed, web-based, continuous process
- The system allows continuous, on-line, automatic inspection of the dispensed active
- Individual doses have high solubility in comparison with tablets
- The system could be modified to achieve delayed release

If you have an interest or application please contact Howard Biddle or Dave Wilson at 42T.



News at 42 Technology

Five new staff join 42T



Simon Jelley and Mark Mellors both came on board to provide mechanical engineering input to a range of client projects. Simon has previously worked on production line optimisation with Newton Industrial Consultants and has also gained considerable field engineering experience from his passion for car rallying. In 2007 he took part in a charity rally from London to Mongolia which he completed in under a month amassing a number of hair-raising anecdotes.

Mark was previously with GKN Aerospace developing novel systems for wing de-icing and Carbon Concepts, a composites development company. In his spare time he is an enthusiastic and accomplished inventor. His recent achievements include designing a robotic unicycle, a hydrofoil windsurfer and appearing as a competitor on Channel 4's 'Scrapheap Challenge'.

Chris Walters joined from Sagentia as a technology consultant specialising in physics as well as being

actively involved in leading a number of 42T's multi-disciplinary projects. Before moving into industry Chris taught physics in the Far East.

As office manager, Rachael Hoyle has taken charge of all HR and recruitment for the enlarged team as well as ensuring 42T's office is running smoothly and handling its increased workload. Rachael was previously with the HR department at Sealed Air in St. Neots.

Sue Smith is 42T's new finance manager and has previously held similar roles for a software consultancy, Silvaco Data Systems, and in an accountancy practice. She is a fellow of the Association of Chartered Certified Accountants and teaches swimming in her spare time.

Pictured above from left to right - Simon Jelley, Mark Mellors, Chris Walters, Rachael Hoyle, Sue Smith. ■

Ten year party

42 Technology's 10 year anniversary was celebrated with staff and partners on a weekend in Rome. Sight seeing (some intrepid souls even did a Segway tour resulting in a race round the forum), shopping and relaxing culminated in an evening meal in the hotel where team building took the form of food, drink and merriment. A great time was had by all. ■



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