

**ADDED
SCIENTIFIC**

ADDED SCIENTIFIC LTD
SPECIALISTS IN MATERIAL JETTING, BINDER JETTING
AND PHOTOCURABLE 3D PRINTING DEVELOPMENT

HARDWARE AND MATERIAL VENDOR SERVICES



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WHO WE ARE AND WHAT WE DO

Established in 2015, Added Scientific Ltd (ASL) is a UK based contract research company providing technical consultancy, problem-solving and lab-based services in the field of Additive Manufacturing / 3D printing.

We are experts in material jetting, binder jetting and photocurable 3D printing hardware and materials development.

HOW WE SUPPORT 3D PRINTING HARDWARE AND MATERIALS COMPANIES

We help 3D printing vendors elevate their machine productivity, performance, reliability, accuracy, and functional materials capability. We help our clients bring new and innovative 3D printing solutions to market by addressing fundamental and scientific problems.



WHY DO TECHNOLOGY VENDORS LOOK TO ASL FOR SUPPORT?

We know that hardware and materials vendors and users don't always have the capacity to develop new ideas or address complex technical issues. We recognise that radical innovation can be highly disruptive to your core business and existing technology development roadmaps. We appreciate that scaling up 3D printing research activity with the right people can be expensive, risky, and fraught with problems – particularly in larger organizations.

HOW DO ASL REMOVE THE INNOVATION ROADBLOCK?

At ASL we provide the people, the technical resources, and the thinking to turn hardware and material problems and complex customer requests into commercial opportunities. We operate as a strategic partner across the TRL spectrum, from validating blue-sky ideas to testing market-ready technology. Through our founders' close affiliation with the internationally-leading Centre for Additive Manufacturing at The University of Nottingham, we also have unparalleled access to cutting edge analytical techniques and leading academic researchers.



SUPPORTING THE EXPLORATION OF MATERIAL JETTING

At ASL, we are constantly pushing the boundaries of inkjet printing, taking technology developed for 2D printing and developing innovations that enable 3D printing in a range of functional materials.

SERVICE OFFER:

- Print-head and material characterization
- New print-head evaluation and waveform development for both client specific and novel materials
- Design and development of bespoke jetting rigs & systems for both specific industrial applications and for research and development use by our clients
- Print strategy and software development
- Rapid evaluation of existing inks and resins for jetting suitability
- Formulation and development of new, novel, and bespoke resins and inks with functional properties
- Evaluating and optimizing the jetting material and substrate interface
- Developing multi-material jetting solutions including hardware, materials, control systems and software



SO HOW DO ASL PROVIDE MATERIAL JETTING SUPPORT TO VENDORS?

At ASL, we utilize commercially available, but reconfigurable R&D rigs and proprietary machines that enable UV, thermal, reactive, and multi-material inkjet evaluation, and optimization. We adopt a stage-gated, highly scientific approach to technology development through onsite access to critical analytical equipment, including rheology, microscopy, and stroboscopic drop-watching. We maintain a multidisciplinary team with both broad and deep knowledge in chemistry, material science, physics, mechatronics, and software.

SUPPORTING INNOVATION IN BINDER JETTING

At ASL, our expertise goes well beyond just material deposition by jetting. Our team has considerable expertise around metallic, polymeric, and ceramic powder-based 3D printing, making us ideally suited to support companies in developing binder jetting hardware solutions and materials.

SERVICE OFFER:

Alongside our expertise in jetting, we are also able to provide our clients with:

- Support in optimizing the binder-powder interaction, both chemically and through advanced printing and waveform developments
- Surface metrology to determine the root cause of defects and cracking within in binder jetted parts
- Optimization of existing binders and new binder development for functional applications
- Evaluation of existing metallic, polymeric and ceramic powder morphology and 3D printing suitability along with a binder matching service
- Design and development of bespoke binder jetting rigs for specific industrial applications
- Developing binder jetting solutions including hardware, materials, control systems and software



SO HOW DO ASL PROVIDE BINDER JETTING SUPPORT TO VENDORS?

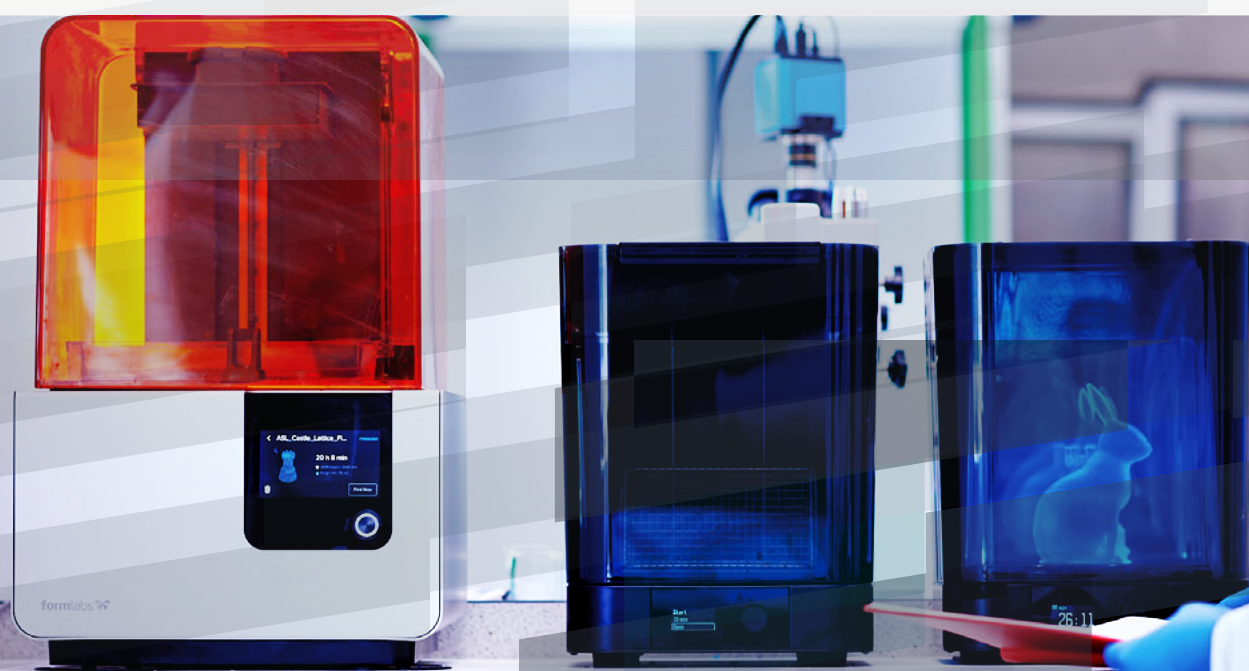
We utilize existing commercial and proprietary binder jetting machinery, including small-batch powder handling, multi-material jetting & controlled environmental printing. We have direct in-lab access to critical analytical equipment including particle size analysis, powder and liquid testing, and stroboscopic drop-watching. We have a multidisciplinary team with both broad and deep knowledge in chemistry, material science, physics, mechatronics, and software.

SUPPORTING THE DEVELOPMENT OF 3D VAT PHOTOPOLYMERISATION

At ASL, we have people with over 25-years of experience developing innovative photocurable 3D printing solutions. From 2 photon and micro-SLA, to DLP and LED solutions, our hardware and materials capability is unrivalled.

SERVICE OFFER:

- Evaluating the suitability of existing materials for use in different vat photopolymerization systems, including laser, DLP and LED
- Optimizing machine parameters for specific resins to achieve maximum throughput and high productivity
- Formulating and developing new functional photopolymers for industrial applications



SO HOW DO ASL PROVIDE VAT PHOTOPOLYMERISATION SUPPORT TO VENDORS?

We utilize existing commercial and benchtop photocurable 3D printers within a range of length-scales in environmentally controlled conditions. We support this with access to critical analytical equipment, including multi-array materials analysis through which our multidisciplinary team of chemists and physicists can screen multiple resin variants quickly and efficiently.

OUR TECHNICAL FACILITIES

ASL operates from an independent laboratory on the Nottingham Science Park with open access to world-class facilities nearby at the University of Nottingham (UoN), Centre for Additive Manufacturing (CFAM).

ONSITE FACILITIES @ ASL

- Bespoke 3-axis jetting development system with 3 nm resolution, recirculating material capability, and complete environmental control
- PixDro LP50 printers with single or multi-head configuration, high-viscosity jetting capability, UV, thermal and IR post curing options and various material processing units
- Best-in-class JetExpert drop watcher for high-speed analysis of both droplet formation and dispersal
- Multiple Industrial DLP & binder jetting printers



FACILITIES @ UON & CFAM

- Complete suite of analytical tools including TGA, FTIR, Rheology, PSD, (UV) DMA and (UV) DSC
- Comprehensive materials hardness mapping, CT, structured light scanning and contact probe inspection
- A wide variety of scanning electron microscopy (SEM) techniques including EDX, FIB, FEG & hot stage
- Complete suite of commercial Additive Manufacturing hardware including metal and polymer laser powder bed fusion, multi-material jetting, micro-SLA and 2 photon lithography
- Experimental technology platforms including multi-material jetting with up to six materials, open architecture binder jetting rig, multiple printing systems (Xaar, Fujifilm, Ricoh etc)

COMMERCIAL DISCRETION AND PROFESSIONAL PROJECT MANAGEMENT

At ASL, we take commercial confidence seriously. We have put measures in place to work across the 3D printing ecosystem, from supporting competitive hardware and materials vendors to working with government agencies, defence contractors and medical innovators. We work under NDA to deliver confidential research, as standard. We have materials and process development laboratories with dedicated and secure project spaces for individual clients. Our IT systems use secondary authentication as standard. We have experienced project managers to ensure project deliverables are achieved on time and within budget.

VALUED CUSTOMERS

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