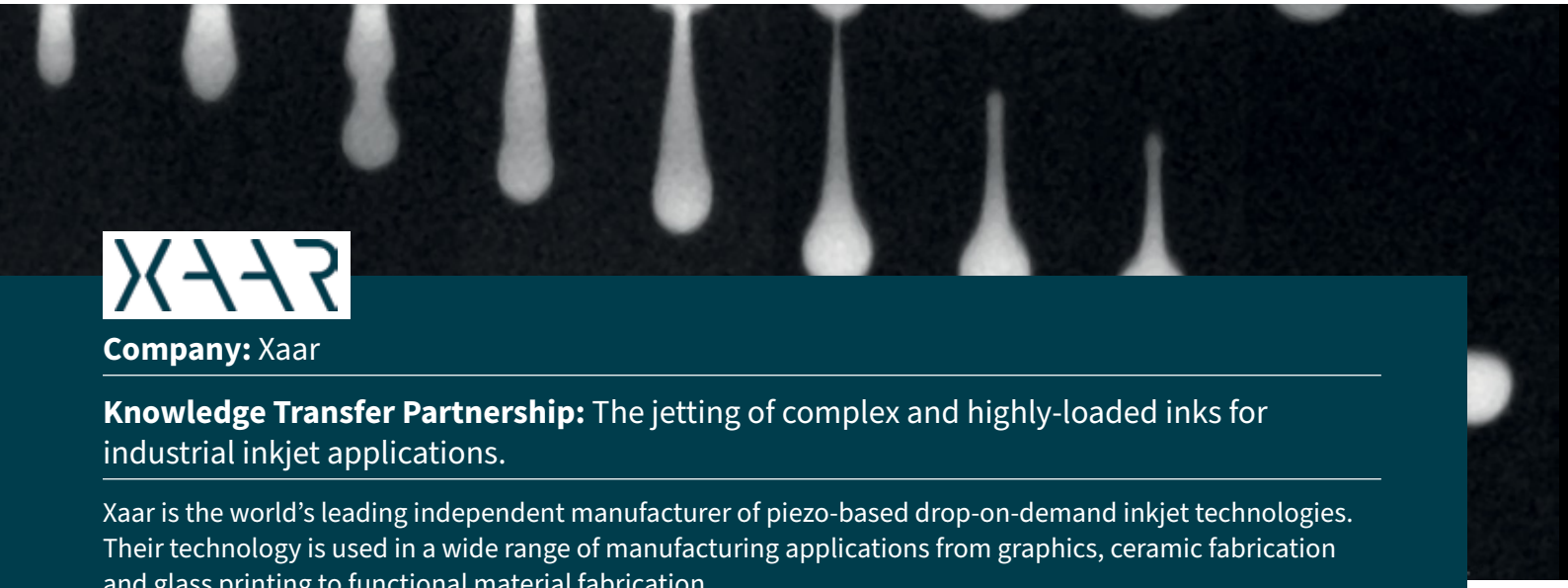
Queen Mary University of London

UKRI Innovate UK



Company: Xaar

Knowledge Transfer Partnership: The jetting of complex and highly-loaded inks for industrial inkjet applications.

Xaar is the world's leading independent manufacturer of piezo-based drop-on-demand inkjet technologies. Their technology is used in a wide range of manufacturing applications from graphics, ceramic fabrication and glass printing to functional material fabrication.

Drop-on-demand inkjet printing of complex and highly-loaded inks is increasingly popular and Xaar's printheads with through flow and high viscosity capability offer a competitive advantage when printing highly-loaded particle inks.

Challenge

Highly-loaded inks are associated with very complex rheology, making predictions of their jetting behaviour a challenge. The performance of inkjet printing is often limited by the rheological parameters of the inks. Understanding of the role of complex rheology in the jetting of highly-loaded inks is needed to facilitate the application of inkjet printing in a range of new markets.

Xaar is supporting a Knowledge Transfer Partnership (KTP) with Queen Mary to facilitate this process and gain a greater understanding of the physics of complex and highly-loaded inks in terms of the formation and break-up dynamics of ink-jetted droplets, and the role of ink rheology in jetting behaviours.

Process to Solution

This KTP project simultaneously studies the rheology and the jetting behaviours of highly-loaded inks, aiming to bring new knowledge on the link between jetting behaviour and the ink properties. The KTP Associate, Dr Jing Shi, works alongside Prof Rafael Castrejon-Pita and Dr Neil Cagney, who are experts in optics and jetting visualisation, and the dynamics of non-Newtonian fluids, respectively, plus Dr John Tatum at Xaar, a Principal Scientist who has extensive experience in ink formulation and characterisation.

Model fluids are being developed containing different particle concentrations and sizes, and their rheology fully characterised. The model fluids are then jetted by an industrial Xaar printhead and the jetting behaviours are visualised and further quantitatively characterised using image processing. Visualising the jetting process from an industrial inkjet system is challenging due to the fast jetting-velocity (usually ~ 6 m/s) and the size of droplets (from around one micron to several tens of microns in diameter).

The KTP project has led to improved visualisation and quantitative analysis of the jetting process. Studying the physics of droplet breakup and formation and investigating the influences of particle concentration and particle size on jettability, the project will establish practical limitations on the design of loaded inks.

This will enable Xaar to develop practical formulation guidelines on highly-loaded inks for Xaar printheads.

> *"Xaar has developed a range of unique inkjet printhead technologies which has enabled us to expand the use of inkjet to a number of industrial applications: one of these is the ability to print high particle loaded inks. However, a fundamental understanding of the limitation of jetting highly loaded inks is limiting our ability to use this capability. The KTP with Queen Mary is at the centre of Xaar maximising the commercial benefit of being able to jet highly loaded inks."*

ANGUS CODIE
COMPANY LEAD,
DIRECTOR OF TECHNOLOGY,
XAARJET LIMITED

Collaborate with us

Company Contact:
Angus Codie,
Company Lead,
Director of Technology, Xaarjet Limited
angus.condie@xaar.com

Academic Contact:
Dr Neil Cagney,
Academic Supervisor, School of Engineering and Materials Science (SEMS)
n.cagney@qmul.ac.uk

KTP Associate:
Dr Jing Shi,
jing.shi@xaar.com