

Centre for Industrial Ultrasonics

www.ciu.ac.uk

Newsletter Summer 2021

Some very exciting work has continued at the CIU since March 2020, as we've continued to support new and existing projects throughout the pandemic. You will read about some of this in the Newsletter - and as we all work back towards the new normal we wanted to keep CIU members updated.

Since March 2020, most of us have had to work from home for several months and even when returning to work faced new challenges with different ways of working and restrictions in the workplace. During this time some CIU staff have moved on to other things, with two of our postdoc researchers landing prestigious lecturing posts, which is fantastic news, and a mark of how well their work at the CIU was regarded externally.

Going forward, administration of the CIU and its members will be handled by the team of clerical support staff that we already have in place at the University, so please be prepared to be contacted by members of the team from time to time. We want to take the next few months to bring CIU members back up to speed, as whilst we have been in regular contact and working on projects with some members, this has obviously not been the case across the board. It has also obviously been difficult for all organisations to commit to things in the current climate, and we have understood that - we took a decision not to ask CIU members for membership renewal fees during the pandemic, as we were not able to provide the same service and facilities that we could prior to the pandemic. With many current and past CIU members also being more financially constrained, it seemed like the right thing to do. We are now working to a more normal availability.

Membership of the CIU had always been intended to be affordable and provide good value for money for members, and the fees helped us to run the administrative side of operating the membership network and run events for members. The CIU is going to relaunch in late Autumn, with a new membership fee structure that will still just go towards the cost of CIU administration and events that we will hold for CIU members – the good news is that these fees will be lower than in previous years for all member categories.

We'd like to start by giving all the CIU's contacts and members past and present access to some of the information on what we have been doing, including a number of technical talks on research progress, details for which will be in the email that you have been sent. In the meantime, we want you to know that we are here to help and are now fully operational and are able to welcome you back to our labs – we hope to hear from you in due course.

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CIU On-line Programme - Friday 17th September 2021**10:00 Welcome and Overview****10:10 Research presentations****10:10 Will Rawes – modelling ultrasonic waves****10:45 CIU clamp-on flow measurement using guided waves****11:05 Update on thermosonics research****11:25 EMAT testing of rail track****11:45-12:00 General Q&A / close**

Research Presentations: We are delighted to have Dr Will Rawes give us a presentation on modelling of ultrasonic wave propagation. Will Rawes works on various projects including novel ultrasonic flow measurement techniques, having studied theoretical physics at Newcastle, with a very short spell of physics teaching before doing fluid engineering research at Cranfield. His areas of research include signal processing techniques to analyse multiphase flows and ultrasonic measurement techniques for flow metering and fluid property measurement. He returned to education developing interactive software at the Open University for teaching & research activities, including modelling virtual ripple tanks and climate models and collecting and processing remote astronomical data. He is currently also working with the Neno Macadamia Trust developing mobile tree surveys in Malawi to help establish smallholder agroforestry. His favourite equation is, of course, the classical wave equation which is behind an enormous range of phenomena.

Clamp-on measurements of flow on copper pipes: Steve Dixon will give an update talk on the use of miniature clamp-on sensors to measure flow in small diameter metal pipes. The discussion will focus on the sizes of copper pipes typically found in homes and buildings.

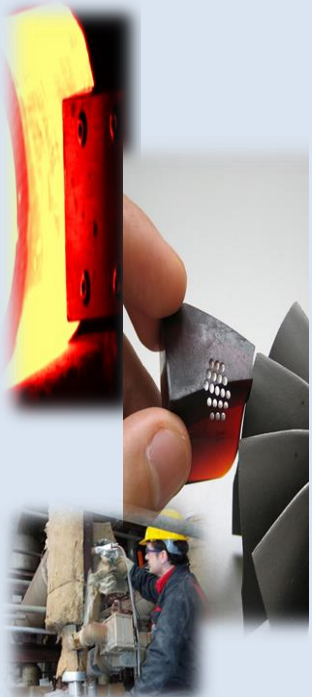
Thermosonic research update: Duncan Billson describes the latest results from a research project developing a non-contacting thermosonic technique for the inspection of composite samples.

Electromagnetic Acoustic Transducers (EMATs) on railtrack: Over a decade ago, the CIU group discovered a way to inspect the running head of rail track using non-contact EMATs, generating and detecting sound on the rail without touching it. Chao Li will describe a compact, EMAT system, with the capability to detect defects in the foot of the rail under the web, and in the rolling head of the rail.

.Publications from the CIU - <http://wrap.warwick.ac.uk/>

Remember - You can keep up to date with some of the work of the CIU and its researchers by looking at the list of publications on Warwick's archive for research papers, Warwick Wrap. Just select the name of one of the CIU academics under the author search facility.

Research Snippets



Clamp-on flow measurement - in addition to our work in developing compact clamp-on techniques for small diameter metal pipes, we have also been working with CIU members to help improve and understand the performance of new designs of flow meter. A number of trials have been run, measuring flow and heat metering of both hot and chilled water on campus. We've been able to see small discrepancies in flow rates between different pumps and have seen that water doesn't always flow where people expect it to !

Inspection of CRFP composites using magnetostrictive patches (MPs) – at the last CIU event, attendees got to listen to one of our PhD students, Silvio Amato, talk about EMAT inspection of composites using self adhesive copper

or aluminium tape patches to provide the electromagnetic coupling to the sample. In parallel with this research, another one of our PhD students, Akram Zitoun, has been using Fe-Co MPs and EMATs on composites to study their fundamental principles of operation – which are more complicated than the Lorentz interaction we use with EMATs on aluminium or copper. MPs have many more applications in different areas, such as the inspection of pipelines, and we are undertaking more research on these highly efficient and interesting materials for NDT and ultrasonic transduction. Akram's paper is available at: <https://www.mdpi.com/1424-8220/20/24/7189>

The robots are coming – Dr Rachel Edwards has recently secured funding to enable the CIU to buy some robotic equipment that is capable of carrying ultrasonic transducers and equipment for performing remote NDT. Rachel and her colleague Dr Oksana Trushkevych have worked on robotic NDT for some time, but these new versatile robots will open up many more testing opportunities.

Ultrasonic anemometers – many of you will have seen previous demonstrations and talks on how we have helped CIU members develop new technology for measuring air flows using low cost ultrasonic sensors. We have developed high accuracy and robust ultrasonic anemometer that can measure wind speed and direction over an extremely wide dynamic range, using some novel low power electronics, extending the air speed measurement range down to flow rates of just a few millimetres per second. We hope to be able to bring you more details of this innovation shortly. Please direct any enquiries on this to Steve Dixon.



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