

At the Forefront of Aluminium Technology

Picture credit: Alcoa

To serve our global client base in the best way possible, Innoval Technology's philosophy is to remain at the forefront of new developments and innovations in the Aluminium Industry.

Over the past 10 years Innoval Technology (Innoval) has participated in many successful UK-Government and EU sponsored collaborative projects, either as a leader or a partner. These projects cover a range of market sectors although the primary efforts have been directed towards automotive applications, with other efforts directed at materials substitution, rail applications, optical film process developments and composite structure manufacture. These project activities have kept Innoval at the forefront of leading-edge developments in materials, processing technologies, surface engineering, fabrication and product applications with globally and technologically leading commercial partners such as Jaguar Land Rover, Novelis, Constellium, and motor sport teams. A recent example of a successful collaborative project, the UICab (Ultra-light Car Bodies) project led by PAB Coventry, is discussed in more detail on page 4. In addition to the commercial partners, Innoval has maintained and developed its more scientific capabilities through ongoing partnerships with key leading universities such as Brunel, Imperial College London, Manchester, Warwick and Strathclyde.

Last year Danieli announced a collaboration with Alcoa which would grant them exclusive rights to license Alcoa's patented Micromill™ technology worldwide, excluding North America and China. We're working with Danieli and Alcoa to design the 'next generation' of Alcoa Micromill™ by Danieli (Alcoa already has a working plant in San Antonio, Texas) which will include special features exclusive to Danieli. As with all Danieli aluminium rolling mills, product and process experts from Innoval are present from the design-phase through to post commissioning support. If you want to know what that means, the AMAG case study on page 2 explains in more detail how we support Danieli's customers.

Since the last newsletter we've welcomed two more people to our team. Junjie Wang has joined our Materials Development team

as a surface specialist with a specific interest in the corrosion and protection of aluminium alloys. Junjie joins us from Manchester University where he has been working as a

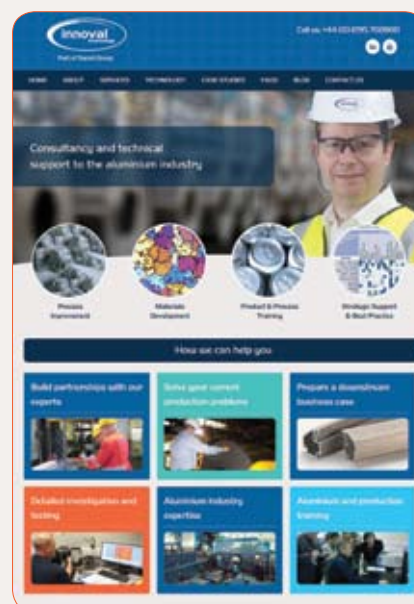


Junjie Wang



David Humphreys

post-doctoral research scientist. David Humphreys is the newest member of our Process Improvement team. David has a huge amount of industry experience, having worked for Alcan and Alcoa, and he has recently completed a 3 year assignment as Casthouse Technical Manager at the Ma'aden Aluminium facility in Saudi Arabia.



Finally, 2015 saw the redesign and relaunch of our web site. New additions to the site include a section on 'Technology' which showcases the areas in which the Innoval team has particular expertise. We've also included thirty-two case studies to give you a flavour of the type of work we do and biographies of every consultant.

*Dr Tom Farley,
Managing Director,
Innoval Technology Ltd*

How we contributed to a successful project at AMAG rolling GmbH



AMAG rolling GmbH (AMAG), based in Austria, is a leading supplier of premium aluminium flat rolled products for industries such as aircraft, automotive, sports equipment, lighting, construction and packaging.



Danieli's Innovative Twin-Coiler Hot Rolling Mill at AMAG rolling GmbH



Inside the pulpit of the new rolling mill

In 2012, AMAG selected Danieli to design, manufacture and install a new aluminium hot rolling mill and auxiliary equipment. This mill would process products ranging from medium-thickness plates to thin-strip coils, and alloys ranging from series 1xxx to 8xxx.

The first plate from the new hot mill was successfully rolled in September 2014, ahead of the contractual milestone, and AMAG signed the Final Acceptance Certificate in October 2015. To date, the mill has achieved all its quality performance targets, which are over and above the contractual requirements. As with all new mill projects from Danieli, Innoval Technology (Innoval) was involved from the start and contributed to the project's success. Danieli is unique in being able to offer, not only the equipment, but also support from recognised aluminium product and process experts.

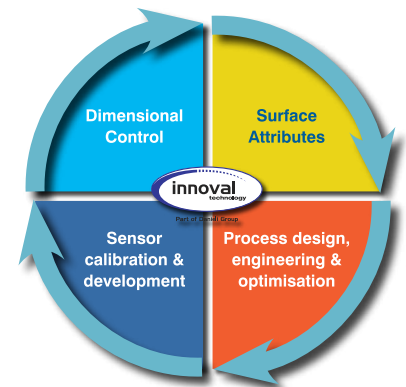
Our involvement started during the sales phase. Because we have a deep understanding of the customer's products, we knew exactly what they wanted to achieve with their new mill and how this could be translated into the design concept. We were part of Danieli's design process from the very beginning using, for example, the Innoval Spray Impact Model to design optimum emulsion flow and roll cooling, and the Innoval Stack Deflection Model to understand how the mill would behave under load. This enabled us to determine the ground cambers on the rolls to obtain the correct product qualities in terms of profile and flatness.

Once the mill and its auxiliary equipment had been installed and the cold commissioning completed by the Danieli team, we were on hand to assist with the start-up. Working with the AMAG engineers, together we manually created pass schedules for every piece rolled with the automation running along side. The automation was then brought on-line to deliver full capability and stability. Innoval's process engineers were present almost continuously to assist in ensuring the mill achieved the desired levels of performance in terms of dimensional tolerances, profile, speed, temperature, surface quality and process timings. We also worked with the AMAG engineers and the operators in close cooperation to update the existing hot mill operating practices so that they were optimised for the new equipment.

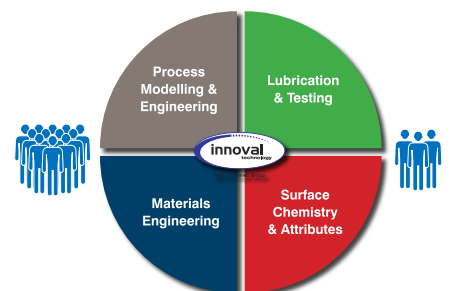
The first slab was produced ten days early, and a large proportion of the material produced during the commissioning process was saleable. Thanks to these excellent results, AMAG has decided to continue working with Danieli by awarding another order for a completely new slitting and coil preparation line.

If you'd like to learn more about how we can optimise your rolling process, or if you're thinking of buying some new equipment and want to know more about Innoval's support, please contact us at enquiries@innovaltec.com

Core areas supported by Innoval during the commissioning and performance phases of the AMAG hot mill.



One or two people on-site but supported by a range of skills drawn from the Banbury office.



Automotive Sheet Know-how for Shandong Nanshan Aluminum Co., Ltd.

The Aviation Material Division of Shandong Nanshan Aluminum Co., Ltd. (Nanshan) is part of the Nanshan Group, which includes more than 30 enterprises. Their facility in the industrial park of Donghai, in the Chinese province of Shandong, is the largest of its type in Asia. It includes a melting and casting plant, a hot and cold rolling plant and a foil rolling plant. The markets served by Nanshan include aviation, marine, automotive and packaging amongst others.

In 2015, following the installation of a new hot mill, cold mill and finishing line to produce automotive sheet, the technical team at Nanshan contacted us to accelerate their understanding of the product. Automotive sheet is a new product line for Nanshan and they wanted to make the route to OEM (Original Equipment Manufacturer) qualification as short as possible. Drawing on the huge amount of technical expertise in automotive sheet that we have within Innoval, we provided a package of know-how tailored to the processing equipment at Nanshan.



南山铝业
NANSHAN ALUMINIUM



Hot rolling line



Continuous annealing line

The package focussed on the specific parameters which must be controlled at each production stage in order to achieve the product quality required by European OEMs. It was supported by a three-day on-site training course which covered, amongst other topics, detailed product metallurgy, control of surfaces and how automotive sheet is used by OEMs.



Cold mill

Following the training course, we are continuing to support the implementation of know-how at Nanshan with frequent site visits and on-going consultancy as part of a multi-year contract.

"Innoval's experience and technical expertise has helped us to rapidly increase the knowledge of our workforce, so that we can produce automotive sheet to world-class standards and will qualify with our OEM customers sooner."

*Sun Xueming, Deputy General Manager of Aero Material Business Division,
Nanshan Aluminum Co., Ltd.*

If you'd like to know more about our automotive sheet training packages, please contact Dr Gary Mahon at gary.mahon@innovaltec.com



Automotive coil

Aluminium Rolling Technology Course is 10 years old!

Our Aluminium Rolling Technology Course is the only rolling course specifically for aluminium. In November it celebrated its 10th anniversary. Since 2005 we've trained people from 59 different companies in 32 different countries.

The aim of the course is to help delegates reduce downtime and improve their product quality by diagnosing and solving rolling problems quickly through a thorough understanding of the process.

Innoval's new web site contains detailed information about the Aluminium Rolling Technology Course, including the registration form which shows the timetable and pricing information. 2016 will see a newly updated course which Kyle and the team are putting together right now. The dates for 2016 are as follows: **9-13th May 2016** and **14-18th November 2016**.

If you'd like to find out more, please contact Kyle Smith at kyle.smith@innovaltec.com



Delegates enjoy a visit to the Jaguar Experience, Castle Bromwich as part of the course

New forming technology for automotive lightweighting



To serve our clients in the best way possible, it's important that we know about the latest, cutting-edge developments in aluminium. To this end, we've been involved in collaborative R&D projects, funded by the UK Government's Innovate UK (and also by European-funding through FP7 and Horizon 2020), for the last 10 years. Most of these projects have had an automotive focus, and one such example is the recently completed UICab project.

The aim of UICab (Ultra-light Car Bodies) was for a consortium of industry leaders - PAB Coventry, Impression Technologies, Imperial College London, Innoval Technology and Lotus Cars - to develop an enabling technology for significant reduction in carbon emissions from vehicles. The project centred on two techniques being combined into one process; tailor-welded blanks and HFQ[®] (Hot Form Quench). HFQ[®] is a patented hot forming process developed by Impression Technologies, based on research at Imperial College London, for enhancing the formability of high-strength aluminium alloys. This technology provides a greater draw depth and allows sharper bend radii, both of which enable pressings to be manufactured in aluminium that were not feasible before.

The combination of tailor-welded blanks and HFQ[®] enables aluminium sheets of two different thicknesses to be formed into one part. At present, forming a sheet containing welds at room temperature will cause the welds to crack. However, if it is done at the solution heat treatment temperature, the welds behave like the rest of the sheet and do not crack. There is no heat affected zone associated with the weld and no loss of mechanical properties.

As part of the UICab project group, Innoval's materials team provided information on alloy selection at the very start of the project. We also developed a simple mechanical abrasion technique to prepare the sheets for welding, and we evaluated the quality of the laser welds using optical and electron microscopy. The success of the project enabled Impression Technologies to develop a commercial HFQ[®]-formed tailor-welded solution and produce proof-of-concept panels at consortium partner PAB's facility in Coventry, UK.

HFQ[®] is the registered trademark of Impression Technologies Ltd



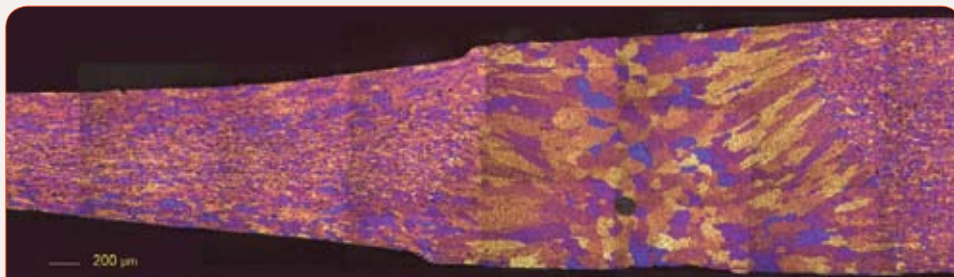
HFQ[®] pressed part

"In addition to the technical expertise that Innoval brought to the project in terms of sheet metal analysis and joining capabilities, they were a pleasure to work with in project management terms. They were always willing and more than able to help with any task that the project required, and helped the project partners form a successful and dynamic working group."

*Adam Malone,
R&D Project Manager, PAB Coventry*

"Innoval brought a unique understanding of automotive aluminium sheet to this project. Their analytical capabilities, as well as their expertise in aluminium joining and surfaces, were key to the success of the UICab project."

*Dr Alistair Foster,
Chief Technology Officer,
Impression Technologies*



Cross section of a HFQ[®]-formed component through the weld region showing the grain structure of the weld and the parent sheet.

If you'd like to know more about the topics in this article, please contact Dr Eoghan McAlpine at eoghan.mcalpine@innovaltec.com

MORE NEWS... MORE NEWS... MORE NEWS...

In November we joined our parent company, Danieli, as exhibitors at ALUMINIUM USA in Detroit. The Danieli booth incorporated two images from our labs: an SEM image of an EDT surface (automotive sheet) taken by Junjie Wang, and a very high magnification TEM image showing disturbed surface layers in aluminium sheet taken by Pete Andrews.

At ALUMINIUM 2016 in Düsseldorf (29 Nov - 1st Dec 2016) we will be co-exhibitors once again with Danieli.

