PAPER*matters!* 2018 Conference and Exhibition Report

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Paper matters! The title says it all. Not just because we all work in the industry but, since its invention around two millennia hence, the material has slowly revolutionised the world, helping to make it what we see today. Coming up to date, the Paper Industry globally is huge, producing around 400Mt of product annually. The UK contribution accounts for around 1% of this which makes our indigenous industry not inconsiderable in size. It is for that reason that over 90 delegates, mainly from the UK but including some from Austria, Germany, Finland, Italy, and even one naturalised Netherlander and another naturalised Swede, gathered at Lancaster University in late September to hear what is new or novel in our great industry. A flavour of each presentation can be found in these pages; the full presentations will soon be posted on our website. For details and enquiries about each presentation, please contact the individual speakers.

Session 1 – Papermaking in the UK

The Keynote Speech was given this year by Andrew Large (**CPI**) on the contentious topic of Brexit. Indeed, this was easily the most controversial subject touched upon during the event, and elicited a large number of questions. Obviously, the speaker was unable to come to a definite conclusion about anything; the politicians are still arguing about the subject, and will continue to do so (presumably even after it is concluded). Rather, Andrew described the complexity as relating directly to the paper and paper-related industries, then went on to discuss how as yet unforeseen problems with industries further down the line (such as logistics) may have major detrimental effects on paper manufacturing. The bottom line according to Andrew involves *Communication*: communicate early with suppliers, customers and contractors, and continue the dialogue as the formalities of Brexit become more concrete. Hope for the best, but be prepared for the worst.

Following on was a much less querulous subject, described most eloquently by Mark Cropper (**James Cropper plc**). Paper has played a pivotal part in the development of society, providing as it does a cheap and reliable material for packaging, hygiene and knowledge transmission. However, most people do not consider its importance in the scheme of mankind; paper is a throw-away commodity. Enter Mark Cropper, who is setting up *The Cropper Foundation* in Burneside, both to capture and display the important history of the material, and to act as a focus for regeneration of the village. Current plans involve some form of visitor attraction, alongside hand paper manufacturing and possibly paper conservation. The paper mill used to be the main focus of the village, but is no more; this project, which is backed by the Parish Council and other local stakeholders, aims to renew the link and so regenerate the village and local area.

In this highly diversified section, the third speaker was Oliver Rosevear (**Costa Coffee**) who described the problems and opportunities associated with single-use beverage cups. In the UK we use around 2.5Bn each year, with Costa being responsible for around 400M. These cups are a source of high quality chemical fibre, but recycling has been limited mainly by the presence of a plastic film. However, James Cropper is already using cups as a furnish raw material, and DS Smith has run trials in Germany with around 40t of waste cups. So the technology exists to handle these materials. The problem then becomes one of recovering cups in sufficient number, and with minimal other contamination, to make it a feasible raw material. Sheffield University researched the final destinations of coffee cups and found most (around 80%) end up at home, making kerbside collection feasible. Other destinations are street bins (very poor quality) and offices (much better prospect). Work is ongoing with **ACE UK** to see how to improve collection of this valuable resource.

The first session ended with a session on that most tenuous of 'soft skills' – leadership – by David Buffin (**Buffin Leadership**). Traditionally it was thought that you were a 'born leader', or you were not. Now we understand that leadership involves a complex but learnable series of traits and skills. David gave a compelling run-through of the importance of *Focus*, and how by applying *Energy* and *Action* you get *Results*. Leadership is partly a state of mind, and as long as you stay committed it is learnable.

Session 2: Energy, Environment & Regulatory Affairs

The first two speakers after lunch were David Morgan (**CPI**) and Arjan Geveke (**BEIS**) who together gave an update on the *2050 Roadmap*. David gave part of the history of this project, showing how far the UK has come to date (current figures show a 67% reduction in GHG emissions by 2017 relative to 1990). Furthermore our annual UK fossil fuel CO2 emissions are currently around 2.2Mt, compared with 20Mt for Iron and Steel, a similar amount for Chemicals, and 10Mt for Food & Drink. So Pulp & Paper is not one of the major industrial emitters in the UK – indeed, we contribute only around 0.6% to the total fossil fuel emissions of the UK which in 2017 numbered 367Mt CO2. To go further and reach the 80% CO2 reduction required by current legislation will require fuel switching, such as to biomass, electrification or injection of renewable hydrogen into the gas grid. Arjan then gave a short follow-up, highlighting in particular sources of finance for energy efficiency and decarbonisation-related investments. There is money available for certain types of project; in the meantime, the industry still needs to push ahead in order to negotiate a sector deal with Government.

The next talk took us from legislation to practical energy reduction strategies, by using advanced mathematical modelling to control processes within our industry. Peter Fisera (**ProcSim**) is someone who has published many articles on this area in *PTI* (for example see p.22 of this edition). ProcSim combine a series of equations to model systems, particularly drying processes, using software developed by **AutomationX** (part of the **GAW Group**). These are then fed with real data points, and the model is used to optimise control of the process. Currently the technology is being screened by the **Carbon Trust**, so we hope to have news of a trial in the UK sometime soon; in the meantime it is already in use elsewhere by major companies such as **Mondi**, **Voith** and **Ircon**.

Ulrika Wising (**Macquarie**) discussed the opportunities introduced by energy transition. The conventional power system has generated electricity using fossil fuel, providing instantaneous response to users, bar failure of the transmission and distribution system. However, the current power system uses many more interruptible power generation techniques, such as solar and wind, which provide both flexibility and variability. In future, intelligent energy systems will become the order of the day, with Demand Side Response (DSR) services able to turn up, turn down, or shift demand in real time. In particular this will offer financial incentives to businesses able to tailor power usage, and so cut costs and reduce their carbon footprint. However, for those industries like ours, which need uninterrupted access to power for continuous production, DSR will only be possible if ways are found to store energy at times of low demand load on the grid, allowing the mill to use stored energy as a supplement for grid power at times of high demand load. There are many ways being devised to store the energy – batteries being an obvious method. On-site generation, such as with solar, will probably also become increasingly more cost effective as prices tumble.

The final programmed speaker was Christina Lugli (**Ecol Studio**) who discussed product compliance for food contact materials and sanitary tissue papers. This most important area of standardisation is made more complicated by the vast number of legislative documents that can be triggered depending upon end use. This is coupled with the fact that very little of this is harmonised across Europe, let alone further afield; therefore, this is one area where Brexit may not have much effect. In this minefield of standards and legislation, a recognised testing facility is a must; with the goal being to protect human health, Ecol Studio are one of the limited number of laboratories in Europe capable of navigating this potential quagmire.

Jason Hunter (**Dale Power**) ended the session with a very short presentation on how installation of batteries on a site can be used to develop a revenue stream. With increasing use of intermittent energy sources (such as wind and solar) the grid experiences both feast and famine scenarios. Batteries can provide some of the answer. They can be charged from low cost off peak electricity, and discharged by the grid at times of peak use. Dale Power operate a system where they fund the installation of the batteries, then charge them to the site at under what the site gains from selling electricity to the grid. Therefore, under current legislative rules, they form an interesting revenue stream that might be attractive to some organisations.

Session 3: Beyond Paper

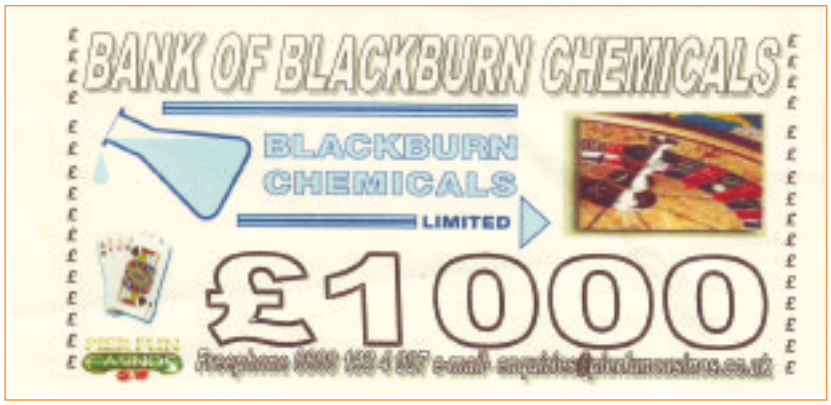
The final session of day one commenced with a joint presentation by Florence Miremadi-Nafici (**Nafici**) and Annabelle Flier (**Tensei**) on developments in non-wood pulps. Florence described eco-pulping of straw, something Nafici have been doing with pilot facilities in the UK for some time, and which is due to commence soon at semi-commercial scale in China. Throughout its long history of use, straw has had a couple of major problems: need for high pressure chemical processing, and a resultant liquor rich in silica. Nafici have found a way of biopulping this and other agricultural residue (such as reed, corn stover and miscantus) which works at ambient pressure and moderate temperature, and which deals with the silica issue. Meanwhile, Annabelle went a bit further and described creation of a brand category (*Optifibre*) using non-wood fibre sources and bio-industrial waste (such as from whisky distilleries) to create 'designer' pulps, either as single source fibres or blends.

From pulp sources of the future, we next stepped into the world of Augmented Reality (AR) with George McKeague (**ABB**). This is different from the Virtual Reality (VR) that a gamer may experience, where the whole sound and vision of their experience is an artificial construct. AR still requires a special headset, but adds a digital layer on top of the real environment in real-time; as such it enriches the real world with digital information and media (such as a 3D model). ABB see this as having potential for product development, training, marketing and sales, and preventative maintenance, among other areas; and it is telling to note that **Stora Enso** have just announced their adoption of AR technology at Oulu Mill in Finland.

The final presentation of this very long day was given by Alex Bryce (**Pilz**) on safeguarding human-machine interactions. In short, although people understand the need for guarding and safety, when it appears to 'get in the way' of their jobs they will find often ingenious ways to bypass switches, locks and cut-outs. Enter Pilz, a company well known throughout out industry for designing systems where this is made as difficult as possible. Alex took us through a whistle-stop tour of various standards and directives that apply to this highly complex area where, should you fall foul, fines are becoming ever greater. The heart of this is the Machinery Safety Life-Cycle: (1) Risk Assessment; (2) Safety Concept; (3) Safety Design; (4) System Implementation; and (5) Safety Validation. Add to this (6) CE Marking for where changes in design, function or safety of machinery has been altered – such as linking different machines together to form a new production unit – and (7) Regular Inspection of Safeguarding Devices, and you just about have things covered.

Social

Important though the technical lectures are, face-to-face meeting with colleagues is a major part of any conference, and so it was here. The evening saw three things on offer: a BBQ (generously sponsored by **Macquarie**) which featured some exceptionally fine burgers and sausages; a hand paper-making competition hosted by **Two-Rivers Paper** stalwart Jim Patterson and his award-winning apprentice Zoe Collis, and a casino sponsored by **Blackburn Chemicals**. It would be fair to say the latter two items were hotly contested by a large contingent of delegates, with Peter Oughtibridge of **Palm Paper Ltd** scooping the award for best handsheet, and Henry Russell of **Envirosystems Ltd** getting a bottle of bubbly for his prowess on the gaming tables.



Session 4: Fibre, Stock Preparation & Forming

Day two held the more technical papers on practical papermaking issues. It started with an update by Mike Mason (**Papermaking Consultancy Services Ltd**) on the *AOKI* dryer fabric cleaner. This was previewed at a previous meeting (see report in *PTI*, Spring 2017, p.38). The concept is very simple: a specially-treated blade is held in light contact with the dryer fabric; water, and accumulated contaminants (stickies and dirt) are drawn out of the fabric without the need for high pressure spray cleaners or extra wash facilities. Therefore the fabric runs cleaner, and the system reduces water (and chemical) usage and prevents damage that can be caused by high pressure sprays. Developed in Japan, until recently there was only one major European reference (**Klingele Papierwerke GmbH**) but that is now changing; the company is pushing the product in Europe, and there are several units already in Germany, with a further three due to be installed in France during the next year.

Next on the podium was Simon Rogers (**Buckman**). We all know Buckman as a chemical supplier, but less well known is the array of instrumentation they can offer alongside their traditional fare in order to add benefit to their customer's production. Simon outlined *Recovery Boiler Advisor* (*RBA*) – a software-based leak detection system; *Echowise* – online ultrasonic monitoring of entrained air; *Online Natural Coating* (*ONC*) – measurement of Yankee coating; *MARISSA* – biological refining aid to assess the effectiveness of enzymes on a chosen substrate; and *Buckman OnSite* – a web based customer portal (the start of Buckman's entry into the 'big data' area). Buckman understand that chemistry will only take you so far; adding measurement technology and data analysis takes their offering to a whole new level.

Mike Armitage (**Kemira**) gave the third presentation, describing the company's *KemRevive* system for improving recovery of starch from recycled paper. As background, Mike suggested that a 400,000tpy packaging mill using recovered fibre could see 16,000tpy of starch lost to COD or BOD. The Kemira concept is to prevent this starch from being broken down as it passes through the process. It has three components: a biocide to control bacteria that use starch as a food source; an enzyme inhibitor which prevents amylases from degrading starch; and a retention aid to keep the starch bound into the sheet. Passing the starch out with the finished sheet improves yield and reduces load in waste treatment. A case study was given for a UK board mill where the process is running successfully already.

The initial session was closed by a long-standing supporter of PITA, Hamish Parsons (**Heimbach**), on the subject of forming fabrics and contamination. In a very detailed presentation he outlined the increasing use of recovered fibre as a raw material, the quality of which has deteriorated significantly over recent years, with a result that more contaminants are reaching the forming fabric, causing numerous problems including clogging of pores and abrasion/damage to the textile yarns. In addition, high pressure spray jets used for cleaning can cause additional damage to the forming fabric. Furthermore, experience suggests that cleaning performance is not necessarily always optimised across the web; the front side may be acceptable, but the drive side is often not. As part of the talk Hamish explained the complications of forming fabric design, with the help of some model fabrics. Overall it formed an excellent training presentation for those of us who are not experts in the field of fabrics.

Session 5: Packaging & Beyond

Packaging is still the single biggest use of paper worldwide, and in the UK it accounts for the greatest tonnage of all grades, hence the importance of devoting a single session to this sector. Mark Smith (**Omya**) commenced with an outline of how his company are targeting the sector with some special grades of calcium carbonate filler; a material not traditionally associated with production of containerboard. The rational is surprisingly simple: by adding 3-6% of GCC into the furnish, they look to increase machine capacity or reduce specific steam demand – substitution of 1% fibre with 1% filler reduces steam demand by 1%. So adding a small amount of filler allows better economics, while not adversely affecting the all-important strength properties. Compelling results from three production-scale case studies were included to show what can be achieved. In addition, for those concerned about a possible increase in scaling by use of GCC in these applications, fears were averted by further testing that showed no appreciable effect of the increase in calcium concentration in such furnishes. Unsurprisingly, the new grade range is called *Omyaboard*.

Hassan Ahmed (**Brunel University**) was next on the podium to discuss work performed in collaboration with **Axchem** on the use of nanocellulose as a strength aid. This work is an extension of that reported from the PAPER*matters!* 2016 conference, where Nigel Jopson presented initial results from a trial run by **Smithers Pira**. Hassan ran through three further trials, all using the nanocellulose produced using the patented method (WO2016/055782A1) devised by Brunel University, which involves combining chemical treatment of the lignocellulose feedstock with ultrasonication, by which process the patent claims to reduce energy costs massively. (Traditionally that has been

the stumbling block which has limited practical application of nanocellulose.) Hassan and Aimee Hutton (Axchem) have produced a paper detailing their findings, which can be found elsewhere in this editon.

Next up was Volker Maier (**Valmet**) who discussed the company's latest innovation to reduce energy costs associated with pulping recovered fibre. Traditionally this is done by using long drum pulpers. Valmet looked at the design with a view to seeing how they could redesign the equipment to retain efficiency but save money. Part of the energy costs of using traditional equipment relates to their size, therefore weight. The solution: to reduce the length of the pulper by around a third. The rationale is based upon the observation that a significant amount of fibre is separated quite quickly in the process. By improving the efficiency of the slushing zone, the material then passes to an area that combines further slushing with fine screening. This removes the material that is already pulped successfully, which can go for further treatment elsewhere in the process. Meanwhile, as the remaining material continues to be treated in the remaining length of the pulper, it is subject to coarse screening. The result is a pulper that is 30% lighter with 20-30% lower energy costs.

Before lunch we had a very short presentation by Jyrki Laari (**ACA Systems**) on roll hardness measurement. For those used to the manual Schmidt hammer instrument, the new device, came as a revelation. About the size of a laboratory gloss meter, it is placed on the roll surface at one edge, then is simply pushed across the entire width. It operates at 50Hz, so if the rate of push is 1m/s, it measures every 2cm. The device uses the initial start point as its reference, so any problem areas can be traced accurately; data can be transferred to the DCS by Wi-Fi; and it can even be used to control downstream processes such as calendering. Applicable to paper, film and foil rolls, the instrument has wide application in a host of industries.

Session 6: Quality & Performance

Stuart Gregory (**Petrofer**) commenced the final session with an outline of the Petrofer business. This is a privately-owned chemical company active across a wide number of process industries, capable of supplying the standard process chemicals and much more. Then he concentrated upon one area where Petrofer have a full range on offer: Yankee coating chemicals, and how they impact softness. However, rather than outline their offering and making the presentation a pure sales pitch, he chose instead to make it a 'teach-in', covering the requirements that a coating has to perform, and the problems that can occur when they fail to fulfil their function, or when other aspects of the Yankee or creping equipment is incorrectly set up. This was an excellent example of a 'soft-sell' presentation, where knowledge and experience is imparted yet the chemicals on offer remain unnamed. An excellent teaching session. (See page 8.)

Mark Whatton (**QCL Scientific**) was next up. Both Mark and the company are relatively new to the Paper Industry, so Mark laid out a simple yet persuasive presentation outlining just one of their many products: a dedicated Chemical Oxygen Demand (COD) analyser used for wastewater treatment analysis. The selling points were simple: rapid analysis (minutes rather than hours for the traditional wet-chemical test) with no dangerous chemicals required. A number of versions of the apparatus are available; that being demonstrated was portable and could be used in the field, maybe to trace the source of a leak. One case study from a Chilean mill was described, where COD analysis time was reduced by 95%, and a saving of US$3M was quoted (giving a payback time for the instrument measured in weeks); the company now operates 5 units across two mills. Overall the unit's selling points are greater efficiency, health and safety, and rapid payback. Enough said!

The final presentation of the entire conference was given by Mikko Viitamäki (**Valmet Automation**). As papermakers, we all get used to high level automated control of manufacturing processes, so it comes as something of a surprise that paper conversion, in this instance corrugating, tends to have little or no automation. Hence Valmet has adapted its renowned *IQ* Control System for use by corrugators, looking in particular at moisture measurement and warp assessment. A case study from one corrugated producer showed massive improvements in speed and quality, and a concomitant reduction in waste and complaints; 'six figure' savings were claimed. Such a simple idea seems obvious to a papermaker; which just shows how advanced paper manufacture has become.

Exhibition & Sponsorship

Finally, we need to pay tribute to the many companies who took part in the exhibition: **Axchem UK**; **Buffin Leadership**; **Costa Ltd**; **CPI**; **Ecol Studio**; **Envirosystems Ltd**; **Nalco Ltd**; **Pilz Automation**; **QCL Scientific**; **QI Soft**; and **Valmet Ltd / Valmet Automation Ltd**. Some were present only one day, others were there throughout. We are grateful to all for taking the time and trouble to attend; for some of the freebies on offer (the Envirosystems 'bug' has proven so popular that it is apparently on its third making); meanwhile Lucy at Valmet, thank you so much for selflessly supplying your personal notebook to one delegate who had nothing upon which to record notes.

Sponsorship for the social events in the evening has been noted already. That for coffee breaks etc has not. That tireless supporter of **Heimbach**, provided sponsorship for this, and we are all grateful for their generosity! Meanwhile, **ACA** and **EurControl Ltd** also provided sponsorship as well.

And so the event ended, yet the presentations have all been supplied, and are available on the PITA website (<what we do>-<events>-<meeting reports>). Meanwhile, we have video footage of the event, some of which we hope to use in due course, again on the PITA website (www.pita.co.uk).