News from the Scottish Plastics and Rubber Association

2009

Newsletter Contents 2009

NEWS

News
from the
Scottish Plastics and Rubber Association

April 2009

Features in this issue:

PRESIDENT'S REFLECTIONS

How to make two years go quickly? Firstly, accept the Presidency of the **SPRA** for the two years of its term. Then agree with your company to undertake a project abroad, which keeps you out of the country for about two thirds of the year. That's what happened to me, in my case abroad being Saudi Arabia, and the time has just flown by. It's at times like these that the President needs the support of a very good Council to make life easy and I have been fortunate to have such a Council. They have, through their energies and enthusiasm, kept a very strong technical programme running through my term in office and worked hard, particularly this year, to ensure the Annual Dinner Dance remains a key focus of our social calendar.
I thank them all!

Of course the plastics industry in the UK has been under pressure for many years now but over the past 6 months the down turn in markets due to the 'credit crunch' has been profound and has left no company untouched. At such times the industry needs strong organisations like the **British Plastics Federation (BPF)** and the **Institute of Materials, Minerals and Mining (IOM3)** that can give advice and provide a representative voice for the industry at government level. Through its association with such organisations the **SPRA** can act as a focal point for the Scottish plastics and rubber sector and as such can provide advice and support. Of course to have a strong SPRA we need the engagement of our members, especially our important Corporate Members. The involvement of strong individuals within our industry is essential for the SPRA to remain relevant and there is always a need for such individuals to step forward to help the SPRA grow in size and influence.

The SPRA has always had a very close relationship with **Napier University** and indeed this establishment has provided the SPRA Council with a backbone of very committed members. I would be very encouraged if we could broaden our outreach to other Scottish based universities over the coming years to capture the talent that resides there not only to input into the SPRA but to provide links with our many company members. Innovation will be one of the ways the industry will recover more quickly from this downturn and company/university links will be one important aspect of this recovery.

Finally, as I prepare to step down I would like to wish **Fergus Hardie** well as he takes up the reins of the Presidency for the next two challenging years. And I would ask one thing of the reader and that is to please support the activities of the SPRA when and however you can. Don't take your Association for granted.

Les Rose, SPRA President

BILLION UK Ltd

*Continuing the series on Corporate Members, this issue features **Billion UK,** another founder Corporate Member.*

In September 2008, **BILLION** announced their best sales turnover for 10 years. **Peter Kirkham**, MD, a well-known figure in the industry and a long-term supporter of the **SPRA** and polymer education in Scotland, explained that "Sales have come from a mixture of existing and new customers, although a common factor in almost every case has been higher specification to provide gains in productivity and savings in energy".

Sales of hybrid machines are particularly strong, due to their versatility, energy saving ability and high productivity. BILLION has recorded typical energy savings of 30 - 50% for their hybrid machines in comparison to previous hydraulic machines in packaging type applications. Hybrid machines have also proved to provide more scope for cycle time gains and improved reliability due to the easier workload of the hydraulic system.

The new **SELECT** range introduced at **K2007** has also proved a strong seller having significantly outperformed sales expectations in its first year. The new range is a huge success and has proved highly productive, reliable and efficient in a wide range of applications. Energy saving is a strong factor with **BILLION** having recorded 50 - 70% savings at customer sites. **BILLION** has also now extended the range to include models from 50 - 300T, with a 400T to be launched in the first quarter of 2009.

A new 150T SELECT machine will be installed in the Technical Centre at **BILLION UK** in early 2009 forming part of a service offered to UK customers. **BILLION UK** will test the power consumption of a process at the customer site, then run the same process on the SELECT machine to provide a real cost saving figure for customers to judge new investment.

Turnkey projects including tooling, automation and other peripherals have also featured strongly in the BILLION UK order book, where customers know that they can trust the knowledge and experience offered by **BILLION** to provide them with solutions to make a difference in their markets.

BILLION UK exhibited at both **PDM** and **INTERPLAS** in 2008 finding both events extremely useful in concentrating sales effort and successful in providing a platform for subsequent sales.

With the strong financial year behind them, **BILLION UK** has continued with strong sales results in October and November, having already sold nearly 50% of the budgeted units planned for 2009.

01908 223 344 **sales@billion-uk.co.uk** **www.billion.fr**

POLYMERS IN MEDICINE

The February meeting featured two Scottish companies describing how polymers contribute to the development of different aspects of medicine.

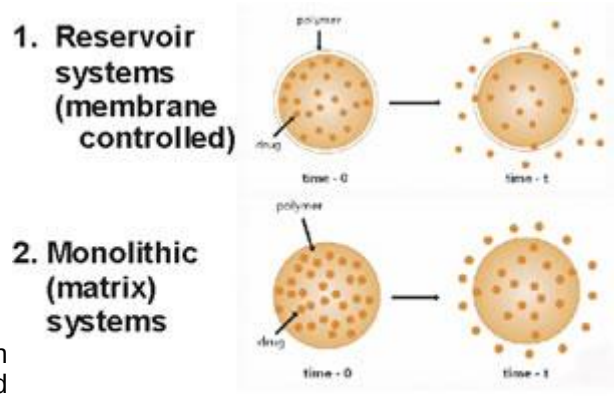
Vascutek, a Terumo Company, established in 1982 in Inchinnan, is one of the world's leading designers, manufacturers and marketers of vascular products for the treatment of cardiovascular disease.

Controlled Therapeutics (Scotland) Ltd was established in 1987 and is located in East Kilbride. The company's objective is to develop, manufacture and license pharmaceutical products based on patented drug delivery technologies.

"Polymers for Drug Delivery - plastics and biopolymers in healthcare"

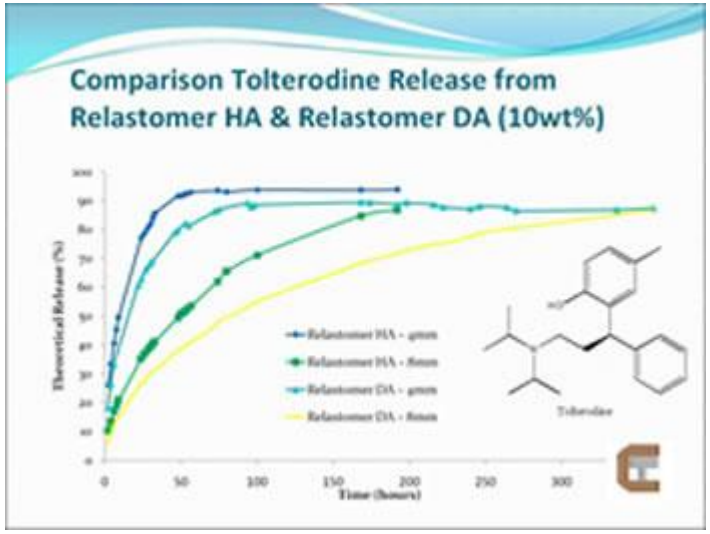
In the first presentation, **Dr Amaia Zurutuza**, Senior Polymer Scientist within the R&D Department at **Controlled Therapeutics (CT)**, explained how polymers offer a versatile medium for drug delivery systems, utilising the characteristic properties of viscoelasticity, phase transition, and physical and chemical properties, combined with ease of processing. A wide range of synthetic polymers can be used, both biodegradable and non-degradable, as well as natural polymers. By careful selection of polymer, the drug delivery can be spread over days or years compared to conventional systems of less than 24 hours.

Drug release mechanisms can be diffusion controlled or chemically activated. In the former mechanism, the polymer can be a coating (reservoir system) or completely mixed with the active agents (monolithic). Chemical systems cover controlled swelling to change the polymer from glassy to rubbery state, biodegradation to release the drugs and degradable pendant links that carry the drug.



Diffusion Controlled Drug Release

Traditionally CT used a cross-linked polyurethane which swells in water and bodily fluids. These hydrogels cannot be easily processed, have short drug release times, have limited loading capacity and can only be used with low molecular weight drugs. CT has moved on to investigate the potential of linear polymers, which can be loaded with drugs and shaped by extrusion or injection moulding.



Linear polyurethane products in development at CT are produced in a double helix melt polymerisation reactor to eliminate residual isocyanate. The main monomers, glycols (polyethylene and polypropylene) and dicyclohexyl methane di-isocyanate (DMDI), are reacted in varying proportions to produce a range of thermoplastic polyurethane elastomers with different ratios of hard to soft blocks and hence of varying hardness and swelling potential. Drugs are mixed into the polymers using a twin-screw extruder or a Brabender batch mixer. Drug release can be varied from 1 day to 1 month by varying the polymer composition and drug loading.

Bioresorbable polymers can be used to deliver peptides and proteins, with potential applications as injectable microspheres or subcutaneous implants. There is no need to remove the transplant because the polymer disintegrates to non-toxic residues in the body. The polyurethane is based on PEG and caprolactone reacted with 1,4 butane diisocyanate (which ensures non-toxic, naturally occurring residues) and gives release rates varying from 1 month to 2 years.

01355 239 166

amaia.zurutuza@ctscotland.com

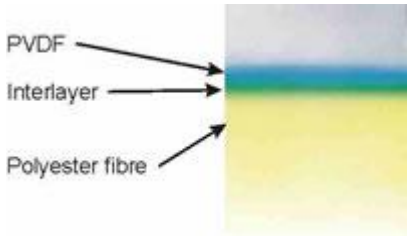
www.ctscotland.com

Controlled Therapeutics
Delivering a Healthy Future™

"Biomaterials in the Real World - choosing and using industrial polymers in implantable devices"

In the second presentation, **Dr Tim Ashton**, Vice President R&D at **Vascutek**, looked at the potential of applying commercial polymers in implants. The standard vascular grafts produced by Vascutek are woven from polyester fibre and have been highly successful. There is a general perception that uncoated polyester can cause blood clotting - although not in reality - and some customers favour a coating of polytetrafluoroethylene (PTFE), which has excellent properties and reputation in the medical field but is difficult to process and apply to the fibre.

Poly(vinylidene fluoride) (PVDF) has many of the properties of PTFE but is soluble in certain solvents and thereby capable of applying extremely thin (sub-micron) coatings to polyester textiles. Because the solvent also slightly swells the polyester, an interlayer is formed, resulting in extremely permanent bonding. Tests (in-vitro and in-vivo animal models) showed that the PVDF considerably reduced blood clotting potential and improved healing. Because PVDF has previously been used as an implant (sutures) the time to achieve regulatory approval in Europe (CE mark) was considerably shortened. However PVDF has no track record in USA and much more data and time is needed to get approval there.



Electron microscope image of the coating and interpenetrating molecular network

With this case study, Tim demonstrated that industrial polymers can be used as implant materials. Issues of supply liability and regulation prove to be more important than the purely scientific drivers.

0141 812 5555

T.Ashton@vascutek.com

www.vascutek.com

SPRA DINNER DANCE 2009

The economic crisis took a back seat for one night when SPRA Members, companies and their guests gathered at the **Marriott Hotel** in Glasgow on Friday 6 March for the **Scottish Plastics and Rubber Association's annual Dinner Dance**.
During what regular guests have described as the friendliest and most relaxed event of this kind, there was an opportunity to enjoy good company over the Scottish themed meal, including the traditional piping in of **SPRA President**, **Les Rose** and his top table guests and an impressive '*Address to the Haggis*' from **Pipe Major Ian Grant**.


Courtesy of David Barlow

PRA President **Les Rose** introduced his top table guests, which **ndy Dobbie**, Chairman of **Chemical Sciences Scotland** and **Stuart** nan of the **Polymer Society** within the **Institute of Materials, Mining**.

Back (l to r): Mrs Sharon Dobbie, Stuart Patrick, Mrs Margaret Patrick, Les Rose, Mrs Val Rose
Front: Dr Sandy Dobbie, John McKelvie
[Photo Courtesy of John Devlin Photography]


Jili Allen

SPRA scholarships were presented to two students from **Napier University** in Edinburgh for their performances in polymer subjects, **Jili Allen**, ***BDes (Hons) Consumer Product Desig***n, and **Martin Miller**, ***BSc (Hons) Product Design Engineering.*** This was a reminder of the contribution that graduates of design can make to companies seeking to become more innovative and hence more competitive during challenging times


Martin Miller

Les also awarded a well-deserved **SPRA Fellowship** to **Colin Hindle**, Lecturer in Polymer Engineering at Napier University, for his contribution to polymer education in Scotland and for exceptional service to the SPRA.

Guests were then entertained by the speaker, **John McKelvie**, with humorous anecdotes drawn from his experiences as a policeman and football referee.


photos courtesy of David Barlow

As usual the function was well supported by regular table hosts, **Albyn Limited, Arburg, Carclo, DSM, Engel, Hardie Polymers, Plastribution** and **Rosti.** This year **Polymer Innovation Network** had a table and SPRA Corporate Member Companies, **Balmoral Tanks, Billion UK** and **Caledonian Ferguson Timpson** were also among the special guests along with **Cogent SSC** and others who have supported the SPRA over the years.

By the end of the evening, after dancing to the popular band, **Life and Soul,** for the more energetic and networking for the others, the hosts and guests were already planning next year's event, traditionally held on the first Friday of March.

Why not put that date in your diary for next year?

SPRA FELLOWSHIP: COLIN S HINDLE

At the SPRA Dinner Dance, the President, **Les Rose**, presented **Colin Hindle** with an **SPRA Fellowship** for "***his contribution to polymer education in Scotland and for exceptional service to the SPRA.***"

Colin has been a lecturer in polymer engineering at **Napier University** Edinburgh for the last 28 years, after completing his studies at undergraduate and postgraduate levels in chemistry and materials science. Currently he is **Programme Leader** for the **BEng (Hons) Polymer Engineering** and is also involved in engineering and design courses at undergraduate and post-graduate levels. He is well known in the polymer community in Scotland, UK and beyond, being a **Chartered Engineer**, a **Fellow of the Institute of Materials, Minerals and Mining**, a **Member** of the **Society of Plastics Engineers** and a **Liveryman** of the **Worshipful Company of Horners** where he chairs the Plastics Education committee which is responsible for the Polymer Study Tour.

Colin's industrial ties are strong, through his teaching (both full-time and part-time students), his extensive research and consultancy work and his commitment to the SPRA. In 1992 Colin was **Chairman** of the **Plastics and Rubber Institute Scottish Section** at the time of the merger to form the **Institute of Materials**. He persuaded the committee that the SPRA should be formed as an independent society, affiliated to the **IOM**, to match the constitution of the sister society, the **Scottish Association for Metals**. Later Colin served another term as **President** and has been one of the most active Council members in his role as **Education Officer**. The spontaneous response of the guests at the Dinner Dance confirmed that Colin is a worthy and popular recipient of the award.

PLASTINDIA 2009

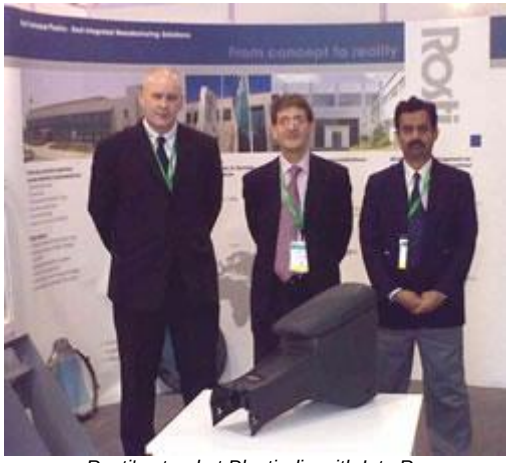
Scotland was well represented at the world's second largest polymer exhibition, held in **New Delhi, India** from 4-9 February. In conjunction with a well-organised **BPF** exhibitor's group and a **Rapra Technology** sponsored trade mission, the following companies and Universities from Scotland were represented:

Rosti Technical Plastics
Safeglass (Europe)
Hardie Polymers
Napier University

Despite the current economic woes, India is still forecast to achieve GDP growth of 7.1% this year, second only to China at 8%. The Indian polymer processors feel their downturn should be fairly short lived and are already looking ahead confidently to future growth in their industry. An interesting point learnt about the plastics industry in India is, that despite the size of the country and its vast population, the polymer industry remains very close knit and like Scotland, everyone seems to know each other !

Technically the exhibition had high standards of exhibits on offer. From a European perspective, Germany, Switzerland, France and the UK were well represented and from Asia, China and Korea appeared to lead the field. The fairground facilities are pretty basic compared to other major shows and a lack of meeting areas proved frustrating. However in terms of sheer visitor numbers and quality, the defining factor for any show, Plastindia is clearly a real winner. The aisles were jammed full of high-calibre industry personnel almost throughout.
Colin Hindle of **Napier University** saw great opportunities to attract Indian students to Scotland, particularly for shorter course durations of 12 months. There appeared to be fewer Universities in India offering Polymer degree courses than one would expect. Colin also commented on the high number of schools groups attending the exhibition as being a positive and something that should be encouraged in the UK.

SPRA Council Members Colin Hindle, Fergus Hardie and Ralph McNeill at the Taj Mahal



Rosti's stand at Plastindia with L to R, Robert Wardrop, Tez Kurwie, International Sales Director and S. Nagamani, Sales Director India.

Ralph McNeill from **Safeglass**, a regular visitor to India, saw some excellent opportunities for diversification notably in mobile communications and the leisure sector.

Robert Wardrop, Business Development Manager, at **Rosti** commented on the high levels of local interest shown in their new Chennai facility in the south of the country. Rosti opened their plant there last year in order to support key global customers, manufacturing in the area.

Fergus Hardie of **Hardie Polymers**, spoke of the great potential for UK companies to replace lost business in the UK by addressing a market that has burgeoning expectations for the future. British companies, he said, could benefit from working together to promote their businesses in India.

At a seminar on **UK Innovation in Plastic**, **Colin Hindle** was kept busy giving two of the presentations, "*UK Excellence in Polymer Education and Research*" and "*Polymers in Photonics and Electronics*", while fellow SPRA Council member, **Ralph McNeill** talked about "*Safeglass (Europe) Ltd: A Business Built on Polymer Innovations*"

The **BPF** continue to offer member companies excellent support and advice on how best to approach new export markets and guidance on how to obtain financial assistance where available. All of the British companies attending were invited to an evening reception at the Intercontinental Hotel where there was an opportunity to network with leading members of the Indian Plastics industry.

Fergus Hardie, SPRA Vice-President

CORPORATE MEMBERS NEWS

Thanks to their unique processing capability located at the manufacturing plant in Dumbarton, **Polaroid Eyewear** can deliver products that remain competitive without any compromise on quality. The patented manufacturing process known as Press-Polishing, akin to compression moulding, allows the manufacture of lenses of a far better quality than the ones provided by Far East manufacturers but at a fraction of the costs of the lenses manufactured in Europe. This in turn puts them in a unique position to exploit the opportunities that should develop in 2009.

Non-polarised lenses

Polaroid Ultrasight XI polarised lenses

With sales in the "luxury segment" rapidly declining, **Polaroid Eyewear Products** are positioned as "good value for money". **Polaroid Eyewear** is already exploiting new opportunities by re-launching Polaroid Eyewear in America with their new lens, ***Ultrasight XI***, a 1.6mm thick polarised lens developed by the R&D Department also located in Dumbarton.

Polaroid Eyewear

www.polaroideyewear.com

From l to r: Graeme Herlihy (MD ENGEL UK), Barry Coughlan (MD Rosti UK), Dr Peter Neumann (ENGEL CEO)

ENGEL UK, the latest company to become an SPRA Corporate Member, recently supplied **Rosti Technical Plastics UK** with an *ENGEL victory 4550/600 tech* injection moulding machine for the Larkhall plant, bringing the complement of ENGEL machines in the Scottish plant up to ten, out of a total of 47. This machine carries the nameplate ***No 70,000*** and represents a significant milestone for the Austrian based company in their 50 year existence. **Barry Coughlan**, MD of Rosti UK, said "We are delighted with the performance of the machines and service level offered from ENGEL. The tie-barless solution fits with our lean model, providing greater flexibility with our moulding operation.

ENGEL

www.engelglobal.com

Rosti

www.rosti.com

INSTITUTE NEWS

On 10 February, the **SPRA** organised a **Membership Clinic** at **Napier University** to allow potential members to find out more about the **Institute of Materials, Minerals and Mining** and to advise existing members how to go about upgrading their membership and seeking professional qualifications. The clinic was conducted by **Sarah Boad**, *National Coordinator* and was attended by students at **Napier University**, SPRA members and members of the **Scottish Association for Metals (SAM)**. One immediate outcome was recruitment of 7 student members.

RECYCLING GRANTS

The **Scottish Government** has made available £5 million from its Mixed Plastics Capital Grant Programme to help foot the bill for companies setting up new plastics recycling facilities, capable of sorting, separating and reprocessing more of the 200,000 tonnes of plastics waste generated by households in Scotland each year. The scheme, administered by **WRAP Scotland (Waste & Resources Action Programme**, will provide funding to cover up to 30% of the capital set-up costs for recycling plants.

Ian Gulland, WRAP Scotland Director, said "*At the moment, only 15,000 tonnes of plastics used by householders is collected for recycling in Scotland, with the majority of that being sent to Asia for processing. This funding package will help develop plastics processing and recycling facilities, transforming Scotland's approach to managing plastic waste.*" In addition to dealing with plastic bottles, the new facilities will be expected to handle mixed plastics such as yoghurt pots, margarine tubs, salad bags and plastic film. Businesses and organisations are being asked to submit applications for the Grant Programme, outlining recommended locations and technology, and researched sources for feedstock and markets for the processed polymer. Applications will close on Friday, June 26.

For more details, guidelines and application form, click **here**

WRAP Capital Grants Team

+44 (0)129 5819900

capital.support@wrap.org.uk

www.wrapscotland.org.uk

NEWS

News from the Scottish Plastics and Rubber Association

June 2009

Features in this issue:

NEW SPRA PRESIDENT

I am delighted to take over the **Presidency** of the **SPRA** from **Les Rose** and, in doing so, wish to thank him for all his efforts over the last two years. My father, Donald, was Chairman of the Plastics and Rubber Institute, Scottish Section during the 1970s, so there is a bit of family history here for me as well !

There can be no doubt that our industry is facing some real challenges this year. Orders for many companies are down, jobs are being lost, cash is tight and none of us really know how long it will take to improve. I believe, however, that our industry in Scotland, whilst not as large as before, has great diversity and retains significant expertise in many areas. Many of our companies compete strongly in markets around the world and further export opportunities exist in new emerging markets. The SPRA, through its affiliation with the **British Plastics Federation**, can help direct companies towards further information and assistance in this area.

Like any organisation, the **SPRA** needs active support from its members in order to develop and flourish. Come along to one or two of our technical meetings, which we run regularly through the year, meet some industry colleagues and let us know what's important to you - we are listening!

My aims for the SPRA for the term ahead are:

- **To broaden the appeal of the SPRA across the plastics and rubber sectors and encourage new members.**
- **To encourage our members to highlight their interests or concerns to help the SPRA develop further.**
- **To highlight the strengths of our member companies to prospective clients beyond Scotland.**

Fergus Hardie , SPRA President

Fergus Hardie*, a long serving member of the SPRA Council and Vice President in the last year, is* ***Managing Director*** *of* ***Hardie Polymers*** *in Glasgow, having taken over from his father, Donald, in 1998. Prior to that, Fergus had a career in the hotel trade, having studied hotel management and worked for British Transport Hotels from 1980 and then with Thistle Hotels, Sheraton and other Groups in London, Manchester, Zurich and the United States. After moving into sales in the U.S he returned to Scotland and joined* ***Hardie Polymers*** *in 1987. Between 1995 and1999 and with the Scottish market booming, Hardies developed the strongest market share in the UK for sales of injection moulding machines (for* ***Demag Hamilton****) and engineering polymers (for* ***GE Polymerland****). Following contraction in the Scottish market, Fergus has overseen a move into new export sales and now supplies raw materials into Eastern Europe and India.*

CARCLO TECHNICAL PLASTICS

Continuing the series on Corporate Members, this issue features ***Carclo Technical Plastics,*** *another founder Corporate Member.*

Carclo Technical Plastics, Harthill

Carclo Technical Plastics (CTP), a division of **Carclo plc** and another of the original **SPRA Corporate Members**, has one of its main moulding operations at Harthill, Lanarkshire, with a total of 27 moulding machines and over 100 staff. Over the years, **CTP** has increasingly concentrated on precision moulding and is a leading exponent of designing and moulding high tolerance gears, with the aid of its prototyping tooling system, Q-Drive, which uses hardened steel inserts as a rapid cost-effective bridge from concept to low volume

production and finally full production.

One of the moulding shops at Harthill, with 'cleanroom' machines on the right

Having made an exit from low margin automotive moulding in 2008, Carclo is capitalising on the optical markets, with lenses and high performance LED lighting, and the growing medical industry.

Over the last few years Carclo has invested in innovation and emerging technology, in its own R&D capabilities and in collaboration with universities, and a couple of projects have already borne fruit. Moulding of poly(vinyl alcohol) (PVOH) has been developed to produce water soluble capsules for drug delivery, mainly to replace gelatine. PVOH gives a more reproducible product with less deterioration in hot and humid storage conditions.

The development of inkjet technology for the deposition of conductive metals and other materials on non-porous substrates has provided a low cost solution for products such as RFID tags, smart packaging and display applications. **Conductive Inkjet Technology** is now an independent division of **Carclo plc**.

To meet the needs of global customers for local production and expertise and efficient communication with local customer's engineering staff, as well as capitalising on lower labour costs, CTP introduced state of the art facilities in the Czech Republic in 2001 and 2004 and more recently in India. The Indian plant will not be competing with the local industry on low cost mouldings but concentrating on precision components.

www.carclo-ctp.co.uk

carclo
technical plastics

HIGH PERFORMANCE THERMOPLASTICS

Stepping in at late notice when the original speakers withdrew from the March meeting on Engineering Thermoplastics, SPRA member, **Peter Burke** (left), and his **Ticona UK** colleague, **David Almond**, presented a number of case studies to illustrate the high performance and versatility of ***Vectra***®, the liquid crystalline polymer (LCP).

Compared to other very high performance thermoplastics, ***Vectra***® combines high stiffness, heat resistance and chemical resistance with low melt viscosity which makes it ideal for intricate thin-walled mouldings. Many of Vectra's applications have been metal replacement. In the award winning Syclix surgical instrument, a long thin moulding in Vectra was selected over the first concept in steel wire in the operating mechanism. In an airborne radar connector block, the original material selected, polyetherimide (PEI), was causing problems with flash due to the high melt viscosity and associated high injection pressure. The superior mouldability of Vectra (reducing injection pressure from 60 MPa to 9 MPa) eliminated the flash problem while still meeting the broad operating temperature range (-50 to +200 deg C), dimensional stability and fire performance.

Syclix surgical instruments
(photograph courtesy of Ticona UK)

(photograph courtesy of Ticona UK)

An optics block in a gas detector was redesigned to reduce weight. From the short list of possible materials, polyphenylene sulphide (PPS), thermoplastic polyester (PBT), polyamide (PA) and Vectra (LCP), **Vectra A130**, with similar shrinkage in length and cross, was best for stiffness, dimensional accuracy and coefficient of thermal expansion. However initial mouldings revealed a weakness at the base of one of the thin legs, which was found to be due to voiding from localised underpacking. Reducing the wall thickness at the base of the leg cured the fault.

One of the most interesting applications of ***Vectra*** is for bakeware, both industrial and domestic. With its excellent heat resistance, chemical resistance, fire performance and non-stick qualities, Vectra makes a feasible alternative to the metal tins currently used. Metal tins are either coated with silicone or PTFE to make them non-stick but these coatings have to be renewed. In addition to the longer life, lighter weight, good impact strength, non-buckling qualities, reduced noise and design freedom, the characteristics of *Vectra* that make the economic difference are energy saving associated with reduced baking time, faster surface cooling and the option of transferring from freezer to microwave pre-heat to oven. The constant tare weight is another attraction.

(photograph courtesy of Ticona UK)

Medical grades of ***Vectra***, manufactured in a separate production line, can provide complete traceability of each batch.

A special grade of **Vectra** has been developed for extrusion and thermoforming applications.

01952 213 456
peter.burke@ticona.co.uk
www.ticona.co.uk

Ticona

Peter Burke and David Almond in informal discussions with SPRA members after the presentation

SCOTLAND'S RUBBER AND PLASTICS HERITAGE

To trace the evolution of the rubber and plastics industry in Scotland, who better than **John Campbelton** who started as a laboratory assistant in **North British Rubber (NBR)** in 1954 and retired 40 years later as **Technical Group Manager** of **Royalite Plastics**, the company that emerged from NBR.
In his presentation at the April meeting, John covered the early history of NBR before charting the birth and growth of **Royalite Plastics**, illustrated with personal reminiscences.

The Origins
In the early days of the rubber industry, Scottish pioneers, including **Charles McIntosh** with his rubberised fabric that transformed rainwear and **R W Thomson**, inventor of the pneumatic tyre, had contributed much to the emerging rubber industry. However it was an American, **Henry Lee Morris**, who made the greatest impact. He had spotted an opportunity by

recognising that **Thomas Hancock's** English patent for vulcanisation of rubber did not apply to Scotland and he was free to exploit **Charles Goodyear's** US Patent in Scotland for the market in Europe. In 1855 he had hoped to set up a manufacturing plant in Glasgow but failed to find any suitable premises. He did locate a disused silk mill in the Fountainbridge area of Edinburgh beside the Union Canal and the following year he brought in machinery and skilled labour (mostly female) from America and started to manufacture rubber footwear.

NBR: The Early Years

The **North British Rubber Company** (deriving its name from the custom at that time to refer to Scotland as North Britain) was established in 1856 and, over the next 50 years, NBR diversified into other products manufactured from rubber, including hose, belting and solid rubber tyres, although footwear still accounted for 50% of production in Edinburgh. 1910 saw the introduction of golf ball manufacture and the following year vulcanite was added to the portfolio. The First World War presented further opportunities for the 6000 strong workforce through diversification into barrage balloon fabric, trench footwear and gas masks, a pattern that was to be repeated for the 1939-45 War, when war materials constituted almost 80% of production. During the Second World War NBR developed a strong technical liaison with **US Rubber**, which had been formed in 1892 by the amalgamation of eight American companies in order to compete with the other rubber giants, Goodyear, Firestone and General Tire. To secure a supply of natural rubber, US Rubber had bought rubber plantations in Sumatra and later acquired plantations in Malaya and Liberia. In 1946 US Rubber took a controlling interest in NBR and they acquired the Arrol Johnson plant at **Heathhall**, Dumfries for the production of belting, footwear, golf balls and rubber underlay.

NBR: The Post-War Years

In Edinburgh, pneumatic tyre manufacture had become a major part of the business, along with other automotive products such as car mats. In the 1950s NBR still had a workforce of 3000 in Castle Mills and, like other large employers, the company operated as a large family, with access to doctors, nurses and dentists on site. The site had a strong characteristic smell, not just the smell of rubber being processed but Fountainbridge also had a sweet factory, a curious mixture of odours that greeted staff on their way to work. Because workers were paid only for 'good' output, reject tyres were thrown in the nearby disused canal until the Edinburgh Council put a stop to that and the company introduced its rubber reclaim department. Likewise the super strong workers stripping hot water bottles from their formers enjoyed the challenge of throwing reject product up onto the rafters until the extra weight began to affect the roof's stability. Before today's safe working practices, fires were commonplace at Castle Mills. The last extensive one in 1969 accelerated the move to Newbridge and the eventual closure of the Fountainbridge site in 1973.

The Plastics Beginning

Although predominantly manufacturing in rubber, in the immediate post-war years, the company kept an eye on all polymer developments. PVC was introduced to the hose department, including recycling even then. PVC plastisol slush moulding in the footwear department was eventually transferred to Heathhall and the company also dabbled in polyethylene. However, in 1956, its interest in a brand new thermoplastic, acrylonitrile-butadiene-styrene (ABS), allied to the emerging field of polyurethane foam, was the key to the next major development. With a trend to soft fascia in cars, the original product of polyurethane foam with a plasticized PVC skin gave problems of fogging of windscreens. John and his colleagues in the laboratories developed a flexible ABS version that avoided the fogging and started a long and profitable association with the transport industry.

For initial trials, a rubber calender was modified to reach temperatures of 180 deg C but sheet thicknesses were limited to less than 0.5 mm and sheet had to be plied up in large multi-daylight presses (2.4 m x 1.8 m) and embossed using rubber blankets, taking over 3 hours to produce 80 sheets. The ABS sheets, with the trade name ***Royalite***, were heated, draped over a mould and vacuum formed before being trimmed and loaded into a second mould where a mixture of polyol and isocyanate was applied before the final foaming stage in a horseshoe oven. The first crash pads produced at Castle Mills were for the 1957 Vauxhall Cresta. Soon production outstripped the capacity of the calender at Castle Mills and a neighbouring PVC company, Duraplex Industries at Slateford, came to the rescue by hiring out their 4-bowl calender, which could produce thicker sheet and had in-line embossing. By the early 1960s, production had accelerated to 20,000 units per week for all the well-known UK brands, Vauxhall, Ford, Rover, Humber, Hillman, Jaguar and Lotus and later to Citroen, Mercedes and Volkswagen on the Continent.

Calendering of ABS flexible sheet for crashpads at Castle Mills in 1957

Royalite Rigid Sheet

1959 saw the beginning of rigid part thermoforming with an order for interior door linings and other components for the new Austin taxi, built by Carbodies Ltd. For the next 50 years Royalite supplied the iconic black London taxi with 2500 - 3500 cab sets per year.

About the same time Royalite entered the aircraft interior market with a flame retarded grade (FR) for seats and interior cladding. In the early days Royalite was supplied to Vanguard, Viscount, Comet and Boeing 707 models and eventually to all major airlines.

New Site

As demand for crashpads and Royalite sheet increased, plans were drawn up to move production to a green field site at Newbridge on the outskirts of Edinburgh. The main facility at Newbridge was a new tyre factory but Royalite production was in an adjacent, but separate, unit based around a new 4-roll inverted-L calender with an internal mixer and holding mills. Production at Newbridge started in 1967, continuing to produce flexible sheet for crashpads as required and the full range of rigid Royalite grades. When the UK demand for crashpads declined, rigid part manufacture was transferred from Castle Mills to Newbridge in 1971 but sister plants in Germany, France and Italy continued with flexible sheet. When car manufacturer BLMC established a factory nearby in Bathgate, Royalite had to reconsider their wage structure but staff loyalty, maintained from NBR days, paid off during the energy crisis in 1974 when, forced into a 3-day working week pattern, the workforce succeeded in producing more sheet in 3 days than they had been doing in 5.

The next major development, in 1979, was the introduction of extrusion lines with the capability of manufacturing sheet up to 12 mm thick without laminating. Eventually there would be 6 extrusion lines at Newbridge, producing not only PVC and ABS sheet but also

polyethylene and polypropylene. Royalite sheet from Newbridge ended up in a range of diverse markets, in addition to automotive applications and the aircraft industry. Other outlets included buses, caravans, safety helmets, wall cladding, canoes, computer housings, luggage, play equipment, doors and baths.

Bodyscanner housings for hospitals were constructed from a special FR grade of ABS. The in-house thermoforming facility, which had pioneered the process of high pressure forming was moved to Livingstone and eventually sold off as a management buy-out in1995.

Ownership

Although the tyre factory at Newbridge had been sold to **Continental Tyres** in 1979, **Royalite Plastics** remained as a Uniroyal company until it was sold to **Polycast Technologies** in 1986. Two years later **British Vita** bought the Newbridge and Italian facilities, thus eventually severing all links with the US after 130 years. In 2005 Royalite was back in US ownership when **Texas Pacific** bought British Vita and the Newbridge plant is now trading under the brand name, **VitaSheet Group**. Sadly the calender, which had been the lynch pin at Newbridge, had its last production run in 2006, 39 years after it was installed.

Throughout John's presentation it was demonstrated over and over again that progress in a company requires so many factors to come together, visionaries who can see and grasp market opportunities, technical know-how, teamwork and looking after the workforce. These are just as important today as they were 150 years ago.

www.vitasheet.com

For more information on the History of the North British Rubber Company
Go to this fascinating website constructed and run by retired staff
http://www.nbrinklies.com

For John Campbelton's booklet on the 50 years of Royalite Plastics
click here

NATIONAL MUSEUMS SCOTLAND MATERIALS COLLECTION

Also at the April meeting, **Katarina Grant**, *Assistant Curator in the Science and Technology Department* at the **National Museums of Scotland (NMS)** in Edinburgh, talked about the Materials Collection at NMS. The Collection dates back to the early days of the Industrial Museum, which was founded by Prof George Wilson in 1854. Prof Wilson was an early exponent of networking and he persuaded expatriate Scots from around the world to send back specimens for the national collection. Today the Materials Collection at NMS is one of the strongest in Europe, particularly in chemicals (over 1500 objects) and the mining and minerals processing industry, which includes shale oil distillation and steel manufacture. The collection also covers manufactured objects to illustrate the use of specific raw materials.

However it has become apparent that there are significant gaps in the collection since the 1960s, particularly in more modern materials such as plastics and rubber. NMS is now actively seeking examples of raw materials, semi-finished products and finished goods to chart the development and exploitation of polymeric materials in Scotland in recent years. NMS is also looking for examples of machine tools and moulds used in the manufacturing process, particularly if these have been manufactured in Scotland.

www.nms.ac.uk

Expanded polystyrene plantholder donated by SCA Tuscarora, Livingston

The SPRA has been collaborating with NMS to identify companies that may be able to contribute to the Materials Collection and Katarina is in active discussions with a number of companies in the plastics and rubber sector. However it is important that other companies come forward with samples and background so that the rich heritage of plastics and rubber manufacture in Scotland is preserved for the activities of the museum service in education, research and conservation.

Companies wishing to discuss possible donations for the Materials Collection should contact **Katarina Grant** at

0131 247 4390
k.grant@nms.ac.uk

SPRA AGM

At the SPRA Annual General Meeting in May, **President Les Rose** reported that the SPRA had enjoyed another successful year. Membership numbers have been maintained. A well-attended programme of seven technical meetings had been delivered, covering diverse topics such as *Advanced Injection Moulding, Designing with Plastics, Recycling Plastics, Polymers in Medicine, Engineering Thermoplastics, Scotland's Plastics and Rubber Heritage* and *Environmental Sustainability*. The annual Dinner Dance was a memorable event, considering the economic uncertainty. All this was achieved whilst retaining a strong balance sheet.

Council Members have represented the SPRA on a number of bodies, including the ***Institute of Materials, Mineral and Mining, Cogent Sector Skills Council, Polymer Innovation Network*** and ***Chemical Sciences Scotland***. The SPRA provided two scholarships to students on polymer engineering and design programmes at Edinburgh Napier University and sponsored two teachers on the Polymer Study Tour.

Fergus Hardie, Managing Director of **Hardie Polymers**, was elected as **President** and **Barry Coughlan**, Regional Director of **Rosti Technical Plastics**, as **Vice-President**.

SPRA Council Members 2009-10

Left to Right: **Andrew Russell, Diane Paterson** (Teacher Representative), **Sheena Geddes** (Membership Secretary), **Charlie Geddes** (Honorary Secretary), **Barry Coughlan** (Vice-President), **Fergus Hardie** (President), **Mike Barker** (Honorary Treasurer), **Colin Hindle** (Education Officer), **David Barlow** (Social Convener), **Les Rose** (Immediate Past President), **Ralph McNeill**
Inset: **Richard Donnell, Tom Campbell** (Industrial Liaison Officer)

CHEMICAL SCIENCES SCOTLAND CONFERENCE

There was a real buzz of confidence and optimism at the first **Chemical Sciences Scotland** conference, held at Dunblane in March and attended by over 160 delegates from 78 companies and organisations.

Dr Sandy Dobbie was able to announce that the chemical sector continues to play a major role in the Scottish economy with annual sales now £9.3 billion and £2.2 billion in exports. After upbeat remarks from **Jim Mather MSP**, Minister for Enterprise, Energy and Tourism, **Prof Peter Tasker**, University of Edinburgh, gave his vision on how the research community should be best organised and **Tony Crotty**, CEO at Ineos, affirmed his commitment to the Grangemouth operation.

At the lively break-out sessions on ***Investment, Innovation, Reputation*** and ***Skills***, delegates threw up many ideas on how the chemical sector in Scotland can continue to move forward. One major outcome from CSS since it was launched in 2007 is to create 31 PhD studentships working on industrially initiated projects. Innovation through collaboration and cross-sectoral cooperation holds the key to the future of the chemicals sector but the image of the industry has to be improved. Biotechnology and biofuel from organic waste are the next big challenge for the chemicals sector in Scotland.

For more information on the Conference click here

For information on Chemical Sciences Scotland click here

Chemical Sciences SCOTLAND

INSTITUTE NEWS

Colin Hindle, SPRA Education Officer and Lecturer in Polymer Engineering at **Edinburgh Napier University**, has been elected to the Council of the **Institute of Materials, Minerals and Mining** as Regional Councillor for Scotland, representing the interests of the **Scottish Association for Metals (SAM)**, the **Mining Institute of Scotland (MIS)**, the **Scottish Packaging Society** and the **International Clay Technology Association Scotland** as well as **SPRA.** Colin takes over this role from **Graham Smith** (MIS) who has been Regional Councillor for the last 8 years.

Also elected to the IOM3 Council is **Dr John Wilcox**, a former SPRA Council Member and currently Secretary of **EngineeringScotland**. John will be representing Professional Members on the IOM3 Council, a position occupied for the last 4 years by **Dr Mike Barker**, SPRA Hon Treasurer.

NEWS

News from the Scottish Plastics and Rubber Association

September 2009

Features in this issue:

PLASTICS: PERFORMANCE AND SUSTAINABILITY

In his usual provocative style, **John Sale** had no problem in inviting audience response when he tackled the emotive subject of '***Plastics: Performance with Sustainability'*** in the presence of SPRA members, some non-members and teachers on the Polymer Study Tour. Since the early 1960s John has been involved with the plastics industry, and plastics packaging in particular, first with **ICI** and then with **British Polythene Industries**.

His presentation started with definitions of 'sustainability' and a plea to use the term 'environmentally responsible' instead of 'environmentally friendly' because nothing is really environmentally friendly when talking about the needs of society.

John then proceeded to explode a number of myths surrounding plastics packaging, such as:

MYTH	REALITY
Plastic packaging is a major user of valuable earth resources, particularly oil	Plastic products save resources by reducing product damage, spoilage and waste. The average shopper uses more oil driving to the supermarket than is used in all the plastic packaging that protects their goods.
Plastics have to come from oil	Today plastics are conveniently derived from oil and gas but, in the long term, as the supply/demand balance of oil and gas tightens, the carbon and hydrogen for plastic can come from sources such as biomass and ultimately from abundant resources in the atmosphere.
Degradable products are always environmentally friendly	Products such as paper degrade to produce greenhouse gases and contributes to global warming.
Plastics are never recyclable	The UK plastics packaging industry recycles 300,000 tonnes of plastic film and 100,000 tonnes of plastic bottles every year.
Plastics leach dangerous chemicals into our food	All food contact packaging meets strict international limits. Polyethylene contains no toxic materials. Most landfills are lined with plastic to prevent leaching.
We should tax plastic packaging to reduce use and prevent litter	Plastics packaging is a very small percentage of litter (less than 1%) and is already taxed under EU Packaging Waste Directive then again at landfill. Litter is a social problem and requires education. A tax on carrier bags in Eire actually increased the total amount of plastics used (+300%) because people had to buy bin liners and refuse sacks to replace carrier bags..

John also took issue with the misinformation spread by the media. In the recent debate on single use plastic carrier bags, the figure of 17 billion bags per year is frequently quoted but this figure was plucked from the air by one journalist without bothering to check it. The true figure is nearer 1 billion bags.

Efficiency of Plastics Packaging

Weight of packaging to contain 100 g of packed product

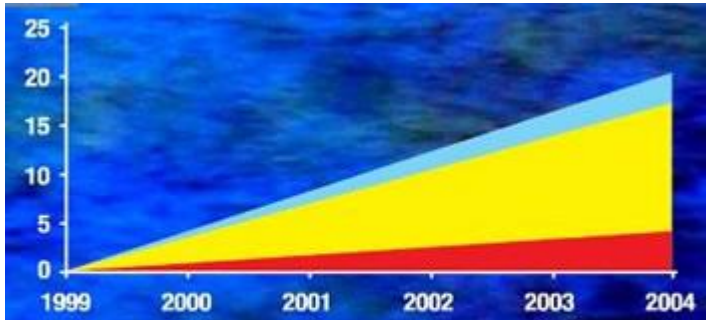
Packaging is a major application of plastics because of its many advantages in prolonging the life of food and reducing waste. The audience raised the issue that some food, particularly fruit and vegetables, are over packaged but John explained that research has shown that there is 27% more wastage if fruit is not sealed in a tray.

Although not generally recognised by the public, recycling of plastic packaging can be a successful operation, particularly with bottles but John explained the dilemma for recyclers. Manufacture of plastics raw materials ties up around 100 MJ/kg of energy and processing into packaging adds another 20 MJ/kg. If the energy expended in the collection, washing and reprocessing packaging waste exceeds 120 MJ/kg then, in energy terms, it would be better to use virgin materials. With other packaging materials having higher intrinsic energy content (1200 MJ/kg for paper and 1600 for metal) energy consumption in recycling is less of an issue.

John believes that it does not make sense to try to recycle all packaging waste and that energy from waste has an important role to play. It is significant that Denmark, the country that started the wind energy industry, has now abandoned that form of energy because of dubious pay-back economics and is concentrating on energy for waste, which now supplies half of Copenhagen with hot water.

Plastics offer many advantages over alternative materials for packaging, not least being the reduction in weight of packaging per weight of product. In a truckload of soft drinks in glass bottles, 36% of the load is glass. With plastic pouches, only 3.5% of the load is packaging.

In the last 10 years household consumption has increased by 20% but plastics in packaging has increased by only 4%, a testimony to the efforts made by plastic packaging designers to reduce packaging.



Without plastics the weight of packaging would increase by a factor of 4, packaging volume would increase by 60% and the energy consumed by 50 %.

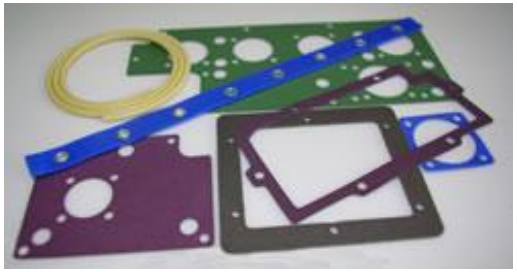
In other markets, such as transport and medicine, plastics continue to offer more sustainable options, conforming with the criteria for sustainability -- social progress, prudent use of natural resources, protection of the environment and stable levels of economic growth and employment.

CALEDONIAN INDUSTRIES

Continuing the series on Corporate Members, this issue features ***Caledonian Industries.***

Caledonian Industries Ltd, formerly **Caledonian Ferguson Timpson**, an SPRA Corporate Member for 7 years, was founded in 2000 by **Alan Thornton**, after he acquired two long established plastics companies, **Caledonian Industries**, specialists in precision foam packaging, and **Ferguson and Timpson**, renowned for their sealing and gasketing products, both operating in Hillington, Glasgow. **Caledonian Industries** now considers itself a materials technology and manufacturing organisation, balancing the traditional foam packaging, noise control and engineering plastics business with innovative ventures.

In 2003 Caledonian installed the first **Dynamic Cast Moulding System** (DCMS) for the moulding of semi-finished PEEK tubes, a second following later in 2007. The novel DCMS process produces near-net shape tubes with little or no moulding stresses in filled and unfilled grades of PEEK. CNC machining of very high performance thermoplastics such as PEEK, PPS and PTFE for rings and seals for the oil and gas industry further compliments the moulding technology.



gaskets

biodegradable foam

Caledonian Industries deals with a range of elastomeric foam materials not just for specialist packaging applications but also for acoustic and vibration control. Production facilities include foam slitting, die-cutting, lamination and sub-assembly operations. Gaskets in either conductive elastomers or wrapped in conductive fabric are supplied for EMI/RFI applications. CIL has also pioneered a water soluble, biodegradable foam packaging.

Today **Caledonian Industries** is supplying into a wide range of markets including packaging, electronics, telecommunications, automotive, aerospace, oil and gas and defence. To promote the engineering plastics business for the Oil & Gas sector, Caledonian Industries exhibited at the Offshore Europe Exhibition in Aberdeen in September 2009.

0141 882 4691

ask@caledonian-group.co.uk

www.caledonian-group.co.uk

POLYMER STUDY TOUR 2009

Thanks to some last-minute registrations after concerted efforts to publicise the course, the annual 4-day residential course for teachers, held at **Edinburgh Napier University** at the end of June, attracted an encouraging mixture of design & technology and science teachers from across the UK but mainly from Scottish schools.

The aim of exposing teachers to various aspects of the chemistry, engineering and design associated with plastics and rubber were well achieved through lectures and group discussions from **Colin Hindle** and his Napier team as well as guest lecturers --- **Colin Williamson** on ***'History of Plastics***', **John McLoughlin** on '***Plastics Product Design***', **John Sale** on ***'Environmental Sustainability*** and **Diane Aston** on ***'IOM3 Schools Affiliate Scheme'.***

First Prize for Rocket Car Race

The ice breaker event, in which teams had to construct a rocket car from a coke bottle, vacuum formed chassis and injection moulded wheels, was approached with enthusiasm but failed to achieve record breaking times. The enthusiasm was channelled into more satisfying results in the hands-on practical sessions covering polymer processing, materials testing and plastics identification.

Booby Prize for Rocket Car Race

Mill mixing of a rubber compound

Getting to grips with injection moulding

More injection moulding

Extrusion

Factory Tour at Carron Bathrooms

Factory tour at Carron Phoenix

The second aim of the Polymer Study Tour is to demonstrate to teachers the exciting career opportunities in the industry by visiting three typical polymer companies. This year the teachers visited **Bausch & Lomb** to see injection moulding in the production of contact lenses, **Carron Bathrooms** to view vacuum forming and **Carron Phoenix** to see a rare application of polymerisation in the process of casting kitchen sinks. Both of the last two companies have emerged from the **Carron Ironworks**, which was founded 250 years ago. Teachers were impressed by the factory tour in all 3 companies.

Colin Hindle addressing teachers and guests at the Course Dinner

Teachers then enjoyed a relaxing evening at the course dinner, which was also attended by SPRA members. The chief guest was **Mark Spofforth**, Master of the **Worshipful Company of Horners**, the main sponsors of the Polymer Study Tour. Once again SPRA sponsored two teachers, **Mrs Mairi Harper**, Design & Technology teacher from Grove Academy, Dundee and **Mr Andy Boswell**, Chemistry teacher from Auchmuty High School, Glenrothes.

Mark Spofforth addressing the company

Companies are urged to consider sponsoring a teacher, perhaps from a local school, for the 2010 Polymer Study Tour. As the economy recovers and companies start to recruit again, this could prove to be £750 well invested.

For details of enrolment and sponsorship for Polymer Study Tour 2010 contact Colin Hindle
C.Hindle@napier.ac.uk

FANTASTIC PLASTIC

To increase the awareness, at school level, of the potential of polymers, the SPRA organised a schools lecture/demonstration ***"Fantastic Plastic"***, delivered by **Prof Averil Macdonald**, **Reading Universit**y on Tuesday 01 September 2009 at **Edinburgh Napier University** to over 370 pupils and teachers from 11 schools, from as far as Dundee, Selkirk and Barrhead. In introducing the speaker, **Fergus Hardie**, SPRA President, explained that, in supporting the its aim to support the teaching of polymers in schools, this was the first time that the SPRA had organised a lecture specifically for school pupils and the first time that Prof Macdonald had given the lecture in Scotland.

Prof Macdonald began by outlining the three challenges she had set herself:

1. that the audience would go away having been convinced that plastic is fantastic.

2. that when the audience got home, they could not resist telling somebody what they had learned about polymers.

3. that something she said will have a direct impact on the future of some of the audience.

Fergus Hardie, SPRA President introducing Prof Averil Macdonald

She then disclosed that the real title of her talk was ***"How to make your first £million"*** to emphasise the potential of implementing a knowledge of the science and engineering associated with polymers.

Prof Macdonald demonstrating the properties of gels

Prof Macdonald then captured the attention of her audience by cataloguing the many applications of plastics that have impacted on our lives before turning her attention to how to capitalise on some of the less publicised applications based on the unusual properties of polymers. First she demonstrated how hydrophilic polymers can soak up large quantities of water to produce gels, before demonstrating that, although these gels could be poured, the nature of the polymer chains allowed the gels to be cut cleanly with a pair of scissors and the cut gel showed elastic recovery. The principle of polymer gels is applied in the 8 million disposable nappies used every day in the UK, when inexpensive polymer fibres are coated with a hydrophilic polymer, a good example of combining two novel ideas to produce a winning product. Similarly the challenge of hygiene associated with hospital laundry has been solved by using water-soluble plastic bags, which are impregnated with detergent, filled bags being introduced to the washing process without having to be opened. Her third example used the other end of the polymer polarity spectrum, with oil absorbent polymers used to soak up oil spills, the really novel aspect being how the oil could be recovered, and reused, from the resultant gel.

She then showed how addition of borax to a poly (vinyl alcohol) gel resulted in crosslinking and more usable materials for applications ranging from cosmetics such as hair gel and lip gloss to novelty toys such as 'aliens'. Judging by the murmur round the auditorium, Prof Macdonald, not for the first time, had connected with her audience by showing how polymers contributed to childhood experiences. The excitement level rose as she started to explain how conducting polymers would impact on society in the future. The radio frequency identification (RFID) tags based on conducting polymers would not only revolutionise shopping through faster payment systems and improved stock control but also introduce new concepts of marketing and appliances in the home such as the 'internet fridge'. The excitement grew as she explained the role of polymers in the flat TV screens, as thin as 3 mm, flexible and capable of showing two images, by viewing from different angles.

Flexible flat screen

The buzz as the pupils departed confirmed that Prof Macdonald had hit all the right spots and had succeeded in fulfilling her challenges. The success of the event was later confirmed when teachers provided some excellent feedback on a venture which hopefully can be repeated next year.

Feedback

"I though that Prof Macdonald's presentation was excellent. It was pitched at the right level for the audience and went down very well. The students from our school that I spoke to after thoroughly enjoyed it."

"Our pupils and staff enthused about it when they came back! The speaker was excellent and the content was pitched at the correct level for what we want."

"The lecture on Fantastic Plastics yesterday was excellent! St. Luke's thoroughly enjoyed the presentation and I am sure all other schools did as well. During the presentation I noticed the silence in the audience as everyone was listening to the talk. This is unusual for a group of school pupils and speaks volumes about how interested they were in the topic.
The speaker was very entertaining as well as informative and gave an excellent presentation. The content was exactly appropriate for the audience which was S4 to S6."

"My troop certainly enjoyed it and I'll be keen to repeat this with another group next year if possible. The first half of the talk was pitched at the right level for Standard Grade Chemistry (S4 is probably the best at this stage of the year) and the second half where she focused on future applications really seemed to engage to pupils."

"Speaker was excellent, content was very appropriate for S5/6 product design, venue and publicity/communication excellent and timeous."

To find out more about the "Fantastic Plastic" Lecture/Demonstration, including experimental details of the demonstrations,

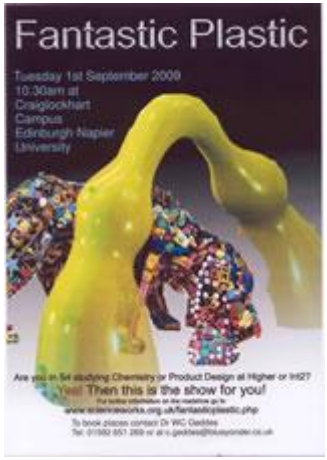
click here

SPRA POSTER COMPETITION

Mr Tommy McKinlay, Head of Design at Braes High School, presenting the cheque to Joanne Penman and Holly Stevenson, two of the winning team.

Pupils studying Graphic Design in Year 5 at **Braes High School**, Falkirk, rose to the challenge of a competition set by the SPRA to design a poster to publicise the Schools Lecture/Demonstration ***"Fantastic Plastic"***.

Working in teams, under the supervision of SPRA Council Member, **Mrs Diane Paterson**, the pupils quickly produced 8 designs. The winning team of **Mark Gavin, Joanne Penman** and **Holly Stevenson** shared the prize money of £75.



Winning poster design

CLIMATE CHANGE AGREEMENT

After two years of lobbying, the **British Plastics Federation** finally achieved the establishment of the **BPF Climate Change Agreement** when the Finance Act received the Royal Assent in July. BPF has entered into a Climate Change Agreement (BPF CCA) with the Department of Energy and Climate Change (DECC) specifically for the Plastics Sector. This will allow companies with a qualifying site to claim an 80% discount from their energy supplier on the Climate Change Levy (CCL) that they pay on electricity and LPG. The BPF CCA has the potential to save the UK plastics industry over £50 million per annum in climate change levy payments until the year 2017. The time scale for benefiting from this scheme from 2010 is extremely tight. Companies who respond quickly may benefit as early as 01 October 2009. Those that miss the final deadline of 31 October will not be able to join until April 2011. Companies taking part in this scheme are at liberty to use any advisor/consultant to help prepare applications but BPF Energy (a company set up to administer the scheme) is working with Inenco. To help companies unravel the intricacies of the scheme, BPF has organised two free surgeries in September.

BPF CCA helpline: 01253 785 069

www.bpf.co.uk/CCA/Default.aspx

BILLION FLYING HIGH

Long-standing SPRA member and regular presenter at SPRA technical meetings, **Peter Kirkham**, Managing Director of **Billion UK,** chose an unusual way to celebrate his 50th birthday by undertaking a tandem sky-dive and parachute jump, or, as Peter described it, attempted suicide. The jump consisted of sky-diving the first mile and and a half and then more gentle progress by parachute in the second mile.

The SPRA looks forward to Peter 'dropping in' to deliver one of the presentations at the November meeting on ***"Multi-material Moulding"***, an event sponsored by Billion UK.

PLASTICS AND RECOVERY

A recent report ***"Economic Crisis: Impact on the Plastics Industry and Opportunities"***, issued jointly by the European plastics converters organisation, EUPC, the plastics and rubber machinery association and PlasticsEurope, outlined how the plastics industry can contribute to gearing up for economic recovery. The European plastics industry has already demonstrated how it contributes to long term solutions and sustainability through insulation, renewable energy, drinking water preservation, healthcare, packaging, transport, electronics and sport and leisure. It argues that, for short term recovery, priority should be given to tax/financial incentives and regulatory tools to create a climate for accelerating innovation and the recovery process. The industry is asking regional, national and European authorities to:

enhance access to financing;

improve cash flow and tackle late payments;

boost innovation;

make environmental policy integral to recovery plans;

avoid negative impacts of the EmissionTrading System;

recast public procurement legislation and guidelines;

avoid further legislative burdens on businesses

To view the report click here

News from the Scottish Plastics and Rubber Association

December 2009

Features in this issue:

ROSTI TECHNICAL PLASTICS: DESIGN FOR MOULDING

The attraction of a tour of the facilities at **Rosti Technical Plastics** in Larkhall and a presentation on the application of simulation software to plastics injection moulding, ensured a record turnout of 71, consisting of students, academics, moulders and designers from 22 organisations, for the SPRA technical meeting on 22 September 2009, the first evening meeting in the 2009-10 programme.

The production facilities at Larkhall of the UK arm of Rosti Technical Plastics, part of the global Rosti organisation, has 47 injection moulding machines, from 25 to 1500 tonne clamp force, and a range of ancillary processes, including spray painting, pad printing, laser etching and ultrasonic welding. Specialist moulding techniques such as fast cycling, two-shot, thin wall, gas-assist injection and in-mould decoration are utilised to supply a range of markets, such as automotive, domestic appliances, business machines, life sciences and safety products, covering not just the moulding stage but advanced assembly as well.

Kenny McIntosh, Engineering Manager explains a moulding to SPRA members

Students inspect Rosti's largest injection moulding machine

Kenny McIntosh, Engineering Manager explains Rosti's Customer Care Centre

The massive injection moulding machines, associated robotics and large mould tools caught the eyes of the visitors but, for most, the really impressive part of the factory tour was the Customer Care Centre, where Rosti has gone to great lengths to monitor quality for each customer, with a wealth of detailed information, yet easily viewed and displayed in a transparent manner.

Barry Coughlan, **Managing Director** of **Rosti Technical Plastics** and **SPRA Vice President**, opened the presentation stage of the evening with an overview of Rosti, which, until December 2009, was part of the AP Moller-Maersk Group. Now it is owned by **Nordstjernan AB** and merged with **Stella Plastic Holding AB**, formerly known as GP Plastics, based in Denmark. Prior to the merger, Rosti Technical Plastics employed 1800 on 9 sites in 6 countries and had a turnover of $250 million.

The **Larkhall** facility has 185 employees and has responsibility for providing R&D and design services (currently based in China) to the rest of the group. Over the years Rosti has accumulated many awards for business excellence and, at the **2009 Plastics Industry Awards**, picked up two awards, one as *Processor of the Year* and the other for *Best Environmental Initiative*. Rosti at Larkhall also encourages education through apprenticeship schemes and projects with local schools.

DESIGN FOR MOULDING

The main speaker for the evening, **Andrew Blemings**, **Product Development Manager** at **Rosti Technical Plastics**, graduated with 1st class Honours in BEng Polymer Engineering from **Edinburgh Napier University** in 2006 and has been applying his knowledge of moulding and simulation techniques in various posts within Rosti. Recently he set up a team of 4 specialists in Rosti's facility in China to establish simulation analysis as a technique for part design and process optimisation, for the majority of mouldings within Rosti worldwide.

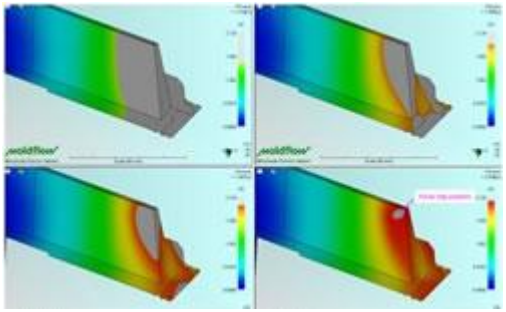
The facility is based on a range of computer aided engineering software, including stress analysis and several modelling packages, but the key programme is ***Autodesk Moldflow Insight (AMI)*** suite which covers not just mould filling simulation but also the packing and cooling phases and shrinkage and warp analysis. The team tackle upfront design optimisation in the product design and pre-tooling phases, in full collaboration with the customer's design team, to predict and solve moulding problems before they occur.

The team go through various "what if" scenarios to design runner and gate systems before cutting steel and anticipate quality issues of weld lines, sink marks and dimensional stability. The software can also be applied to optimise process windows, reduce cycle times and save material.

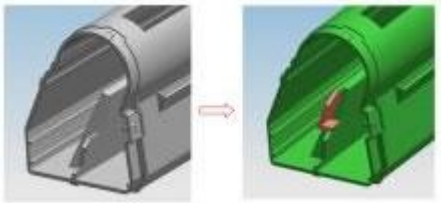
To illustrate the impact that the team is having, **Andrew** presented four case studies.

Case Study #1

A moulding, already in production, had problems with a pinhole in a prominent position, associated with a gas trap at the last point to fill. However AMI simulation did not predict a gas trap at exactly the same position. However, after sectioning and dimensioning an actual moulding it was discovered that, due to discrepancies in tool construction, the wall thicknesses did not correspond precisely to the solid model from the part design, and used in the analysis, a situation not unusual in the plastics moulding industry. After remodelling the part and running several analyses on modified designs with ribs, flow leaders and flow deflectors, the gas trap problem was finally solved by adding, with the customer's permission, a non-functional, non-cosmetic tab to accommodate the gas spot.



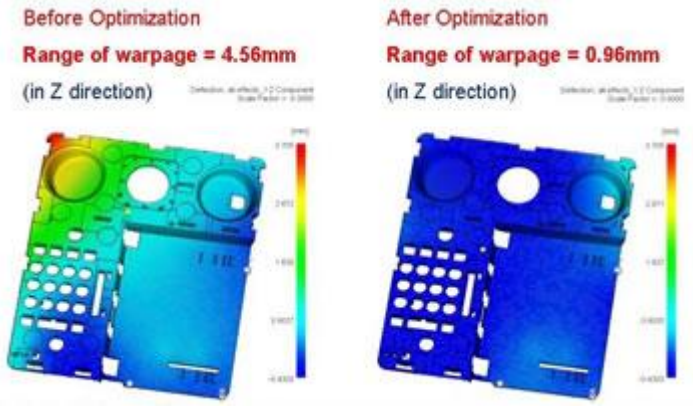
Fill analysis predicts gas spot



Tab added to correct the fill pattern

Case Study #2

Complex mouldings can often result in unbalanced fill patterns, leading to excessive pressure differentials and subsequent shrinkage and warping. One particular moulding took 25 AMI iterations, covering changes in rib dimensions, refining wall thicknesses in different areas of the moulding and relocating the valve gate, before successfully predicting a balanced moulding with minimal warpage, all at a cost well below that of a series of tool modifications.

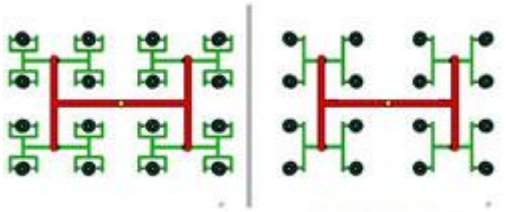


Case Study #3

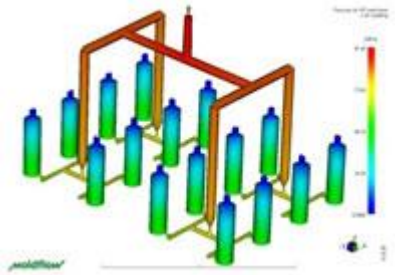
Another common scenario is a moulding that has evolved from a part originally designed in metal. One such moulding had some thick sections, which, as shown by AMI analysis, considerably extended the cooling stage, introduced severe shrinkage and minimised the process window. By redesigning the part, mainly by coring out the thick sections, while maintaining critical dimensions, and modifying the cooling circuits, AMI analysis and stress analysis predicted significant improvements in shrinkage and dimensional stability. The other benefits of the redesign were materials savings of 12% and a cycle time reduction of 9 seconds, not inconsiderable for 600,000 parts per year.

Case Study #4

The final case study involved a 16-cavity tool to produce a medical product, which was basically a hollow cylinder with a neck area. Originally the tool had been designed with two gates in each cavity, feeding into the base of the cylinder, following the classic design guidelines, which suggest that a single gate would give unbalanced flow, differential shrinkage and a dimensionally distorted moulding. However AMI analysis showed that, because of the thin wall, concentric flow was established quickly and the mould could be safely designed with a single gate per cavity, with a 50% reduction in the material in the cold runner system.



Original feed layout *Redesigned feed layout*



During the question and discussion time, Andrew emphasised the importance of collaborating with the customer at all stages, feeding back any design modifications made for process reasons to ensure that the modifications did not compromise assembly and functionality. There are less expensive versions of the software available for designers to evaluate moulding feasibility but Andrew warned that these utilise simplified analyses and do not have the advantage of being able to manipulate the mesh of the underlying mathematical model to improve accuracy and solve particular problems. AMI also has the advantage of simulating advanced injection moulding techniques such as gas-assist, overmoulding and 2-shot moulding. To demonstrate the shift within Rosti from a few years ago, when simulation analysis was the exception, Barry Coughlan said that the benefits to Rosti and its customers were so well recognised that any moulding not requiring AMI analysis now has to be personally signed off by him.

The evening ended with a draw for prizes, which included products containing Rosti mouldings.
The popular winners were:
Eric Christison (ST Microelectronics) and
Edinburgh Napier University students,
Adrianna Pia,
Friday Alerara and
Syed Mubashir Hassan.

***Adrianna Pia** receiving her prize from*
Barry Coughlan, MD Rosti Technical Plastics

Andrew's rapid career progression gave great encouragement to the teachers and their students of design and polymer engineering present but also vindication for the SPRA who had awarded Andrew an SPRA scholarship in 2006 for his performance on the 3rd year of the BEng Polymer Engineering programme at Edinburgh Napier University.

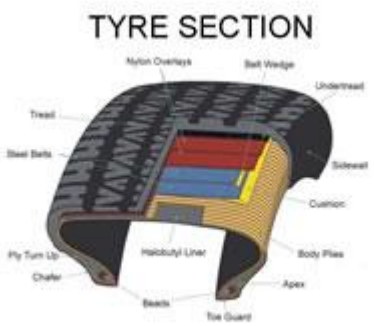
Andrew Blemings anb@rosti.com

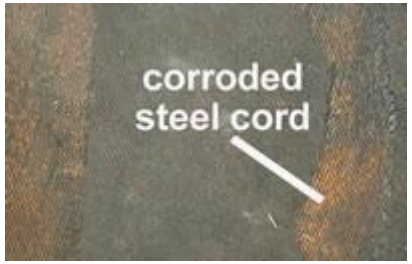
Rosti Technical Plastics
01698 552 200 www.rosti.com

AUTOMOTIVE AND AEROSPACE

The theme of the October meeting at Edinburgh Napier University was **Polymers in Automotive and Aerospace** with presentations on tyre ageing, automotive applications of engineering thermoplastics and the introduction of thermoplastic composites in the aerospace industry.

David Osborne, a tyre failure analysis consultant, opened the meeting with the observation that, among the failed tyres that he had been asked to investigate, there was a disproportionate number of old tyres (over 6 years old), regardless of the mileage.
He suggested that the permeation of air through the rubber carcass, from the differential pressure of the inflation air, was accelerating the oxidation of the rubber in the inner structure of the tyre. The resulting changes in mechanical properties were then leading to crack propagation under fatigue conditions and ultimate delamination and total failure of the tyre.





He had also observed cases where the permeation of water vapour, from the inflation air, had resulted in failure of the rubber to metal bond in the brass coated steel reinforcing cords, causing corrosion and tyre failure.

Although there is currently no legal limit to the age of a tyre, rubber and tyre manufacturers recommend disposing of tyres after 10 years, while car manufacturers suggest 6 years. Every tyre now has a code moulded into the sidewall that indicates the age of the tyre. The last two digits in the code represent the year of manufacture and the second last pair gives the week number. For example 4106 indicates that the tyre was manufactured in week 41 of 2006. This coding is retained even after a retreading operation. One suggestion from the audience was to use dry nitrogen for inflation and thus minimise tyre ageing by oxidative degradation of the inner layers, or even another opportunity to use carbon dioxide.

David Osborne
01249 818 739
drosborne@earthlink.net

Peter Burke, **Ticona UK**, opened the second presentation with numerous examples of how high performance thermoplastics had penetrated automotive manufacture, mainly through weight saving replacement of metal components but also through design opportunities and reliability. Not only does the chemical resistance of polyacetal make it ideal for fuel system components but its excellent fatigue flex endurance makes it suitable for clips to make assembly easier. Thermoplastic polyesters are favoured for electrical components and sensors, while thermoplastic elastomers find applications in seals, grommets and seating suspension. *Fortron* polyphenylene sulphide, with its excellent heat and chemical resistance and dimensional stability is replacing aluminium in air management systems in air management systems. The *Celstran* long fibre reinforced thermoplastic (LFRT) technology pioneered by **Ticona**, with excellent mechanical properties, low creep and dimensional stability has resulted in a number of applications including gear shift mechanisms, battery trays and even complete door modules.

Grille opening retainer in Celstran glass filled polymaide

Replacement of metal components by thermoplastic composites reluts in 50% weight savings

Peter's colleague, David Almond, then switched to the emerging opportunities from continuous fibre reinforced thermoplastic composites, which are produced in tape form, up to 200 mm wide, and can be converted to components using compression moulding and thermoforming. These tapes have also been used as in-mould placement to produce injection mouldings with localised reinforcement. Thermoplastic composites based on *Fortron* polyphenylene sulphide, with excellent chemical and fuel resistance and good fire performance, are proving popular with aircraft designers and manufacturers, through reduction in weight, decreased process times and hence cost reduction. One of the best examples is the welded segmented structure for the

SPRA members and guests show their appreciation for the speakers

leading edge on Airbus A380 wings but other aircraft applications are appearing, such as an undercarriage door, ailerons and internal seating.

Ticona

01952 213 456

peter.burke@ticona.co.uk

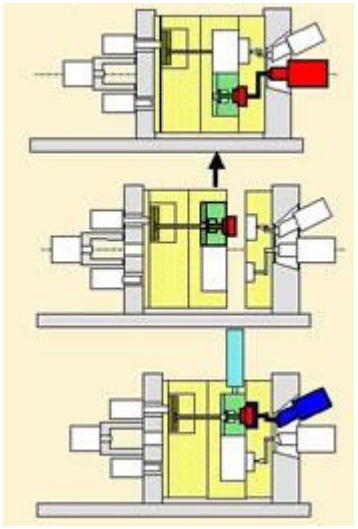
www.ticona.co.uk

David Almond (right) and Peter Burke (second right) in discussion with SPRA members

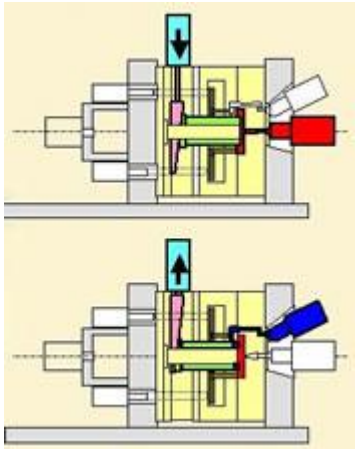
ADVANCES IN PROCESSING: MULTI-MATERIAL MOULDING

The November meeting, **Advances in Processing: Multi-Material Moulding**, was sponsored by Billion UK, one of the original SPRA Corporate Members, and held at the Dakota Hotel, Eurocentral, a new venue selected for the convenience of SPRA members from the Glasgow area.

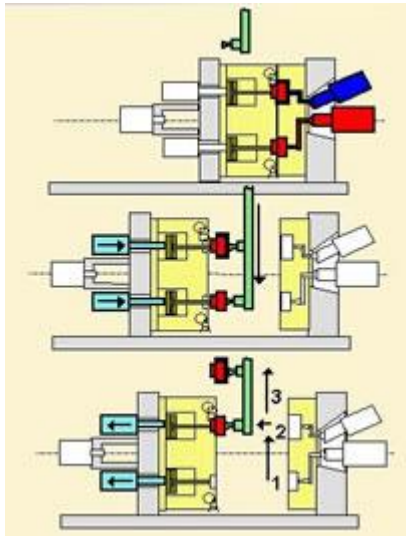
Peter Kirkham, Managing Director of Billion UK, introduced the event with an overview of the different strategies for combining two or more materials in the same moulding cycle. The sequence of injection can be achieved using translation moulds, in which a mould plate slides from one station to the next within the mould to create the cavity change for the second material. For some geometries, withdrawal of a core or sleeve creates the necessary cavity for the second injection. Robotics can transfer mouldings from one cavity to the next at an intermediate mould opening stage. Rotation of cavity plates in an indexing mould provides the opportunity for up to 4 moulding stages or even an ejection station to keep the overall cycle time a short as possible.



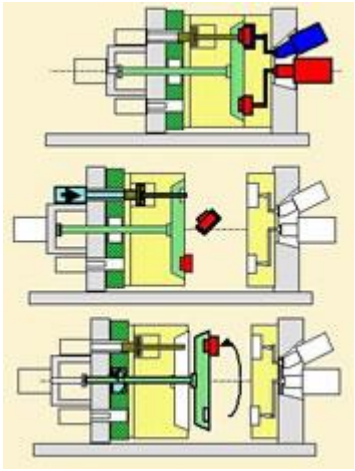
Translation



Core withdrawal



Robotic Transfer



Cavity Rotation

Each strategy has its advantages and disadvantages and selection is a balance of mould complexity and cycle time, decisions generally being dictated by production volume.
Another aspect of multi-material moulding is sandwich moulding, which is proving popular for utilising recycled plastics.

OVERMOULDING	Core displacement	TWIN SHOT MACHINE
	Sleeve displacement	Hydraulic or electric
	Translation mould	Overmoulding nozzle
	Robot transfer	Or sandwich nozzle
	Rotary transfer	+ injection configurations for specific materials
FAST CYCLE	Conventional mould with two feed systems	+Rotary platen or indexing plate
	Core movement in the mould	
SANDWICH	Conventional mould	
IN MOULD ASSEMBLY	IMA double rotation mould	

Peter also reviewed the configuration of moulding machines with two or more injection units, spanning the conventional range of hydraulic, electric and hybrid machines of varying sizes. For injection of the second material, Billion now provides a 'Plug and Play' unit that can be fitted to any machine. For soft touch components, thermoplastic elastomers (TPE) and liquid silicone rubber (LSR) have been combined with thermoplastics for some time but Billion now have multi-material machines that incorporate traditional thermosetting rubbers as the second material.

Plug and Play Unit

Claude Montegani from **AGP Developpement**, a group of French mouldmakers, described, with the aid of animations, video clips and samples, the innovations associated with moulds for multi-material moulding. He showed how multi-material moulding has moved on from producing mouldings with two or more colours, or two or more different

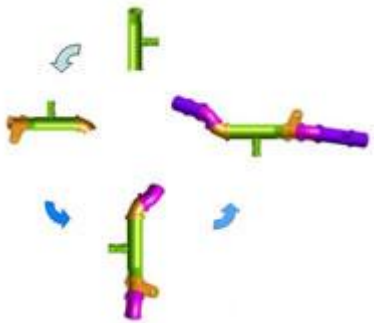
Thick section produced by overmoulding in 3 stages

thermoplastics, to applying the principles to in-mould assembly. Two components can be moulded in separate cavities and then welded with a fillet in a second injection stage to produce a hollow shape, all within one moulding cycle and avoiding the cost and contamination associated with a secondary welding operation.

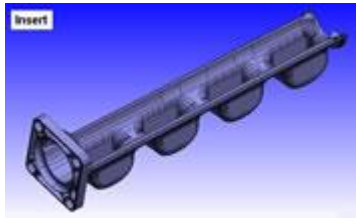
Hollow component with welded fillet in second stage

4 station rotating mould for 3-component moulding (one stage for ejection)

The audience was particularly fascinated with AGP's innovative *Multitube* system, in which complex tubular components can be built up from a sequence of injection stages in a highly actuated mould, in one moulding cycle. Claude conceded that many of the projects incorporating the principles of multi-material moulding are cost driven, mainly through savings in cycle times, but improved quality and functionality are also important factors.



Principle of Multitube System



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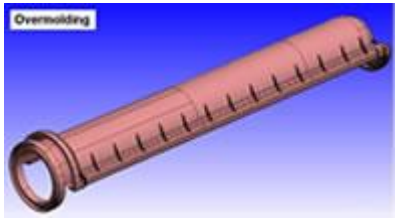
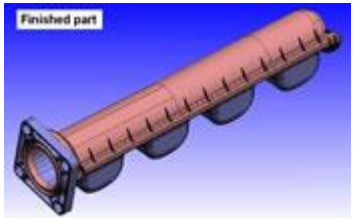


2. Overmoulding



3. Finished part

Billion UK

+44 1908 22 33 44

pete.k@billion-uk.co.uk

www.billion.fr

AGP Developpement

+33 474 816 101

cmontegani@agp-developpement.com

www.agp-developpement.com

BENCHMARKING: CHEMICALS SECTOR

A meeting of **Chemical Sciences Scotland**, in October at **Ineos** in Grangemouth, discussed the results of a recent benchmarking study. The exercise, based on 6 significant companies, representative of the spectrum of chemicals manufacture in Scotland and involving 33 metrics of performance, was undertaken by **PICME** through the auspices of **Scottish Manufacturing Advisory Service (SMAS)**.

The Scottish companies compare favourably with the UK chemical sector benchmarks in:

investment
customer service
innovation
health & safety
operational performance

Areas where the Scottish sample lagged behind the UK norms were:

product changeover times
Right First Time levels (although overall quality was good)
energy and water efficiency.
stock turnover
profitability

Compared to global benchmarks, the Scottish sample came out as world class in a few metrics but the average was short of world class in most metrics.

Areas where improvements would result in significant financial benefits are:

Profitability
Overall Equipment Effectiveness
Material Yield
Energy Usage
Stock Levels

The recommendations from PICME to the chemical companies in the studywere to:

continue with innovation achievements
introduce Operational Excellence/Continuous Improvement exercises
increase employee training, particularly in quality and delivery performance
align support (companies and support organisations need to talk more).

The meeting then heard of two case studies where a *Continuous Improvement Programme* had beneficial results on performance. At **Macfarlan Smith**, a pharmaceutical company, the project focussed on a particular batch process. The changes that had the most effect were not high tech but simple housekeeping, clear documentation and improved working practice. In the second case study, at **PW Hall**, colour concentrate manufacturer for the plastics industry, the Continuous Improvement Programme looked at all aspects of the business. See next article for details.

In summing up, **Dr Sandy Dobbie**, Chairman of Chemical Sciences Scotland, concluded that "*There are no new problems to be solved - just ones that we haven't seen before*". He also suggested that the strength of the chemical sector in Scotland is that very few companies are in direct competition and it is in everybody's interest for companies to be talking to each other to learn how individual problems can be solved. Talking to **SMAS** and companies in other sectors can bring solutions from outside the chemical sector.

Chemical Sciences Scotland **www.scottish-enterprise.com/css**

Scottish Manufacturing Advisory Service **www.scottishmas.com**

P W HALL CONTINUOUS IMPROVEMENT

P W Hall, a small, privately owned company in Kirkintilloch, has a world-wide reputation in manufacturing colour concentrates (masterbatch) for the plastics industry. With 50% of its business in exporting to over 40 countries, P W Hall has been moving more to niche markets and smaller lots, which brings issues of changeover times. Although the company has been implementing Continuous Improvement Programmes for 10 years, the latest exercise, with the help of the **Scottish Manufacturing Advisory Service**, has looked at every aspect of the business.

The company performs well in some areas, such as stock turnover and waste minimisation, but several issues were identified to achieve improvements:

sustained '5S' workplace organisation in the production area;
business performance control throughout the company;
improvement in productivity and capacity;
smoothing of production plans to ensure efficiency of resources and capacity

One particular performance indicator, On Time in Full (OTIF) has improved from 60% to almost 80%, which not only leaves customers happier but also reduces the additional costs associated with part shipments. **Blair Syme**, *Technical Director at P W Hall*, believes that the latest Continuous Improvement programme would not have been as successful without the external assistance from the *Scottish Manufacturing Advisory Service*.

P W Hall
0141 776 2384
blair.syme@pwhall.co.uk
www.pwhall.co.uk

Scottish Manufacturing Advisory Service:
www.scottishmas.com

NATIONAL OCCUPATIONAL STANDARDS

As part of a UK-wide exercise, **Cogent Sector Skills Council** has been assigned the task of rewriting the **National Occupational Standards** for the polymer sector, with each devolved administration preparing its own set of Standards.

In line with the policy of Sector Skills Councils being employer-led, a Steering Group has been formed from companies representing the various sub sectors of the plastics and rubber industry in Scotland. Any company interested in contributing to the exercise should contact **Tony Pringle**, *Skills Development Director, Polymers*, at Cogent SSC.

Details of existing NOS can be found at **www.ukstandards.org.uk**

01227 762851

tony.pringle@cogent-ssc.com

www.cogent-ssc.com

SCHOOL TRIP: FANTASTIC PLASTIC

The **Product Design** pupils from the **Design & Technology Department** at **Grove Academy, Dundee** took a coach to **Edinburgh Napier University** for a lecture called ***'Fantastic Plastic'*** from **Professor Averil MacDonald**. After assuring us that by the end of the lecture we WILL find plastic interesting she began by telling us that we could all be millionaires - this caught our attention. Averil went on to deliver a fascinating and very informative lecture by the end of which we found plastic more than appealing - a picture of a micro-thin, flexible, roll-up, TV the final image on the wall.

Next we headed off to the Merchiston Campus at Edinburgh Napier University for a quick tour of the polymer engineering facilities and a chance to make something. On the tour we were shown various machines for testing, bending and cutting different materials. We also saw an extremely powerful microscope, used to identify different materials.
Meanwhile the other half of our party was busy making Frisbees' and rocket cars. We used a mould that a student had made and placed empty milk cartons that we had brought from home, inside it. We also used the vacuum forming machine to create the body

Loading the Frisbee mould with recycled milk bottles

Trimming flash from the moulding

of a rocket car and tried some injection moulding for the wheels. It was very fascinating as we got to learn about the machines as well as actually use them.

After the trip the pupils were able to use the plastic parts they had manufactured to help build a rocket car. The S4 Product Design class then raced their cars in school.

Overall it was a fun and informative day which will certainly be remembered by our class as our Frisbee is now a clock hanging on the wall.

Report by **Kathryn Brown**

Back (l to r):
Max Carroll, Arran Gardiner, Stuart McCarthy, Michael Wilkinson, Annes Yaqub, Nicole Leslie, and Calum Tavendale.
Font (l to r): the winning team,
Kathryn Brown, Flora Rayner, Iona Broadhurst, Claire Williamson

CONGRATULATIONS

I to r: Timir Pitolwala, Colin Hindle (Tutor), Dr Wisritta Atthokar

Edinburgh Napier University - Graduation 12th November 2009

SPRA member, **Timir Pitolwala** is the first graduate from the newly named ***MSc Polymer Engineering*** at Edinburgh Napier University. Timir carried out his Masters research project with **Safeglass (Europe) Limited** and is now actively seeking a job in the polymer industry.

Dr Wisrutta Atthakor received her PhD for a thesis entitled *"Polymer Microspheres for Microbial Detection"* and will shortly be returning home to Thailand to take up a university position.

Jassim Albrahim and **Abdullah Alshahrani** both graduated ***MSc Advanced Materials Engineering*** and will return home to Saudi Arabia where they will both teach materials in local universities.