2021 AGM and Awards Event

**AGM Calling notice**

Notice is hereby given that the Annual General Meeting of the Institute of Materials Finishing for the year ended 30 June 2021 will be held at:

**The Best Western Plus Windmill Village Hotel**
Golf Club & Spa Birmingham Road
Allesley
Coventry
CV5 9AL
(On the A45 West-bound)
In the Pickford Suite

Tuesday 7th December 2021
commencing at 11.00 am.

Please email Helen on helen@materialsfinishing.org

For more information or if you wish to attend.
IMF DIARY

ANNUAL GENERAL MEETING

7th December 2021

Windmill Village Hotel, Coventry

DISTANCE LEARNING START DATES

21st January 2022

You may enrol from 1st Dec 2021

You may enrol up to 30 days in advance of the start date.

Please note that all course fees must be paid in full before any course materials can be released.

Please contact Karen Yates by email karen@materialsfinishing.org

You can find details of courses and qualifications on our website - https://materials-finishing.org/

UPCOMING WEBINARS/SEMINARS

Fischer Instruments Webinar
17th November 2021
See page 5 for details

Webinars for Students
Tuesday November 16th @ 14:00 Principles of Electroplating
Tuesday December 14th @ 14:00 Cleaning & Pre-Treatment

Everyone is invited and if you wish to attend any webinar or seminar please contact John Burgess by email JohnB_IMF@btinternet.com
As I write this at the end of September, I despair at where the world, and particularly our country is going! A short mention on the TV and radio news over some minor issues with tanker deliveries to petrol stations, and everybody goes into a blind panic! Roads get blocked by queues trying to fill up, and arguments and even fisticuffs have almost become the norm! A repeat of the toilet roll crisis at the start of lockdown last year!

Yes, I realise that in our surface finishing industry we are seeing issues with limited supplies of some raw materials, and prices beginning to increase, in some cases quite dramatically. But does industry panic? No: instead it looks at changing strategies to alleviate the situation.

I think we all, whether in our working lives, or for our personal lives, must accept that we are now living in a different world, and being an independent state there may be ongoing issues that will affect our everyday lives.

That’s my rant over!

I had hoped that by this edition of IMFormation I would be able to report the successful sale of “Old” Exeter House, and the completion of our move to the new offices in Coleshill, which we are to name “New Exeter House”. Perhaps I was being too optimistic?

As I write this, we still haven’t exchanged contracts on either the new purchase or the sale. My goodness me, don’t solicitors take their time! We currently have no dates I am able to advise on when we will be in the new offices, but I know both Helen and Karen can’t wait!

What the delay has allowed us to do, is to be more structured in packing all the paperwork, books etc that will be moved to the new unit. It will be good to be able to set up our library in an airy office, meaning we can all be more comfortable using this excellent reference centre.

Away from the problems of delays in the move, the Institute continues to function with Helen and Karen still working from home. It is pleasing to report a good intake of students onto our education courses at the September enrolment, so well-done Karen.

I am keeping up to date on the effects of REACH, particularly as it affects UK companies trad-
ing with the EU. Of concern now is whether re-authorisation of chromium trioxide and chromium salts for use in industrial applications can be arranged for continued use after September 2024, when the current authorisation expires. There is confusion about how this can be achieved; there is the ADCR consortium to cover aerospace applications, but at present nothing for industrial. This is a point that I will raise at the upcoming Cross Sector Group Meeting that is scheduled for the end of October. Any updates will be reported in the next issue.

I was pleased to be able to present a paper at the recent Interfinish conference, organised by our good friend Hide Kanematsu from Suzuka college in Japan, on the effects of legislation and environmental issues on the formulation of anti-corrosive primers for aerospace use. Our President Karl Ryder also spoke at this event along with Transactions editor Clive Larson. I think it was excellent for the IMF to have three speakers at this prestigious event, even though at business was via the zoom platform.

It is great to be able to meet face to face again with so many friends within our industry; whilst virtual meeting will, I am sure continue, I am sure so much more can be achieved when we get together in person. The IMF will be at the Advanced Manufacturing show at the NEC on the 3rd and 4th November, so it would be great to meet you all there. I recently attended the CHEM UK exhibition at the NEC, and it felt really natural to be able to walk an exhibition again!

So lets hope that now we are nearly all double vaccinated against Covid, and with boosters for all us “oldies”, the pandemic will be kept under control and we can continue to live and work under this “new normal”.

Graham Armstrong
September 2021

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Choice & Value
ReGail acknowledged by the SEA

On Friday 8th October 2021 the Surface Engineering Association (SEA) held its bi-annual awards dinner and ReGail was a nominated candidate for the Process Innovation Award. The dinner took place in the Birmingham Park Regis Hotel, Five Ways and was attended by about 120 people. The evening was sponsored by British Jewellery and Giftware International, Citation, CHTA (Contract Heat Treatment association), Schloetter Surface Technology, SPD (Stephen Price Design Ltd) and Sumari Business systems; the evening was hosted by John Simonett.

ReGail is an InnovateUK funded consortium based project that has successfully demonstrated the feasibility of recovering gallium from waste LEDs. The consortium comprised Envaqua Research Ltd – a company specialising in the development and implementation of novel resource recovery technologies and the materials conservation and reuse in the context of the circular economy; HSSMI - a sustainable manufacturing innovation consultancy that works with manufacturing companies to help them respond to market challenges by increasing productivity, transitioning towards a circular economy, and upscaling their products and processes; Recologht - a not-for-profit company working under the Producer Compliance Scheme under the WEEE Regulations; S2S Electronics Ltd – a company offering IT asset recovery and WEEE recycling services to business across the whole of the UK; EC Williams Ltd – a sub-contracting electroplating company based in Birmingham; the IMF – the Institute of materials Finishing, who was responsible for the project’s dissemination. Our project was represented at the Awards by Katarina Deme and Margaret Beever of HSSMI and Trevor Crichton of the IMF.

In his opening remarks, John Simonett, emphasised the importance of surface engineering to the UK’s manufacturing economy and introduced the SEA’s President – the Lord Whitby.

Lord Whitby is an industrialist who is heavily involved in the surface engineering industry as well as being a previous Leader of the Birmingham City Council. He, too, stressed the importance of surface engineering to the UK’s economy but also pointed out the importance of Birmingham and it surrounding areas to its evolution.

The InnovateUK funded ReGail project was nominated for an award in the Process Innovation category, but was unfortunately a runner up to the category’s very worthy winner – TextureJet Ltd. This company is a spin-out from the University of Nottingham and had been awarded another InnovateUK funded research project that developed a novel surface processing technology process that is capable of redefining the surface texture of a component; this includes roughening, polishing, and etching. It is environmentally friendly, simple to carry out, clean and does not require any no masking nor creates any surface damage. It can be done on site and in-situ. The core technology is based on electrochemi-
cal jet machining (EJM), which is a localised variant of electrochemical machining (ECM).

The Environmental Award was won by Firma Chrome Ltd – a Sheffield based company that offers a wide range of surface finishes, including anodising, electroless nickel, electropolishing, phosphating and polishing. During the covid induced period of reduced economic activity, Firma Chrome has taken the opportunity to enhance its green credentials and has made major efforts towards environmental sustainability. In what began as a cost reducing initiative, Firma-Chrome has introduced solar panels and LED lighting and has achieved a 60% reduction in gas consumption; it also employs and trains local people to nationally recognised standards to collect litter from the local riverbank.

The Quality Award was won by Poeton Industries Ltd and was an acknowledgement of the company’s efforts towards its increasing levels of quality and environmental sustainability. The company has introduced a new digital quality management system as well as restructuring its new product introduction, resources and maintaining its quality accreditations.

CBE Plus – a multi-disciplinary sub contractor based in Chesterfield was awarded the Outstanding International Contribution Award for its efforts in reducing its carbon footprint by 50%. It has also developed and increased its export drive, as the company sees this as the key to long term success.

The Marketing Award was won by Lamberts London, a family-owned business that saw the covid pandemic as an opportunity for both growth and change. The company completely re-evaluated its marketing strategy and employed more staff and focussed on all aspects of social media.

Other personal awards were made to Derek Close for his Meritorious services to the Heat treatment Industry. He joined the Wolfson Heat Treatment Centre in 1981 and retired in 2019 when he was the longest serving employee. The Centre was initially based at Aston University, but later relocated to the SEA HQ. Since his retirement he has organised and led the centre’s heat treatment courses.

The Ray Alford Award was won by Godfrey Evans, who joined the SEA’s National Committee in 2012 and became acting Chairman in 2018, retaining his tenure until late in 2020. He has made major contributions to the industry and is always prepared to question politicians and civil servants on their policies and implementation of legislation, especially when there appears to be a much simpler and more logical way of doing things.

Finally, a special award was made to David Elliott for his exceptional contributions to the surface treatment sector. Not only has David been at the forefront of surface engineering, but he has also developed the SEA into a globally recognised and authoritative body. Moreover, he has become extremely well known throughout both the industry and governments, where he is well known in the Visitors’ Section in the House of Lords, the European Parliament and ECHA – and the Member’s section of a various Institutions, including those associated with engineering, materials and environmental sectors.
Natural capital – why is it important?

In recent months the UK Government’s Parliamentary and Scientific Committee has shown increasing interest in environmental issues and policies and in particular “towards zero carbon” and “natural capital”. The former is a well recognised policy – namely the reduction of atmospheric emissions and especially carbon dioxide, to a net zero by 2050, but there is some underlying confusion by what is meant by “net zero emissions”; in the UK and EU this refers to a net zero of all greenhouse gases, but in China, it only refers to carbon dioxide.

However, “natural capital” is a very little understood concept. In its basic form it is about thinking of nature as an asset or set of assets, that makes it possible for both life on Earth and the provision of benefits to people. The understanding and use of natural capital is becoming increasingly important in developing economic and social strategies and is being included in an increasing amount of legislation but the approach should put people at the heart of both nature and the natural environment.

Natural capital should simply be thought of as the world’s stock of natural assets. This includes the Earth’s natural resources, such as its geology, soil, air, water and all living things as well as providing the building blocks of our environment. It should also include other attributes, such as the ability to assimilate waste, absorb carbon dioxide and regulate temperature, all of which are currently under threat due to human activity.

In some ways natural capital is similar to the Bhutanese concept of “Gross National Happiness” which is based on the concept that sustainable development should take a holistic approach towards notions of progress and give equal importance to the non-economic aspects of well being.

The concept of natural capital was first used in the 1970’s, but it was not until 1997 that it was monetarised, when it was valued at about USD $33 trillion (thousand billion), compared to the world’s gross national domestic product of USD $18 trillion; of the USD $33 trillion, about 64% was from the marine environment. The total natural capital value was re-assessed in 2020 and estimated to be to be about USD $140 trillion compared with the world’s gross domestic product of USD $85 trillion.

Whilst natural capital is all embracing in terms of resources, in practise it includes a combination of other more recognisable and better quantified capitals such as financial, social, human and manufacturing, all of which are dependent on it.

We use the natural capital resources to provide ourselves with a wide range of services or “ecosystem services” that make our lives possible. These include the provision of crops, water, manufacturing and building materials medicines and fuel. Through these ecosystem services, we derive many benefits and “well being”, such as physical and mental health, food, potable water, energy, recreation and social satisfaction. These benefits manifest themselves by increased life expectancies, reduced depression, increased amounts of food and potable water, all of which enhance our lives. To help maintain the sustainability of natural capital, we need to improve the efficiency of converting the ecosystem services into benefits and well being. This can be achieved by making processes more efficient, cheaper, less wasteful and less polluting. However, the benefits derived from the ecosystem services can also have feedback loops, such as if a water or air system is polluted,
it could reduce the amount of food produced, which in turn adversely impacts on the human well being.

Prior to industrialisation, human societies and organisations worked synergistically with nature and used the available natural capital in a sustainable way. The concept of “sustainability” in this context can be defined as “Organisations will maintain and where possible enhance stocks of capital assets rather than deplete or degrade them”. However, since industrialisation began its domination of many economies, we society has become more detached from nature and has over exploited its assets (ie natural capital). As with all capital assets if natural capital is badly managed, it can create an unsatisfactory situation that results in a decline in its and other capitals values. This has been demonstrated by the loss of rainforests due to uncontrolled logging and the resultant loss elsewhere of highly productive arable land. Whilst natural capital is ecological, its payback is social and economic.

Society has already seen a clear link between its activities and the environment, both local and global. The impacts of poor management of natural capital-have resulted in the onset of global warming and we are becoming increasingly aware of its impacts. Furthermore, there is an increasing case against the polices of globalisation, resulting in our actions through the supply chains are impacting the natural capital elsewhere.

To help mitigate our adverse impacts on natural capital, new policies and legislation are being gradually introduced; these include towards net zero emissions, the green industrial revolution, changes in agriculture etc., all of which are designed to minimise any negative feedback loops that the ecosystem services and any benefits and well being derived therefrom may generate. In the longer term, a natural capital approach will be used to integrate the concept of natural capital into decision making. Thinking in “capital” terms enables comparisons of many changes and decisions at the same time. The natural capital approach uses information form and provides inputs into many existing environmental management and analytical approaches.

If the environmental objectives of sustainable living, zero carbon emissions etc are to be achieved the negative feedback loops from the benefits society derives from the natural environment must be minimised and this will be achieved by gaining a greater understanding and mitigating the effects of society’s impacts on nature in all its forms. To achieve these objectives, both society and industry need to be as one and not try to separate themselves for each other.

Achieving these objectives is already underway, with processes such as impacts assessments. Account needs to be taken on a broader basis and should be a greater part of the decision making process and it should not just be based on the monetarisation of the environment. For example, to achieve the net zero emissions objectives, there will certainly be a need to increase carbon storage, but how this will be achieved will be subject to much debate, but any process should minimise the feedback loops linked to the natural capital processes.
COURSE SERIES ANNOUNCEMENT

FREE Virtual Webinar Course:
Electroplating Challenges and Fundamentals of ED-XRF

In collaboration with the Institute of Materials Finishing

Date: Wednesday 17th November, 2021
Time: 2-3pm

AGENDA:
• Surface finishing - UK overseeing bodies explained
• Electroplating - issues and how to rectify them
• XRF methodologies
• Standards explained & explored
• Health & Safety aspects

To join us for this webinar event please register by contacting Georgina McWhirter via email: gmcwhirter@fischergb.co.uk or call 01386 577370
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www.occa.org.uk/surcon2021

Inspiring Colourful Futures
An Introduction to the Organics Group

What does “Organics” mean; in the context of materials finishing, it is any finish which is based on organic chemistry as opposed to electroplating which is generally inorganic – the application of a metal to a surface. Organic chemistry is based on compounds made up of carbon, hydrogen and oxygen starting with the simplest CH₄-methane and building up with the addition of carbon and hydrogen atoms to multiple carbon chain polymers, to which can be added oxygen and nitrogen.

H
H−C−H
H
Methane

The most common example of organic surface finishing is paint

Functional Groups in Polymers and monomers used in paint

The use of the words, paint and coating, can be used interchangeably - they mean the same thing. However it is necessary to distinguish between a coating system and a coat of paint. A coating system is more than just the material applied, it also refers to other factors such as the surface preparation requirements, the application of a number of coats of paint, in a specific order, and the thickness of each coat of paint. A coat of paint is a single layer, applied to form a coherent film when dry.

All liquid paints are composed of three basic ingredients: resins (polymers), pigments and solvent. The resin is the film forming portion of the paint - it holds together the pigment particles and binds the paint to the surface. The resin plays the main part in contributing to the durability, strength and chemical resistance of the final film. Paint types are often referred to by the type of resin in the formulation, so when we talk about an alkyd or epoxy for example, we are referring to the main resin used to make the paint.

The second ingredient in a paint is the pigment. This is a relatively insoluble finely divided powder, or
more commonly a mixture of powders. The pigment(s) primarily provide hiding power (opacity), and colour, but they also improve weather resistance, increase paint adhesion, decrease moisture permeability and control gloss.

The final ingredient, the solvent, "carries" the resin and pigment(s) and controls the viscosity such that the paint can be applied to a surface. The chemical ingredients in each of the components vary widely from one generic type of paint to another, in addition each of the components (resin, pigment and solvent) are also usually mixtures of different materials. For example, a paint formulation may contain three or four solvents - one solvent dissolves the resin, while some are used to control evaporation, and others are used to dilute the solution (control viscosity). It is not important for a user to know all the ingredients in a paint, suffice that he knows the properties.

The common designation of a series of coatings applied to a surface is primer, intermediate or build coat, and top coat. Normally each coat contains properties that contribute to the success of the total coating system.

Function of each coat

The primer is the first coat applied to the surface. The main function of the primer is to provide adhesion to the substrate - if the primer doesn't stick, then the whole coating system will fail. The primer also provides a key for the rest of the system.

The intermediate coat is required in many coating systems to provide one or more of the following functions; increase film build, improve chemical resistance, or serve as an adhesion or tie-coat between primer and topcoat where they are not compatible.

The topcoat is intended to be the last coat applied. This provides the weather and/or chemical resistance and also imparts characteristics such as colour, gloss wear resistance, abrasion resistance.

Paint generally falls into two categories; Decorative and Industrial (protective), paint manufacturers have tended to split their manufacturing and R&D, specialising in one or the other, however, decorative paint can be protective and Industrial paint can be decorative. Decorative paints are used for aesthetic reasons, but still need to offer protection of the substrate from their environment and mechanical damage. Specialist decorative paints have been developed to protect the public e.g. fire retardant properties which supress the spread of flame, antibacterial properties and some can even clean the air. They can also contain fungicides, biocides and algacides. Industrial paints tend to be more technically sophisticated and are manufactured for a specific purpose, providing a barrier between the substrate and the environment to prevents erosion or corrosion and protection from heat or fire.

A paint film can be used to give a purely cosmetic finish to an article. It can impart colour, gloss and
texture. The decorative properties of a paint system are dependent on the topcoat. This has to be chosen to give good resistance to the environment it will be exposed in to ensure that the cosmetic properties are retained throughout the life of the article. The most common environment to be considered is atmospheric exposure. The coating systems with the best weathering properties are the polyurethanes and acrylics.

Industrial paints are designed to protect against, amongst others, abrasion, chemicals and fire, but probably the most common protection use is to prevent corrosion of steel. There are three recognised mechanisms for protecting steel, barrier protection, inhibition and sacrificial action.

Barrier protection is just as the name implies, the dried paint film blocks moisture from reaching the steel surface. All coatings allow moisture and oxygen to penetrate them to some extent, this is permeability. Coatings which protect by a barrier mechanism have very low permeability. Typical barrier coatings are 2-pack epoxies, chlorinated or acrylated rubbers and polyurethanes.

Coatings that protect by inhibition contain active pigments to inhibit or interfere with the corrosion reaction on the steel surface. Traditionally inhibitive pigments were lead compounds and chromates. Since the 1970s concerns about toxicity and environmental pollution have lead to their replacement with less toxic anticorrosion pigments such as phosphates. Anticorrosive pigments are typically added to alkyds and water-based paints which have higher permeability than the coatings which protect by a barrier mechanism. As moisture passes through the film, the anti corrosive pigments slowly dissolve and depending on their chemistry interfere with either the anodic or cathodic reaction and thus retard corrosion.

The third mechanism is sacrificial action and is the way that zinc rich primers protect steel. These primers are highly loaded with zinc, such that the zinc is in contact with itself and the steel surface. As zinc is more active than steel, and if the elements necessary for corrosion are present, then the zinc will corrode in preference to the steel (i.e. sacrifice itself), and hence protect the steel. Zinc rich paints are classified into two types, inorganic and organic. This classification refers to the resins used in the formulation and not the form of the zinc. The binder (resin) in inorganic zinc rich coatings is a form of silicate, and organic zinc rich paints are nowadays typically epoxy based.

Current Developments

To complete this introduction to paint technology developments which are currently taking place in the industry and are mainly driven by Health & Safety and Environmental Protection regulations, are in the reduction of solvent usage. In a conventional paint, the amount of the solid portion (the resin and the pigments) is about 50%, therefore in a 5-litre can of paint approximately 2.5 litres of organic solvent commonly referred to as VOC, enters the atmosphere when the paint is applied. To overcome this, paint manufacturers are producing paints with lower solvent levels, or no organic solvent: high solids coatings (typically 80 % solids), solvent free products (100% solids), and water based products (where the organic solvent has been replaced with water), which are used in both sectors.

Brenda Peters

Acknowledgments: BPF Goldie - Overview of Surface Engineering
September 2021 Member News: Quantum Design UK and Ireland launch new Company video and magazine featuring staff, suppliers and customers

The company video is being launched in tandem with Quantum Design’s first Company magazine “High-Tech Instrumentation”. QDUKI Marketing Manager, Angela Carslake comments, “Featuring some of our partners and customers, the video provides an insight into our people, method of working and proud history.”

Angela Carslake, Marketing Manager, Quantum Design UK and Ireland

There are contributions from:

- Prof. Joseph Keddie, University of Surrey, JA Woollam Ellipsometry Customer for 20 Years
- James Hilfiker, J A Woollam Co.

Dr. Gavin Stenning, Rutherford Appleton Laboratory, QD Systems Customer

UK Contact: Angela Carslake (44) 01372 378822 angela@qd-uki.co.uk
Website: www.qd-uki.co.uk
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**SURFEX 2022**

7–8 June 2022

Ricoh Arena, Coventry, UK

**OTHER EXHIBITIONS**

29th & 30th June 2022  NEC, Birmingham, UK

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