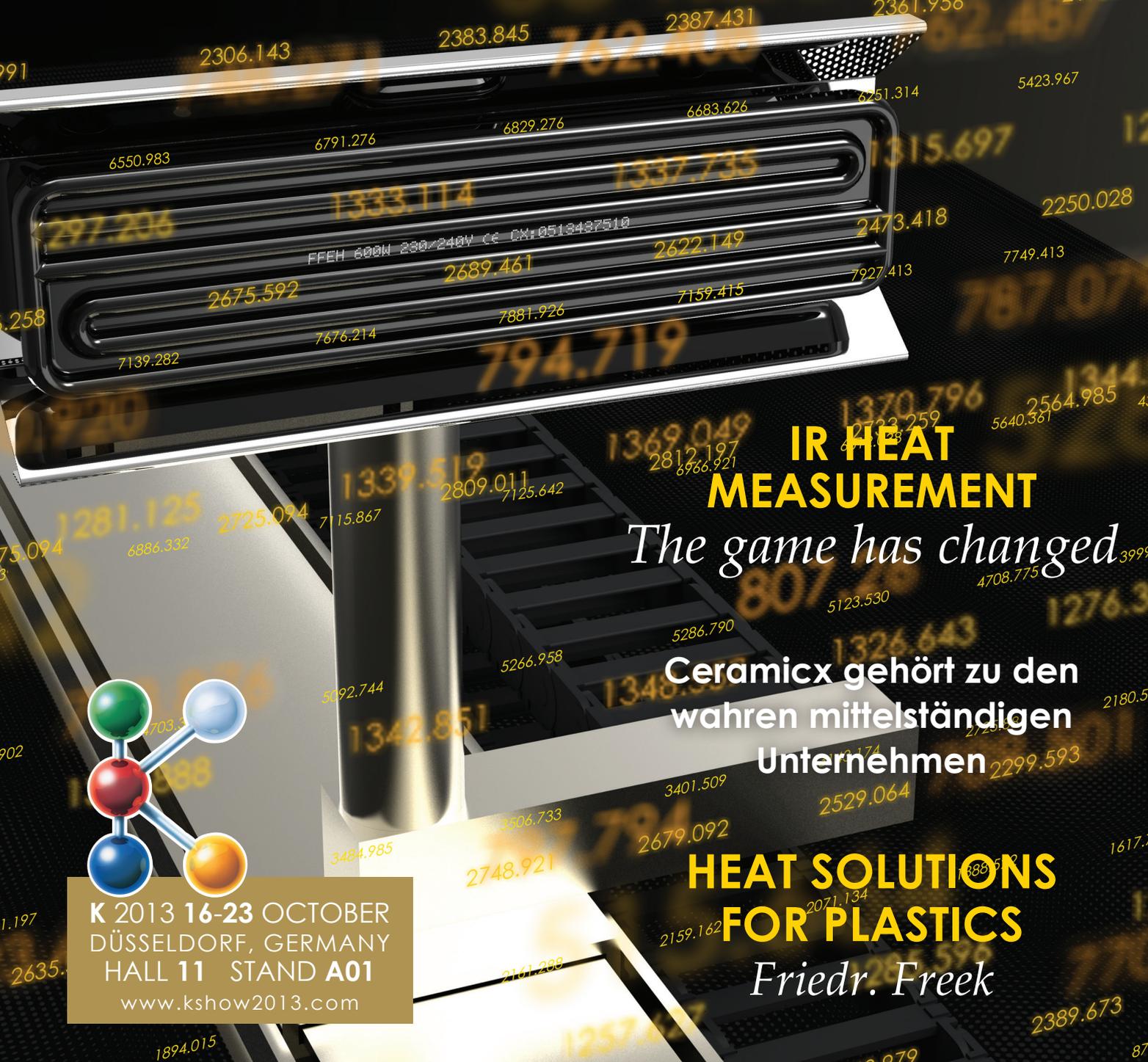


HeatWorks

HeatWorks 10 | September 2013 | www.ceramicx.com



IR HEAT MEASUREMENT

The game has changed

**Ceramicx gehört zu den
wahren mittelständigen
Unternehmen**

HEAT SOLUTIONS FOR PLASTICS

Friedr. Freek



**K 2013 16-23 OCTOBER
DÜSSELDORF, GERMANY
HALL 11 STAND A01
www.kshow2013.com**

**RAISING THE BAR
MODERN MACHINE**

**A GLOWING EMERALD
SER REZISTANS**

**DESIGN AND BUILD IT
CERAMICX**

Lest there be any doubt, it is clear that this edition of HeatWorks is nearly entirely dedicated to events and successes in Germany and our forthcoming exhibiting presence at the K 2013 exhibition, Düsseldorf, October 16-23.

We're looking forward immensely to the exhibition and we have a great blend of new science and commerce to offer key players in German industry.

Here you will find the very latest on our IR machine tool to be unveiled at that show. We will also be taking an in-depth look at our esteemed German distributor, Friedr Freek. Read about the commercial growth of Freek and then turn to the middle section of the magazine in order to browse the wealth of heating products that the company offers.

Closer to home, Ceramicx has been preaching some of the values of Germany company organization. Dr. Cáthál Wilson lined up with Sean O'Driscoll, Glen Dimplex, CEO in order to explore the common ground between Ireland and Germany. Indeed Cáthál discovered that Ceramicx shares very many of the values and qualities that are common to German manufacturing SME companies. This Mittelstand; accounts for over 70% of employment in Germany and is extremely integral to the success of the country's economy in the past 50 years.

The truth is that every manufacturer in Europe should take note of the successful approach deployed by Germany's Mittelstand companies.

It continues to be the definitive manufacturing model for our times.

And although we count no chickens by the latest statistics that Europe is exiting recession Ceramicx notes that the German economy is leading the way.

Once again – we hope you enjoy our magazine. Please do not hesitate to contact us on any points or follow throughs.

Many thanks -

Frank Wilson



Patrick, Frank and Cáthál Wilson packing for a busy week in Düsseldorf

Contents

Page 1 IR Heat Measurement
Ceramicx introduces a new way of measuring and reading the Infrared heating spectrum

Page 2 The Science of IR Heat Measurement
Dr. Tony Robinson runs the rule over the new measurement system

Page 4 Getting Ready for K 2013
Friedr Freek and Ceramicx are putting together the final touches to their joint stand for K2013

Page 6 Mittelstand
Ceramicx gehört zu den wahren mittelständigen Unternehmen.

Page 8 A Glowing Emerald
HeatWorks catches up with our partner in Turkey, Ser Rezistans

Page 10 Case Study
Leading US thermoforming machine builder now uses all types of Ceramicx heaters in their thermoforming solutions

Page 11 Weco International Inc.

Page 12 Hot and Cold
HeatWorks talks to Collen Baker, UK associate and Director of Cool Technology

Page 13 Design and build it
There has never been a better time to ask Ceramicx about your advanced heatwork needs

Page 14 Ceramicx sets it's sights on a world class future

Page 16 Ceramicx Product Range

Page 24 Heat solutions for plastics from Friedr Freek
A pre K 2013 Show interview and synopsis about Freek process heating solutions for the plastics industries.

Page 24 Ceramicx News

Page 25 The Ceramicx Team
Talk to us today about your infrared needs

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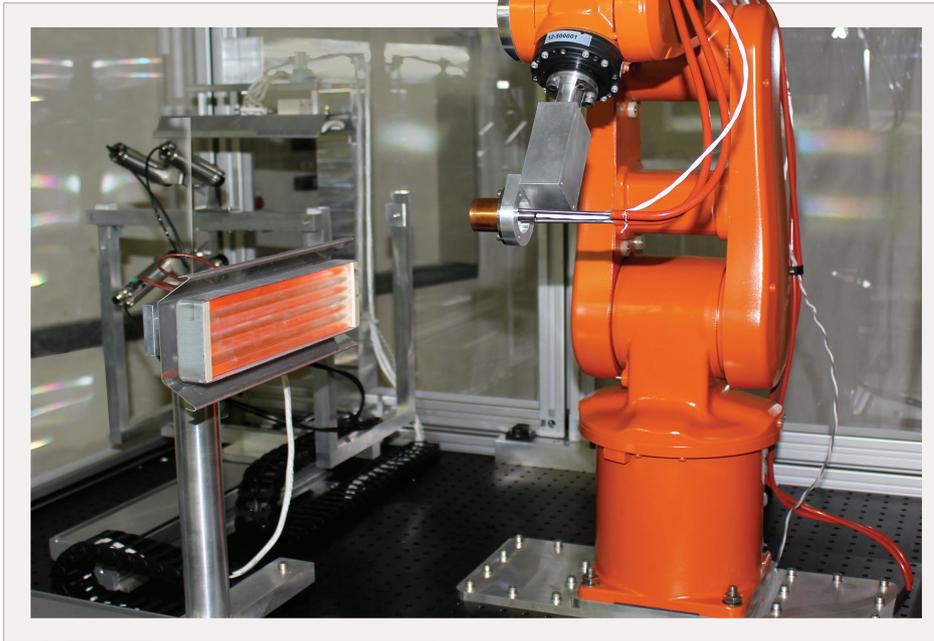
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IR heat measurement - The game has changed!

Thanks to hard work, innovative thinking and Enterprise Ireland (EI) Innovation Partnership funding, Ceramicx and Trinity College Dublin (TCD) are now ready with a new way of measuring and reading the Infrared heating spectrum



The characteristics of the heat of IR heat radiation has sometimes been described as 'sunshine without light' indeed the scientific literature on heat to date constantly refers to formulae and methods involving 'black bodies'.

Now a little more light has entered the picture. Ceramicx and TCD have developed a high quality machine tool that will offer a predictive Infrared energy science; a new instrument that will be invaluable in designing both manufacturing processes and thermal-

based manufacturing machinery.

Ceramicx expects to use it immediately in the design and performance of its own IR components, the assessment of competitor materials and in enabling design for those building machines involving IR heatwork. The machine will focus on measuring infrared energy produced and the best application of this energy for the correct heatwork solution for our customers.

Ceramicx expects to offer sales of finished instruments together with a bureau service for those manufacturers;

processors; thermoformers etc. who need precision accuracy in energy application for their heat processing work.

Not only will the new system enable research – based upon empirical measurement; such research will also enable increased production control, accuracy and cost savings through effective IR energy application and the resulting heatwork.

Industrialists will be further guided as to the correct application of IR heating and the understanding of energy content per part.

This kind of IR heat research is actually essential for industry and our sustainable future since it precisely maps the energy required to perform the required heating of the target body compared with the energy required to produce the heat at the source.

In short our IR heating machine tool is on spec and on schedule for delivery to Düsseldorf Germany in good time for our exhibiting presence at the triennial plastics exhibition K 2013, October 16th -23rd.

Please turn the page for further details of the build and the technology involved.

*Dr. Tony Robinson. arobins@tcd.ie
Trinity College Dublin, College Green, Dublin 2.*



K 2013 - just ask the Doctors!

Both Dr. Cáthál Wilson, Ceramicx (left) and Dr. Tony Robinson, Trinity College Dublin, TCD (right) will be in Düsseldorf, October 16 - 23, in person with the new IR machine tool - and available to answer customer queries and help develop applications for the new machine. Dr. Karl Brown of TCD will also be available at the K 2013 show as part of the team.

Cáthál and Tony welcome Düsseldorf visitors in relation to plastics and to all kinds of heatwork. The new IR heating measurement tool is expected to find a wide variety of uses in all kinds of industries over the coming months. The K 2013 triennial plastics show is the first such outing for the new machine tool.

All further details from Ceramicx.

The new science of IR heat measurement

Ceramicx and Trinity College Dublin (TCD) have worked hard together in order to establish IR energy and heat measurement principles and hardware that will both stand the test of time and sustain further developments.

HeatWorks magazine asked Dr. Tony Robinson, TCD, and Ceramicx partner in the EI Innovation project, to run the rule over the new measurement system.

Heat flux transducers are a key part of achieving what we do in this work. This equipment is a sensor that measures a change in temperature over a certain distance and uses the geometry and the thermal properties of the material within this distance to calculate the heat flux. For example, a radiometer acts as a differential thermocouple measuring the temperature differential between the centre and the circumference of a thin circular foil disk. This disk is generally made of metal, such as Constantan, and it is bonded to a circular opening in a cylindrical copper heat sink. As the thermal properties of the metal are known it is possible to relate the output voltage from the transducer to a heat flux value via the calibration data provided by the manufacturer.

IR transparent windows can be placed in front of the heat flux sensor to block out the convective heat flux reaching the sensor such that only the radiant heat flux energy is measured. The material used in the window will determine the radiation bandwidth that reaches the sensor.

The heat output from radiant heaters is generally characterized by the total output power and some form of heat map. To find the total output power, a heat flux sensor is used in order to scan a plane or a hemisphere in front of the heater: The advantage of using a hemispherical test area is that a smaller test rig can be used while ensuring that the total radiant heat energy from the heater is bounded within the test area. A heat flux curve can then be plotted from the obtained data points and via interpolation, the total output power is then determined by integrating under the resulting curve.

If measurements are to be taken over a large physical space and done so with high spatial resolution it is essential that the measurement system be automated. This is particularly true for cases, such as the Ceramicx/TCD measurement tool where the technology is to be used in an industrial setting. To this end, a new infrared heat flux measurement and

mapping system is being developed which also uses a robot in combination with a linear stage to position an IR heat flux sensor at fixed grid locations in 3D space in front of a heater assembly. The entire controls and positioning system along with the data acquisition are controlled with the LabView programme and the data is post processed in the Matlab programme.

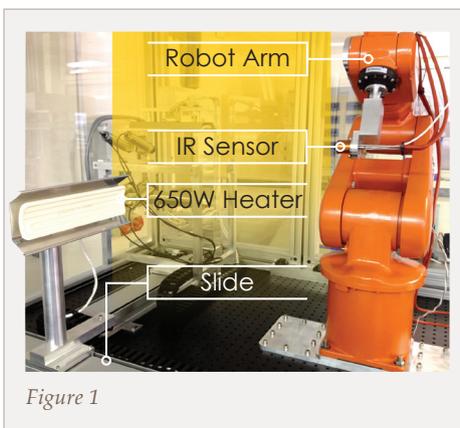


Figure 1

A photographic idea of the IR heat flux mapping apparatus is shown here in Figure 1. A full trough ceramic heater element manufactured by Ceramicx Ltd is mounted on an SMS rolled screw, twin-bearing linear stage with a total travel of approximately 630 mm. The heater is rated at 650W and has an Aluminised steel reflector situated behind it to redirect a portion of the heat which would otherwise be lost through the back. The heater has an embedded K-type thermocouple and is powered by an Elektro-Automatik PS 8000T, 0-360 V, 0-10 A DC power supply.

A Vatell TG9000-9 series radiometer is used as a radiant heat flux sensor in this project. This sensor actually measures irradiance, i.e. the amount of radiant flux incident on the sensor area. The sensor head is small; the diameter of the barium fluoride window, in this case is less than 5mm and the irradiance is generally measured in W/cm^2 .

This barium fluoride window can transmit 90% of radiation within the 0.4 - 10 micron range incident on it while blocking convective heat flux. However applications which have high convective heat transfer rates may produce

erroneous results in the radiant heat flux readings. When used in conjunction with a Vatell AMP-15 single gain amplifier, the sensitivity of the sensor is $10.012 mV/W/cm^2$ with a manufacturer calibrated accuracy of $\pm 3\%$ and repeatability within 1%.

The primary aim of course of our new system is to measure the radiant heat flux distribution from the heater system. This is so that its footprint can be determined with regard to heating of a materials target such as the plastic sheet used in a thermoforming process. Further to this, this will also allow the radiant efficiency to be determined as well as how different heater and reflector designs change the radiant heat flux distribution. To this end, the heater and sensor is mounted on positioning systems so that a heat flux map can be created in a space of 500mm x 500mm x 500mm.

An ABB IRB-120 6-axis robot is used to position the sensor in front of the infrared heater assembly. The robot has the capacity to cover the required width and depth (500mm x 500mm) plane parallel to the front plane of the heater, however it can only cover a length of 100mm from the heater. In order to increase the length, the heater is mounted on the SMS twin-bearing linear stage which then increases the total possible length to 500mm.

The measurement system requires that the robot and linear stage be controlled so as to position the sensor in a specified location in front of the heater after which one or more IR heat flux measures is acquired. The relative position and the magnitude of the sensor output voltage must then be stored for future post processing.

The user operated PC is connected directly to the IRC-5 robot controller, the LabView system administrates the operation of the robot and the data recorded from each of the thermocouples and heat flux sensors.

When the program within the robot controller is initiated, the robot arm defaults to a specified 'Home' position. In the LabView interface, a designated grid size is defined, along with the number of data points to be recorded, the distance between these data points and the number of grids to be executed.

Once these parameters have been set, the LabView system sends a connection signal to the robot controller to set up position through a LabView system loop. The data acquisition system is then triggered and the desired information is recorded from each of the sensors about the system.

When the data acquisition is completed, LabView generates the next target for the robot to move to, and the loop continues. At the end of a complete grid, the robot arm is signalled by the controller to move back to the 'Home' position while the linear stage is activated and traverses back to its next position. The linear stage

is activated a number of times and is defined by the user depending on the resolution desired. When each of the grids is completed, the data is saved and the robot is moved to a safe position out of the way of the rest of the equipment to allow adjustment to be made on the test bed. Once the doors to the rig are opened the motors to the robot are automatically disengaged, allowing safe access to the rest of the test bench.

Thus far, our new system has been validated using the following tests. It should be noted however that the sample sizes are still relatively small.

Figure 2, for example shows a sample radiant heat flux map for a 500mm x 500mm vertical plane located 100mm centrally in front of the heater. The heater power was 800W for this particular test. The graph indicates that for this particular test, the radiant heat flux distribution is parabolic in shape with a concentrated zone in the centre in proximity to the heater element itself. The peak heat flux in this region is 10184 W/m². Moving away from the central region, and thus the heater, the heat flux drops off rapidly, being as low as 80 W/m² at a location 250mm above the geometric centre of the heater.

These simple enough measurements can be immensely helpful to designers of industrial processes. For example, the magnitude of the radiant heat flux, as well as its distribution, is an important parameter in industrial process, such as heat treatment and thermoforming, since heater elements are often used in arrays. Information such as that provided below will aid in the design of the arrays whereby the quantity and uniformity of the impinging infrared radiation on a target can be assessed.

Figure 3a illustrates the 3 dimensional mapping of the radiant heat flux within a 500mm x 500mm x500mm region of space. The left figure shows cross planes of the radiant heat flux distributions at

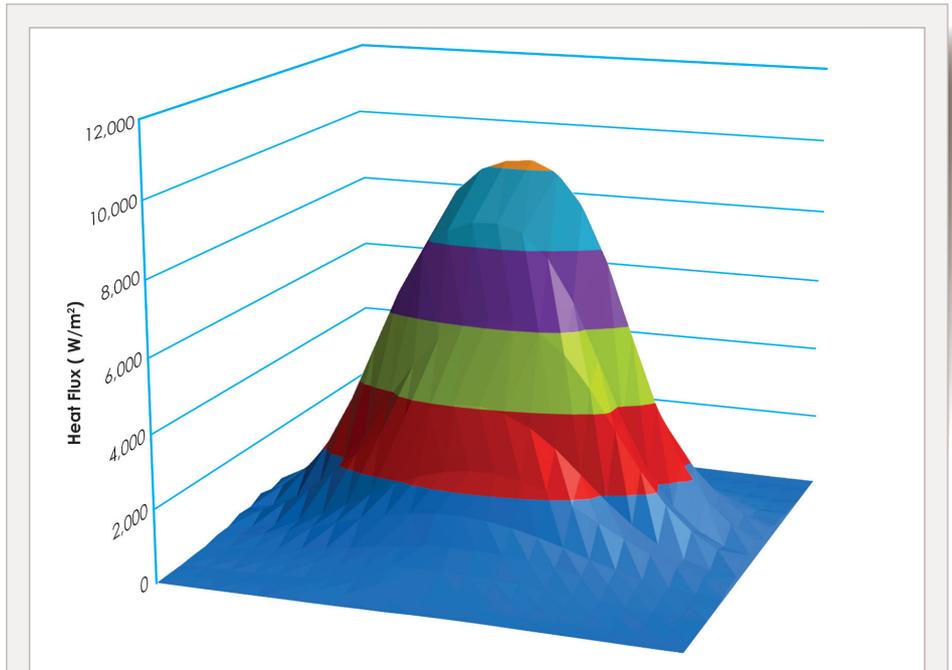


Figure 2

distances of 100mm to 500mm from the heater surface. Since infrared radiation diffuses in all directions, it appears as a spreading of the radiant heat flux, in the sense that the magnitude of the heat flux diminishes with distance from the source as does the steepness of the local profile. This is better illustrated in figure 3(b) which plots the IR received by the sensor as a percentage of the heater input power. The orange plot illustrates how the percentage radiant heat flux emitted from a typical white FFEH element diminishes with distance from the heater assembly. The red plot represents the equivalent black FFEH element and shows clearly how the 3D IR mapping tool can measure differences in performance.

Again, knowledge of the 3D radiant heat flux profile such as this is crucial for the

design of most IR heater systems. These kinds of empirical measurement give an accurate and direct measure of the quantity and evenness of the radiation on a target. These measurements also help inform decisions regarding the heater assembly design as well as the positioning of the target.

Thus far, and in scientific terms, the preliminary results of our new system have shown the viability of the technique. Measurements have been obtained which quantify the magnitude and spread of radiant heat from a source. Future work will include using more complex measurement topologies such as a hemisphere in front and behind the heater assembly so that the radiant efficiency of the heater can be determined.

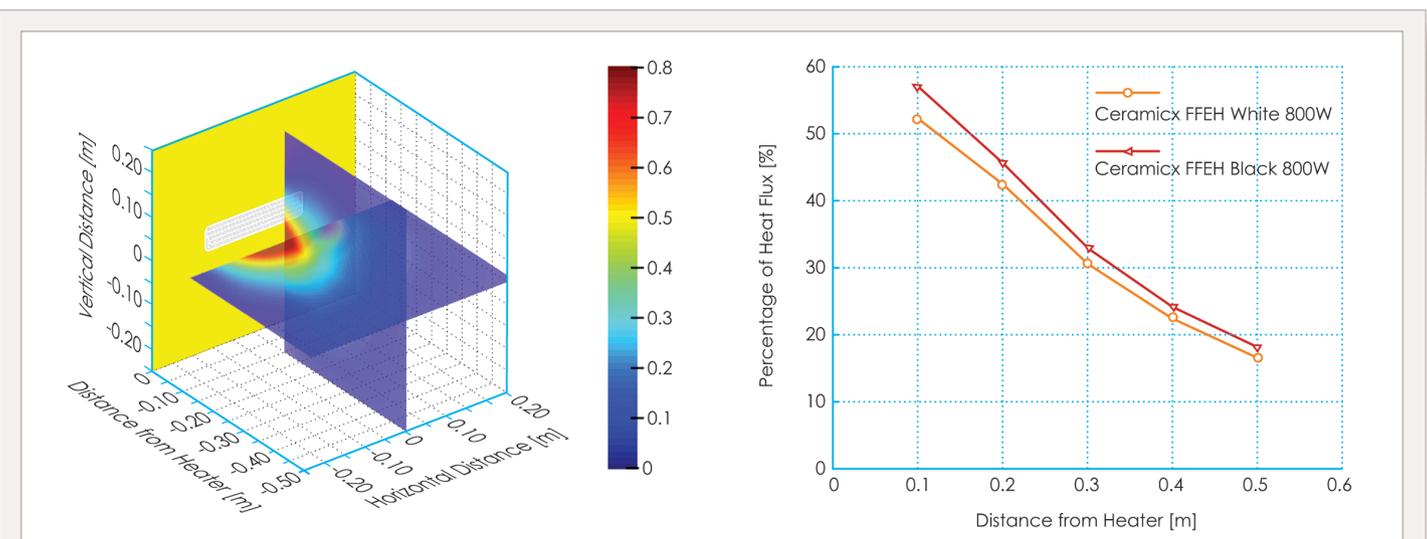


Figure 3a

Figure 3b

Getting ready for showtime in Germany!

It gives Ceramicx great pleasure to once more be preparing to celebrate our expansion and our new products with our friends and associates at Friedr Freek, Germany.

Both companies are now putting the final touches to our joint exhibition stand at the leading plastics exhibition in the world – K 2013, October 16-23. Ceramicx of course will demonstrate the use and benefits of our new IR testing machine tool.

Freek will also have a host of complementary innovations in all kinds of technologies; especially for injection moulding - just check pages 24 – 27 of this issue. As part of our K 2013 preview we catch up here in depth about the ongoing Freek story.

Down the years it has been invaluable to us at Ceramicx to learn and to keep pace with all that happens at Friedr Freek. We have much in common: Major investments are ongoing; product innovations are ongoing and Freek growth is set to surpass itself again over the coming period and Ceramicx hopes to do the same.

We share the values of focus, hard work, innovation and invention. K-Show 2013 customers are king of course but the October time in Düsseldorf will provide both of our companies with the opportunity to brainstorm and to interact together for mutual benefit.

For Freek the 1990s saw a period of great structural change. The company effectively re-invented itself – from a 100% domestic heater producer to a 100% industrial heater producer. The worldwide movement of low-tech domestic appliances production to locations with cheap labour and the steadily growing price pressure on simple open-coil or panel heaters lead to the inevitable loss of Freek business in consumer areas; tumble dryers, hand or hair dryers, cookers or ironing presses.

Nonetheless, and following European collaborative projects such as EUCOPET (with Ceramicx and others) and by meeting the challenge with strategies such as LEAN and Low2High, Freek succeeded in defending this business much longer than expected.

In this period of transition Freek found interesting heat niches and even high-tech applications for the formerly domestically dedicated elements. Today, for example, heating crosses for hair dryers perform demanding roles in hot drink vending machines and simple fan heaters do an excellent job in sophisticated house or room ventilation systems.

Freek's 'low2high' strategy - mainly aimed at finding high-tech applications customers for simple standard heaters – also lifted the company to another level of professionalism. This in turn opened up new markets for Freek's industrial heating business.

Looking back over the past twenty years a cluster of various changes - technology, organizational and scientific have now brought success to the company.

Freek defines part of its success by the following benchmarks:

The company supplies world-class manufacturers and market leaders in traditional as well as young and growing industries amongst them medical, laboratory, aviation, solar & wind energy

Freek is increasingly involved in a number of top-confidential development projects and signs nondisclosure-agreements on a regular basis.

2010 saw Freek overtake the losses of the crisis year 2009 completely, repeating the former turnover record of 2008.

Freek turnover 2012 vs. 2010: +17% and enjoyed stable development in 2013 – now approaching the 8 million Euro threshold and set for increased growth through to 2014.

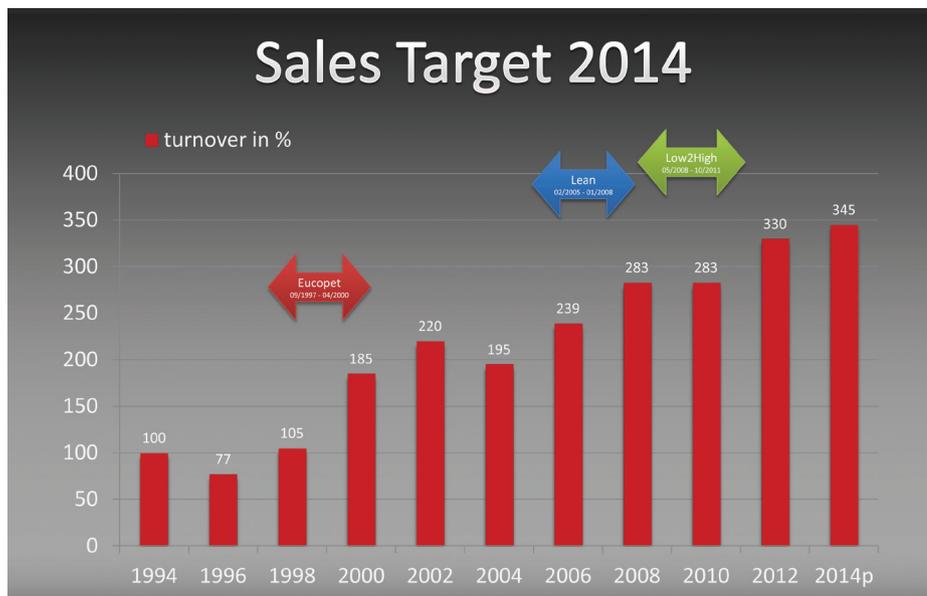
Freek's customer pool has grown some 30% in 2012 vs. 2008: +30% with approx. 1000 active accounts

Further signs of the new professionalism at Freek include:

More capacity (engineers) in R&D and Quality & Project management (matching our status as a technology leader and matching the needs of our high-tech customers/markets).

Installation of a new computer network, EDP 4.0 (servers, switches, operating systems), new PCs, ERP Upgrade, Windows 7&8, latest MS Office version, 3D design software (Inventor), new Website

Major investments have also been necessary due to the implementation





- by focusing on producing and supplying the best possible heating elements.

Freek gained a deep understanding and thorough know-how about the physics, components and ingredients and the art of assembling them to perfect heaters.

of laser technology, another test bench for our laboratory, the expansion of Freek's HotMicroCoil production, the set-up of a new production line for cartridge-heaters as well as inevitable renovations of the administration building.

All the above changes have come within just three years and have been based on a stable, skilled and most motivated team and a company culture that supports communication, co-operation and innovation.

Freek has come to enjoy particular prominence in the plastics moulding world. Ceramicx of course has been Freek's trusted partner in IR heating and in plastics thermoforming. Freek has made great strides in injection moulding heatwork; especially for 'hot runner' applications and for markets within Germany and in German-speaking countries such as Switzerland and Austria.

Freek always enjoys the K 2013 exhibition. The company feels that - in addition to the hot runner manufacturers - perhaps this year's event will also see a number of new interests converge on the Ceramicx/Freek stand.

Bigger molders, especially those having maintenance and tool making departments in house would certainly benefit from visiting Freek on site.

Freek already supplies most of the German and Swiss premium players in the hotrunner industry. And yet there are some who have never tested Freek hotrunner heaters, at least not the latest generation. These companies would definitely be surprised about the extraordinary quality level Freek has achieved today.

Freek also believes that some companies still maintain the former

Freek's continuous growth manifested in 500 m² second story extension on top of production hall 2

Volker Fleige (mayor of Menden) with Wolfgang Kaiser (left) and Stefan Kaiser (right) on the occasion of Freek's 60th anniversary in June 2010



image of Freek - as supplying the domestic appliance industries, and conducting just some side business within the plastics industry. Should such companies exist, they would do well to use K 2013 to convince themselves of the opposite.

With Freek located right in the middle of Germany it has been normal that foreign markets have not received the same attention as the German home market. This and a relatively young history with less than 20 years of presence in plastics means that many blanks in the global markets remain. Freek is therefore keen to invite these companies to attend Düsseldorf to weigh the options for beneficial cooperation and to introduce Freek quality heaters to new markets abroad. Freek sees itself as increasingly at home in the plastics industry: Processors and equipment supplier typically value the continuity in Freek team members, the industry experience, the personal contacts and tradition of loyalty.

Quick commercial responses are the norm - order confirmation next day, express spare parts delivery within 24 hours; excellent service and back-up guaranteed.

Freek has found that it does best with plastics customers - often very experienced and savvy purchasers

An assortment of alternative/ competing heating solutions (different heater types) allows 'neutral consulting' with a better chance to find the best possible solution. Plastics processors can look forward to:

- **full-range supplier of industrial heating elements**
- **flexibility** (changes within placed orders, capacity (various external cooperation partners, our sister company KSG Gerätetechnik in Waldheim in Saxony, homeworkers, part-time contracts, ...))
- **reliable and continually improved quality**
- **customized solutions** (innovation culture / eight engineers & technicians involved in R&D together with quite a number of trusted development partners)
- **cost-effective standard solutions**

K 2013 will provide many opportunities for listening and learning and K 2016 for Ceramicx/Freek will contain even further heat technology advances, based upon customer need and service.



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Ceramicx gehört zu den wahren mittelständigen Unternehmen

HeatWorks is

pleased to present the edited highlights of a talk by C ath al Wilson, presented in June 2013 at the Rosscarbery Summer School, Cork

The event was opened by the first secretary of the German ambassador to Ireland and the theme of the day was the common ground between West Cork and Germany. C ath al shared the business section with Glenn Dimplex CEO Sean O' Driscoll. As you can see – there is indeed much common ground between Ceramicx and Germany at the present time and even more to build on for the future!

Ceramicx's German experiences began in 1997, Ceramicx are represented by our Dortmund based partners Friedr Freek. We got to know Freek via a collaborative and successful EU programme through which SMEs such as ourselves could leverage our flexibility, ideas generation and fast reactions together. This project formed the first of its kind for SMEs and at this time was featured on the National News in Germany as an Innovative method by which SMEs were working together.

This program found a co-operative partnership model that extended the traditional distributor outlook. Today Ceramicx co-operates on a number of fronts with Freek, Ceramicx has a German translation website that has

grown extensively over the last number of years with the help of Freek. Freek translates the dynamic content or blogs on a regular basis for the site which helps drive Search Engine Optimization. Ceramicx now holds the number one position for Google searches for a number of our products despite having competitors in Germany.

'...were Ceramicx based in Germany there's absolutely no doubt that, we would fit right into the engine of the thriving Germany economy. That engine is called the Mittelstand.'

Freek is heavily involved in informing our technical developments and working on the ground with customers to ensure that the developments that we make to our products are in line with their expectations. Ceramicx and Freek are currently lining up for a major push on the German market and we expect to achieve 20% growth there this year with 15% annual growth in the market expected thereafter.

There are a great number of positives to doing business in Germany. For example, a technical company such as us breathes a sigh of relief when dealing with an industrially educated customer who truly understands what it is to supply and approve drawings. Such customers also understand that getting a product correct is all about the system and its context and not just the components you supply in the system.

For example a large part of our business is the manufacture and supply of infrared emitters; if these are not installed correctly - in reflectors with the correct control and operating conditions - it is very easy to burn them out. Unsurprisingly, this is not something we have to contend with in the German market. This makes any business we can do in the German market far more valuable to us as a company. German engineering speaks our language and the time spent on non-productive issues is seriously reduced.

In fact, it so happens that were Ceramicx based in Germany there's absolutely no doubt that, we would

fit right into the engine of the thriving Germany economy. That engine is called the Mittelstand. It comprises over 70% of employment in the country is largely composed of German SMEs and, in my view, is the main reason for Germany's economic success.

How and why would Ceramicx fit right in?

We're a family-run and family-based company - and I don't just mean that myself, my father and mother direct it and run it and indeed my cousin Patrick Wilson is our production manager.

We encourage a family style vibe about the place - as you might expect with an annual family day barbecue and annual Christmas party

We maintain a relentless focus on doing a highly specific number of tasks. We have an intensity about ourselves that is hard to rival - anywhere, big or small.

And in truth that intensity has to be there - every day, every week, and every year. Last year - after participating in a performance measurement program for over 12 years with Enterprise Ireland - we attained the status of world-class manufacturing for what we do - briefly that means we are within the top 2% of our manufacturing class throughout the world.

Most successful goods and services are innovations on what has gone before. In other words - make something really well to an existing need - and as long as there is healthy demand for the generic product - you will never lack for sales.

Build a better mousetrap and the world will beat a path to your door! - the saying goes. In other words if you can offer the best in class for an existing need - like a mousetrap - you will always have customers. Similarly Ceramicx aims to build the best infrared heating systems and components on the market today.

We export – a lot. Like the Mittelstand companies – who sell over 65% of their goods outside Germany – we export all over the world – because our customers need the quality of our product. In fact Ceramicx exports 98% of our production to 65+ countries thus far with focus on 6 specific markets.

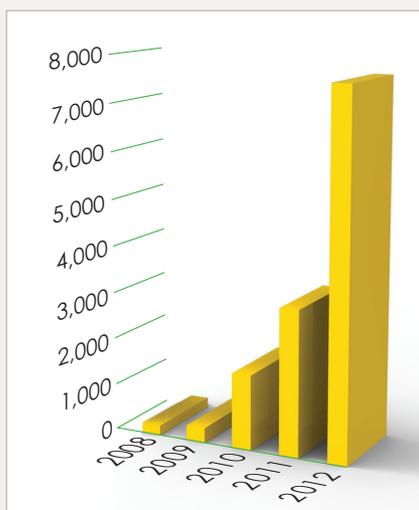


Figure showing Organic web visitors from Germany from 2008 - 2012



Pictured at the Rosscarbery Summer School at the Celtic Ross Hotel were – from left – Frank Harte, Chairman, Rosscarbery Historical Society; Dr Niamh Wycherley, Harald Seibel, First Secretary, German Embassy, Sean O'Driscoll, Chairman and CEO of Glen Dimplex; Gerry Wycherley, Celtic Ross Hotel, and Dr Cáthál Wilson, Director, Ceramicx Ireland. (Photo; The Southern Star)

We spread our bets. What does that mean?

Like Mittelstand companies we are somewhat risk averse. We particularly avoid putting all our eggs into one customer basket. Recently I came across a sales lady from a German machine tool company who turned down a huge contract at a moment in time because it was not right for the company and it would expose the company too much - no one customer should account for over 20% of your total sales.

I was not surprised to learn that the word company has its origins in the Lex Salica as a Germanic expression *gahlaibo (literally, "with bread"). It is also the Germans that still lead the way in their understanding of this word and how it should be nourished and respected. If we take it to mean "with bread" what does that mean? It means the company as an entity or individual as it is in the eyes of the law should hold the money or resources

We invest. We plough back our earnings into investment, research and development. We contract in, not out – no screwdriver operations or outsourcing here – and we make as much of it ourselves as we can through a policy of backward integration building a technology company.

Higher learning and know-how are integrated into our work and industry – academe is not separate. Ceramicx is working with both the University of Limerick and Trinity College Dublin on

leading edge industrial and scientific projects. The company is also exploring and always open to other win-win University partnerships.

The net effect of all the above is a process of wealth creation. Wealth is a word that has not had a lot of sensible air time lately. We are, of course more used to hearing about money. But money is not wealth. Money is sometimes a means and a tool by which wealth can be attained. If money or cash is abused however it will not generate wealth.

And Germany, in truth, is not the European country that prints the most money. But for the reasons above – and for those Mittelstand values – Germany is certainly the wealthiest country in Europe.

So – when you look at the picture and the factors for success – and the Mittelstand values as applied to German SMEs of no greater size than those in Ireland – the way forward seems clear. To be sure there are some further factors: The German business tax system, for example, is set at 38%. However the tax system encourages wealth generation with an accelerated write-off of depreciation in just one year. The company is therefore incentivised to invest money in capital equipment that enhances the productivity of it's staff and the company. This is a tax system very much designed for building up of SMEs rather than the location of Foreign Direct Investment. Ireland to date has been used to the latter strategy and the work to be done now is to balance

and get the best from both worlds. Irish SMEs can and should, for example, do more to engage in trade and exports with Germany; a tough market to crack but well worth the effort.

It is important to spend time looking for and engaging with a partner company which provides you and your company with an opportunity to learn from the best. Irish companies will certainly be able to bring innovation, flexibility and speed to the German table. However, those companies need to make certain of 100% quality assurance and detail.

To recap – here, I believe is the common ground for your company to do business with Germany.

Relentless focus and investment on your company. You will never be successful supplying a market where your competitors reinvest nearly everything if you are not doing so yourself.

The detail matters on every aspect of what you are doing. Make sure you have introduced structures and systems to your own production and follow through.

Know every aspect of your product, engage Colleges and higher learning to consolidate your position and enhance your understanding of the scientific aspects of your products. Then sell on that basis in order to enter the German market.

Familiarize yourself with culture. Find a distributor who speaks excellent English and German.

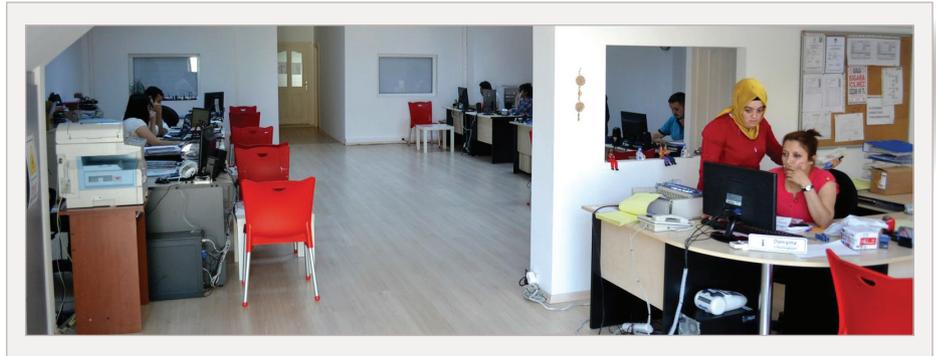
Get your website translated into German with dynamic content in order to bring about great Search Engine Optimisation (SEO).

In conclusion my personal challenge for this coming year - up until our next Summer School here in 2014- will be to share and expand the successful Mittelstand and Meitheal ideas I have observed, here in our own back yard.

West Cork needs to look to its industrial past for inspiration in building its future.

A 'glowing emerald' in the new industrial Turkey

HeatWorks catches up once again with Ceramicx's partner in Turkey, Ser Rezistans. In three short years the relationship has blossomed into something special with many win-win outcomes along the way. We talk to Hasan Duman about the recent changes.



Hi Hasan – we hear you've been extremely busy?

Yes indeed. Ser Rezistans moved to a new factory location some two months ago, a move which included the renewal of our whole management offices. Effectively we're a business that's enjoyed 100% growth in the past two years.

Wow! any special factors involved?

OK, let me explain it a little bit. Part of our secret is to employ open minded people who also have a hard working ethic. When you couple those things to a strong principal business, one that also includes world class partners – such growth figures appear normal to us.

Ceramicx was a World-class partner to Ser Rezistans even before the company received its World Class manufacturing rating.

Both companies met at the K 2010 exhibition?

Indeed – and Ser Rezistans started to design infrared ovens with support of Ceramicx. As part of the process we visited Ceramicx in Ireland to learn some of the fundamentals of IR technology. This was an essential step, since IR heat training is not easily and readily available. At the same time the industrial World is becoming more and more curious about the features and benefits of IR heating.

Particularly in Turkey?

Yes. The Turkish market is one of the fastest growing industrial markets in the World right now. Ser Rezistans gets questions everyday about the ins and outs of IR heating. Some customers want to dry materials or objects, some of them want to cure or cook substances; all of them need to access know-how in heat processing and heat work.

Meanwhile the cost of energy isn't getting any cheaper?

Correct. All markets are suffering from energy consumption problems and therefore all good companies are searching for energy savings. Sooner or later this search leads them to infrared.

How has the Ceramicx IR help been useful?

In this respect Ceramicx and Ser cooperation glows like an emerald stone: Firstly, we changed to being a design, information and development company from only doing production work. Now - thanks to lessons learned from Ceramicx - we inform, design and then develop prototypes for customers. Then we go on to manufacture complete infrared heating systems.

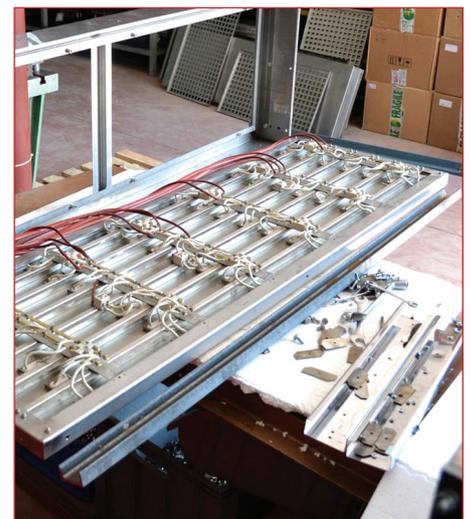
I guess that these company changes have been driving the new move?

Yes. Our new production plant has helped this transition a great deal. As part of it we added two new CNC machines into the system, including

controlled mechanical shear and press break. With this machine we are able to produce a selection of whole thermoforming platens in-house.

And Ceramicx technology helps the platen build?

Exactly so. Because we know we can rely on world-class Ceramicx quality, we're half-way home already. For these reasons – including Ceramicx quality and experience – we believe we are now the number one industrial infrared manufacturer in the Turkish market. The new move means that our storage capacity is expanded and we are bringing in increased Ceramicx product to serve the Turkish market.



Ser Rezistans needs to be able to supply most IR products at a moment's notice. We have a 'ready to ship' policy in place for all cases of IR heating enquiries. And because Ceramicx makes the entire range of IR products – short, medium, long wave – we have a great one-stop-shop partner for all our supply needs.

Ceramicx and Ser are working together on some thermoforming innovations together?

Correct. In terms of thermoforming Ser and Ceramicx have been working on new production development and production improving projects. Our new kind of thermocouple, for example, has been working very well in high temperature environments and resists all kinds of electrical 'noise'. This development alone is winning Ser Rezistans a number of new customers.

And Ser Rezistans has also been doing some branching out in product development?

The move to the new facility has opened up some new room for our R&D department. We recently appointed Mr. Ramazan Eorenkaya to be our new head of R&D. Now we will also focus more on research and development side. Also Ser Rezistans developed a two sided infrared heater prototype for heat large metal press moulds. The Turkish scientific and technologic research institution (TUBİTAK) supported this development. A new high-density mineral isolated strip heater and IR extrusion barrel heating design is also on its way. In this respect we learned lots of things

from Ceramicx - especially the need for project discipline and of the importance in investing in company IP and research and development.

How much does the new facility mean to the company?

Our old production plant was nearly full of inventory and machinery and it was becoming a very crowded space. It was getting to the point where it was restricting our expansion and threatening our capacity to turn around production orders. So we had to do something.

However, in Istanbul it is now very hard to get a decent manufacturing plant and the location is turning into Skyscraper city. Business is booming steadily and Istanbul is becoming a global power. Essentially we are very lucky to have secured a new facility in this city, not least because more demand is coming at us day after day.

You have taken the move opportunity to review and implement some new systems?

Moving the new plant and dealing with our fast growth rate led us to the business of choosing an Enterprise Resource Planning system. Over the next six months we therefore have a lot of work to do in order to implement the system. We are also planning to add and integrate a Customer Relationship Management (CRM) module and production planning module with the new ERP. Our goal and aim is to have all departments working together like a

well managed orchestra. Every year Ser Rezistans focuses on new developments and this year is the time for ERP implementation.

How about the company's marketing and exhibiting?

OK. In a few short weeks the K 2013 plastics fair waits for us. On our first visit to K fair three years ago we met Ceramicx and the rest is history. This time Ser Rezistans goes to Düsseldorf as an exhibitor – which speaks volumes for the way Ceramicx and ourselves have worked at this market in the past three years. You will find us in Hall 11 on Stand 25. Maybe we are newbies but we are confident of telling our story to everyone.

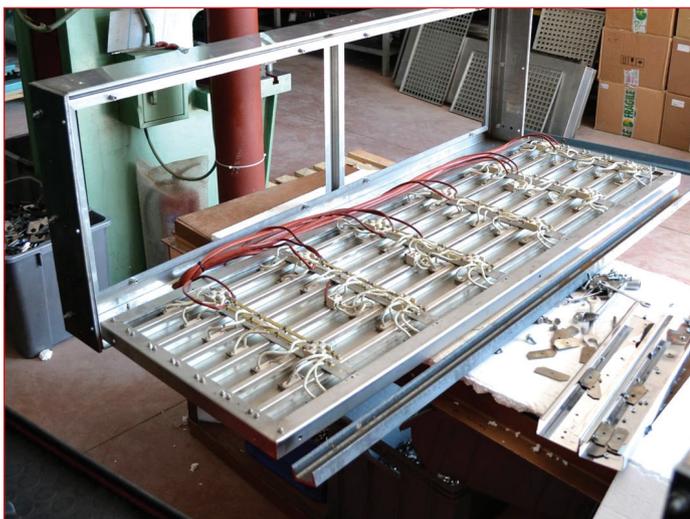
And in the Turkish market?

For sure we are still committed to our usual exhibitions. You can find us at the Eurasia Packaging Show in Istanbul, Sept 12-14 and then also at Plastics Eurasia from December 5-8th. These shows are now like a tradition for us but every year sees us change and mix it up a little more. The K Show commitment is certainly evidence of that!

Thank you very much for your time
Hassan



- SER REZISTANS
- HALL 11
- STAND D25-1



Modern Machine - raising the bar

Leading US thermoforming machine builder, Modern Machine, has standardized on Ceramicx Brand Infrared heaters

Modern now uses all types of Ceramicx heater in their designs for plastics thermoforming solutions - from Ceramic, Quartz, tungsten and Halogen. Modern Machine, located in Beaverton, Michigan, has equipment installed in many Fortune 500 companies and have an excellent reputation throughout the thermoforming industry.

The company sets great store by its abilities to create custom-made thermoforming machines throughout the world. The company also continues to upgrade its software offerings in line with the status of its machine build. Dan Sweet of Modern customer, Ray Products, says that 'throughout the past few years Modern has identified areas of improvement from our discussions and has continued to upgrade the software side of the machine to improve the ease of programming and provide additional capabilities of the machine. We just received our third Modern machine, a three station pressure-former. Built to our custom requirements this is by far the best machine I have ever purchased.'

Recently Modern has also invested in equipment and personnel to expand into the IR welding markets. IR welding is a relatively new process when compared to the old method of hot plate and RF welding.

The IR welding industry uses a phase angle fired control on the Halogen and tungsten lamps. Although this works it

can also cause a good deal of "noise" on the electrical line, potentially causing communication issues within the control system.

Modern is therefore building a new control system from the ground up, throwing aside the industry "standard" The new Modern system will utilize the Hetronik multi channel control system currently used on Modern's thermoforming oven control. This system will provide the IR welding process with diagnostics not found in other system and will do so at a much lower cost.

The ability to detect a failed heater within seconds is critical for perfect welds every time. It also eliminates expensive over-production. In addition the control system will use 'zero cross' with a softstart feature to protect from high inrush currents and eliminate the potentially harmful electrical noise. The Hetronik system offers all this in a compact, efficient control housing. Modern Machine is working directly with WECO, Ceramicx and Hetronik to develop a system that will change IR welding industry forever.



Modern Machinery's HQ in Beaverton, MI.

Modern Machinery was established in 1982. The company leased a building for a few years, but knew quickly that it wanted to expand further into the cut sheet market. Believing we could be competitive with our experience and desire to make the highest quality machines, we made plans to build our own shop.

In 1990, Modern Machinery therefore built its current location in Beaverton, and by 1992 doubled square footage to 12,000. Just six years later we added another building and a high bay. Knowing that Modern Machinery would continue to expand, the company purchased 15 acres of adjacent land in 2007. In the spring of 2012, several acres were cleared in anticipation of building another 12,000 square foot addition in the near future. In 2012 Modern was able to purchase two new machining centres. After the next planned addition, Modern Machinery will have total space of nearly 40,000 square feet.

Modern Machinery's mission is to provide the highest quality thermoforming machines to our clients. Markets served include all kinds of packaging, construction, agricultural and recreation. Modern's equipment offerings include

- Vacuum Shuttle Thermoformer
- Pressure Shuttle Thermoformer
- Double End Shuttle Machine
- 3-Station Rotary Vacuum Thermoformer
- 3-Station Rotary Pressure Thermoformer
- 4 Station Twin Sheet Thermoformer
- Custom Equipment
- Continuous In-line Formers
- Horizontal Trim Press



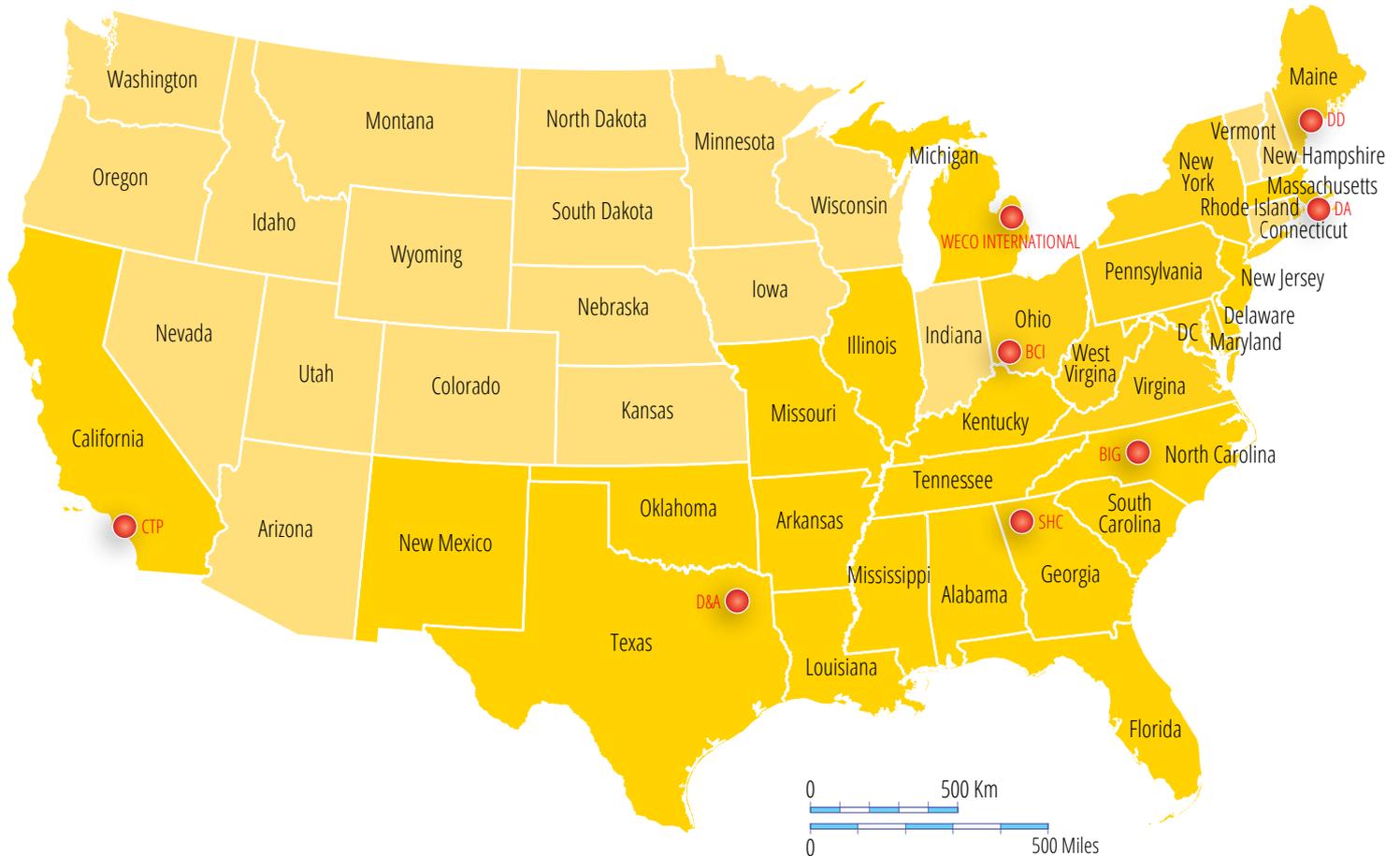
Figure 3

MODERN MACHINERY Modern Machinery
OF BEAVERTON, INC. of Beaverton, Inc.

3031 Guernsey Road, PO Box 423,
Beaverton, MI 48612
info@modernmachineinc.com

www.modernmachineinc.com

WECO INTERNATIONAL INC.



Infrared Ovens and Control systems

	 Beacon Industrial Group 1925 West Innes Street, Salisbury, NC 28144	Phone 1-704-642-1880 www.beaconelectronics.com AL FL GA NC SC TN VA
	 Big Chief, Inc. 5150 Big Chief Drive, Cincinnati, OH 45227	Toll Free 1-800-835-HEAT www.gobigchief.com AL GA IL IN KY MO NC OH PA SC TN TX WY
	 C-T Products 27517 Elmridge Drive, PO Box 2652 Palos Verdes Peninsula, CA 90274	Phone 1-310-377-9983 www.ctproductscompany.com CA
	 Dawson & Associates 3208 Commander Drive, Carrollton, TX 75006	Toll Free 1-800-899-3843 www.dawsonandassociates.com AR LA NM OK TX
	 Doug Davis, LLC PO Box 6263, Cape Elizabeth, ME 04107	Phone 1-508-849-3990 www.douglasdavis.com AL FL GA NC SC TN VA
	 Southern Heat Corporation PO Box 938, Cartersville, GA 30120	Toll Free 1-877-607-4501 www.southernheatcorp.com AL GA LA TN MS
	 Weco International, Inc 841 Tacoma Court, Clio, MI 48420	Toll Free 1-855-IR-2-HEAT www.wecointernational.com MI

Infrared Comfort Heating solutions

	Doug Abdelnour 29 Lake Avenue, Oak Bluffs, MA 02557	Phone 1-508-360-2703 MA
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Joined up thinking for hot and cold

HeatWorks magazine

talks to Collen Baker, UK associate and installer of Ceramicx Infrared (IR) Heating products.



As the company name suggests, Cool-Tech began life in the cooling business. Within a very short space of time, however, Collen Baker realised that joined-up systems thinking needed to apply. Heating and lighting quickly became a part of the company portfolio and service.

'I guess you could say I was lucky to know the score from an early age,' he jokes. 'Designing and building electronic stadium scoreboard systems - was literally the first job I got stuck into from university,' he recalls. 'From there the work further developed into applying technologies for other critical control and real time environments. Other kinds of electrical and electronic engineering led Collen through various sectors; aviation, defence, process plant control up until the largest most recent stretch at Honeywell; managing international sales for process and control for the whole of the EMEA region.

Collen spotted a gap in the market for a company that would specialise in green low energy business solutions.

Cool Tech Ltd was then established on the Suffolk/Norfolk border, with a mission to provide environmentally friendly, low energy solutions to industry and to local authorities.

A large part of the service aims at introducing clients to technologies

that will drastically help with energy consumption. 'This applies to everyone and all environments,' notes Collen, 'from large organisations down to small and medium sized enterprises.'

Initially concentrating on evaporative cooling as a low cost, green alternative to traditional air conditioning, the company has since branched out offering heating solutions using the latest low energy electric, solar and infra red systems. A recent trip to the Ceramicx factory in Ireland confirmed Ceramicx as the IR supplier of choice to Cool-Tech:

In all of these fields the aim is to offer all clients sound advice on which products are most appropriate and most cost effective. Cool-Tech backs up the hardware with full statistical and data analysis, a full quotation of the proposed scheme following site visits and plans, arrangement of finance (when required; 'leasing is a very formative option when the monthly rate is considerably lower than our clients current monthly energy spend'.) They can get assistance with Carbon loan applications (at least in the UK), complete installation and commissioning programme scheme and ongoing aftercare and maintenance.

Another area of Ceramicx/Cool-Tech common ground is the awareness of how much energy opportunity is now currently available to businesses and

consumers from new kinds of control and technology, including IR heating.

'Everything that Frank and Ceramicx have been saying in recent years about industry needing to measure its energy performance and energy inputs and then seize the opportunity to save money and get a grip on the energy cost/units per part equation - I absolutely agree with,' he says.

Very often the first thing Cool-Tech has to do is show our clients their starting position with regards to their energy and energy use and then gently work things forward from there. In many cases the return on investment can be incredibly quick. Just a few months for example in the case of computer server room environments.'

In terms of heating, Ceramicx and Cool-Tech are agreed that a major goal is energy reduction. Solar and photovoltaics can play their part - but infrared heating has perhaps an even greater role. 'Perhaps,' notes Collen, 'Infrared has some kind of untested image problem to deal with but really it's one of the most natural things in the world. You could describe IR energy and its radiation as 'sunshine without the light'. For all kinds of customers, replacing oil and gas heating with IR will offer an immediate cost reduction in running the home or business.'

Collen points out that a typical IR heating system demands about 65% less input power than a conventional convective system. Infrared radiant heaters have the ability to use the storage and re-radiation envelope of the building envelope and can also reduce ventilation losses.

'The fact,' he says, 'is that for a long time we had silo-based thinking - for heating, for ventilation and for lighting: The result was that our built environments were heated up to the point of no return - overheated - and then needed further energy in the form of air conditioning to cool things. A lack of control and a lack of joined-up-thinking were responsible. Without measurement we cannot expect control, our bespoke PLC based platform ensures total control of all of these functions.'

In short, if you want to reduce your carbon footprint and lower your overhead costs contact CoolTech Ltd

Collen Baker collen@cool-tech.co.uk

Cool Technology, Unit 7, Forge Business Centre, Palgrave, Diss, Norfolk, IP22 1AP

www.Cool-tech.co.uk



*Dr. Gerard McGranaghan
Senior Development Manager*

Anyone following the Ceramicx blog will know that last month Cáthál Wilson obtained his Ph.D. Doctorate in engineering from the University of Limerick.

No sooner is that happy event achieved than Dr Cáthál is now joined at Ceramicx by Dr Gerard McGranaghan. Says founder and director Frank Wilson. 'Dr Gerard brings over 23 years of engineering experience from workshop skills through to cutting edge-research. There's great opportunity and need in industry for all of his skills. Ceramicx is itching here for all of Gerard's expertise to be applied in the service of the IR heating world and for Ceramicx.'

Dr Gerard comes to Ceramicx via the Dr. Tony Robinson connection at Trinity College Dublin: 'I learned that the opportunity was in West Cork. And for a Donegal man - that was probably as far away from Donegal as I could get. As I found out more and when I visited the factory and saw the works, the ethos, and what was being made on site in a very compact space I was really impressed. So when Frank and Cáthál invited me to join Ceramicx, I was more than delighted.'

Gerard has been fascinated from youth by engines and all sorts of mechanical gadgetry. 'I knew I had to end up in engineering. I took up a mechanical apprenticeship with the ESB in Tarbert, Co. Kerry where I loved the range of work from hands-on machining to overhauling massive steam turbines. I subsequently worked with the UN in a Vehicle Workshop in Nepal where I met several engineers who left a big impression on me - and it was at this stage I decided I wanted to be an engineer.'

Design and build it - with Ceramicx

There has never been a better time to ask Ceramicx about your advanced heatwork needs – technical or commercial. The company is currently beefing up its consultancy resource for all kinds of industrial liaison and service.

Back in Ireland Gerard became a Mechanical Technician in the Department of Civil Structural and Environmental Engineering in Trinity College Dublin. He also began a part time course in Engineering with the Open University.

'As a Technician I was introduced to the world of experimentation - and this involved a fantastically diverse range of engineering materials and structures. In 2005 I returned to study full time and was accepted into year three of the Mechanical and Manufacturing Engineering Degree course in Trinity College.'

'...help Ceramicx to become a leading provider of expert technical knowledge, contributing to designing whole system solutions and creating high value added products and services.'

In Gerard's 3rd year, his favourite subject was thermodynamics, 'probably from my early interest in engines and the power station experience.' He was selected for a "design and build project". 'This gave me a chance to use my practical skills and apply my new theoretical knowledge. End result was that I designed a novel laptop cooling device which used a vapour chamber to distribute excess heat. I then built a proof of concept prototype, and tested it in the laboratory to verify its performance.' With this project, Gerard came first in all the Engineering projects that year and then went on to represent TCD in the 2007 Innovative Engineer Awards.

Gerard had then planned to enter industry on completion of his degree, but was then tempted by another exciting research proposal, involving a doctorate and once more studying heat transfer but using electrohydrodynamic (EHD) enhancement. EHD is the movement of a fluid due to high voltage.

Says Gerard 'this project involved another "design and build". This time a more complex fluid flow loop was involved. It also needed a test section that was thermally conductive, electrically conductive, and completely transparent so as to show exactly how high voltage can influence fluid behaviour and thereby affect heat transfer. To do this a high speed video camera recorded videos and pictures of the boiling fluid as it passed through a transparent sapphire test section with up to 10,000 volts being applied simultaneously

All through his Ph.D. studies, Gerard was involved in other thermal and product design tasks, one of which was an investigation conducted jointly by Siemens and TCD focused on long term reliability testing of thermal interface materials. He also worked with ABB and in Profector Life Sciences, both in product design.

Gerard's initial role at Ceramicx will be as Senior Development Manager, and he says that he intends to 'help Ceramicx to become a leading provider of expert technical knowledge, contributing to designing whole system solutions and creating high value added products and services.'

Says Frank Wilson, 'Gerard can make an impact straight away; creating bespoke heating solutions for industrial customers and using his background in experimental heat transfer and in product design to create prototyping one-off technical queries and development opportunities for introduction to the production floor.

HeatWorks welcomes Dr Gerard to the Ceramicx team - and looks forward to reporting on his work in these coming pages.

Dr Gerard McGranaghan

Senior Development manager

Gerard.McGranaghan@ceramicx.com

Ceramicx sets sights on a World-Class future

As reported recently in Ireland's press, Ceramicx is now gearing up to bring further prosperity and growth to its growing business in green energy and high-value infrared heating supplies. HeatWorks brings you full details.

Recently ranked in the global top 2% of class for ceramic-based production Ceramicx is now planning its next five years of growth: Last month the company submitted plans for further investment in its Gortnagrough site; upgrading and modernizing the facilities and including new landscaping features that offer the best in environmental and ecological design.

Founder Frank Wilson says that 'our West Cork business future is very bright, particularly as it continues to enable Ceramicx to export over 98% of its production worldwide and to constantly sharpen our international manufacturing competitiveness.

Wilson adds that 'the time has now come for our world-class competitiveness to be housed in a world-class facility: Our planned developments and refurbishments will give us an environment the equal of anything in the world in terms of technology, ecology and good design – an environment in which Ceramicx would be proud to host any international client visitors from companies such as Aston Martin, Corning Glass and Rolls Royce.'

Wilson adds that 'we are a relatively small company but we believe we're on the right track. We have succeeded in double digit growth over the past four years, and in making and selling high-value products and services all over the world. We're doing all that we can to help West Cork business nurture similar values and enterprises for the benefit of the area.'

Enterprise Ireland

Ceramicx recently shared its planning and thinking with Michael Hanley, CEO, West Cork Enterprise Board, with Enterprise Ireland (EI) executive, Director of Manufacturing Dr. Tom Kelly and with Jim Daly TD, Irish Parliamentary representative for the area.

Michael Hanley says that 'the production and export of high value goods and services is an economic model that's extremely hard to beat. These are qualities that are extremely welcome in ensuring that the West Cork economy recovers strength and prosperity. We applaud all the hard work at Ceramicx over the past 21 years and we look forward to helping launch the new facilities.'

“ We have succeeded in double digit growth over the past four years, and in making and selling high-value products and services all over the world.”

Visitor Dr. Tom Kelly added that 'Enterprise Ireland is doing all that we can to collect success stories such as Ceramicx and to ensure that Ireland continues to lead the way



Dr. Cáthál Wilson, Mr Jim Daily, T.D. and Dr. Tom Kelly, Director of Manufacturing, Enterprise Ireland.

as Europe's prime business location. Everything here today strengthens and supports that aim.' Jim Daly TD added his support, saying that jobs and economic recovery in Ireland depended in large part upon the success, creativity and wealth creation of Ireland's own indigenous companies such as Ceramicx.

Ceramicx has learned much from its fifteen year track record working with



Michael Hanley CEO West Cork Enterprise Board (left) pictured here with Cáthál Wilson, Ceramicx Director and one of Ceramicx's new product launches a clam shell oven with full touch screen control for use in a number of applications including plastics processing.



Ceramicx has been manufacturing quality infrared heating in the Ballydehob area for over 21 years. Here some of the company team celebrates their recent shirt sponsorship deal with local GAA team Gabriel Rangers.

and selling to small to medium (SME) German manufacturing companies.

Last month Ceramicx Director C ath al Wilson spoke on this just this topic, sharing a seminar platform with Sean O'Driscoll of Irish heating giant Glenn Dimplex and comparing Ceramicx to the SMEs of the Germany Mittelstand economy; export orientated; family owned; savers rather than spenders; high-value and technology based.

The last mentioned factor has been running through all the Ceramicx Research and Development (R&D) work over the past three years. Key projects have involved research teams from both the University of Limerick (UL)

and from Trinity College Dublin (TCD). Innovation Partnership projects, part-funded by Enterprise Ireland, have advanced Ceramicx know-how and Intellectual Property (IP) in infrared heating.

The UL team, led by Mark Southern, has helped Ceramicx to create a number of scientific-based 'road maps' that accurately defines all the inputs and outputs in their complex mix of skills and ingredients for infrared heater manufacture.

The UL team has also helped Ceramicx in matters of production automation and product quality measurement and control. Frank Wilson notes that

'since we began here over 21 years ago we have been seeking to measure and perfect all of our manufacturing processes and steadily improve the price/performance ratio for our products. Every infrared heating item we now make is delivered from West Cork to its worldwide destination with a data bank of quality assurance information; numbered and traceable and also a detailed specification of heat performance data; graphical and numerical. Every ceramic product supplied by us now has its own individual and technical 'thumbprint', available exclusively to its purchaser/user.'

Meanwhile, the Ceramicx Innovation project with Trinity College Dublin (TCD) will formally launch on October 16 at the K 2013 international trade fair in D usseldorf, Germany. It is an automated cell that measures the production of IR energy emissions in 3D space. 'This is the first equipment of its kind,' says C ath al Wilson. 'Despite being around for over 50 years, Infrared heating is still not very well understood. Our new IR machine tool will be key to revolutionising any number of heating processes for both domestic and industrial use.'

Ceramicx looks forward, therefore, to a dynamic few years ahead; much change in the making and plenty to build upon for the future.

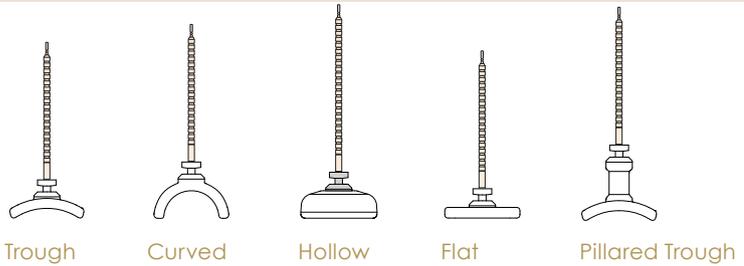
“ The time has now come for our world-class competitiveness to be housed in a world-class facility. ”

Frank Wilson





CERAMIC ELEMENTS



Trough

Curved

Hollow

Flat

Pillared Trough

CERAMIC TROUGH ELEMENTS

www.ceramicx.com/trough-elements/



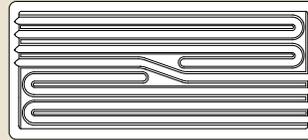
FTE / FTE-LN



HTE



QTE / QCE



LFTE

FTEL - LN

FTE Full Trough Element	245 x 60 mm	150W 250W 300W 400W 500W 600W 750W 1000W
HTE Half Trough Element	122 x 60 mm	125W 150W 200W 250W 325W 500W
QTE Quarter Trough Element	60 x 60 mm	125W 250W
QCE Quarter Curved Element	60 x 55 mm	150W 250W
LFTE Large Full Trough Element	245 x 110 mm	1000W 1500W
FTE-LN Full Trough Element -Long Neck	245 x 60 mm	250W 400W 500W 650W
FTEL-LN Full Trough Element Long - Long Neck	285 x 60 mm	1000W

CERAMIC HOLLOW ELEMENTS

www.ceramicx.com/hollow-elements/



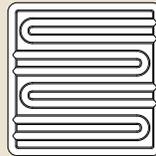
FFEH



HFEH



QFEH



SFEH

FFEH Full Flat Element Hollow	245 x 60 mm	250W 300W 400W 500W 600W 800W
HFEH Half Flat Element Hollow	122 x 60 mm	125W 200W 250W 300W 400W
QFEH Quarter Flat Element Hollow	60 x 60 mm	125W 200W
SFEH Square Flat Element Hollow	122 x 122 mm	250W 300W 400W 500W 600W 800W

CERAMIC FLAT ELEMENTS

www.ceramicx.com/flat-elements/



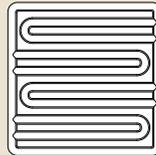
FFE



HFE



QFE



SFSE



LFFE

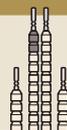
FFE Full Flat Element	245 x 60 mm	150W 250W 300W 400W 500W 750W 1000W
HFE Half Flat Element	122 x 60 mm	125W 150W 200W 250W 325W 500W
QFE Quarter Flat Element	60 x 60 mm	125W 250W
SFSE Square Flat Solid Element	122 x 122 mm	150W 250W 300W 400W 500W 650W 750W
LFFE Large Full Flat Element	245 x 95 mm	150W 350W 750W 1400W

THERMOCOUPLES

www.ceramicx.com/thermocouples/



Thermocouple Type K
+ Nickel Chromium
- Nickel Aluminium



Thermocouple Type J
+ Iron
- Copper Nickel

EDISON SCREW ELEMENTS

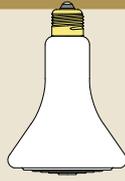
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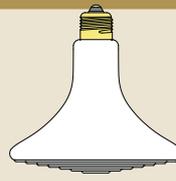
ESEB



ESES



ESER



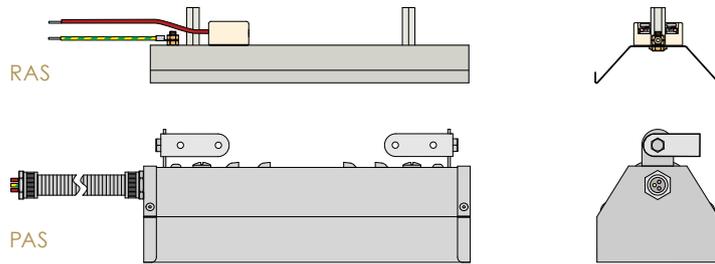
ESEXL

- ESEB** Edison Screw Element Ball
- ESES** Edison Screw Element Small
- ESER** Edison Screw Element Regular
- ESEXL** Edison Screw Element Extra Large

Ø65 x 140 mm	60W 100W
Ø80 x 110 mm	60W 100W
Ø95 x 140 mm	60W 100W
Ø140 x 137 mm	400W



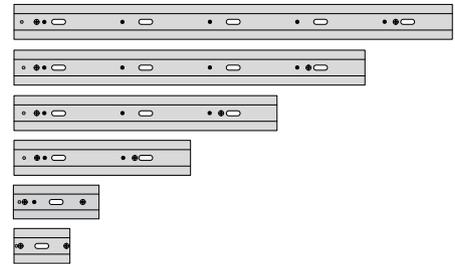
REFLECTORS / PROJECTORS



REFLECTORS

www.ceramicx.com/reflectors/

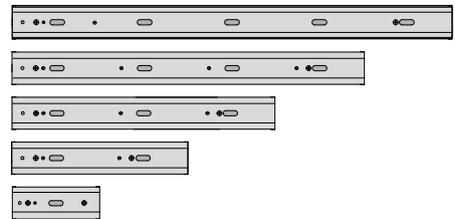
- RAS 5** Reflector Aluminised Steel 5 1,254 x 100 mm
- RAS 4** Reflector Aluminised Steel 4 1,004 x 100 mm
- RAS 3** Reflector Aluminised Steel 3 754 x 100 mm
- RAS 2** Reflector Aluminised Steel 2 505 x 100 mm
- RAS 1** Reflector Aluminised Steel 1 254 x 100 mm
- RAS 0.5** Reflector Aluminised Steel 0.5 160 x 100 mm



PROJECTORS

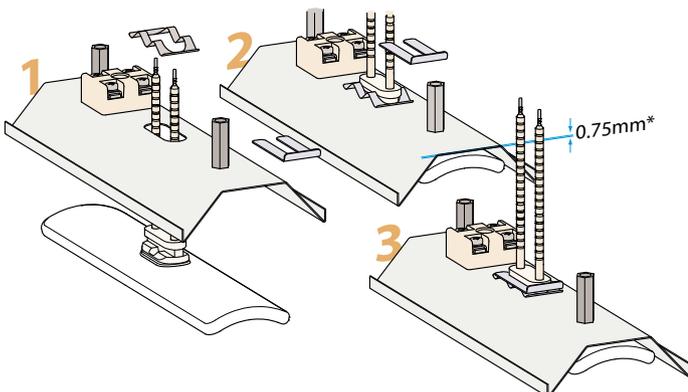
www.ceramicx.com/projectors/

- PAS 5** Projector Aluminised Steel 5 1,258 x 94 mm
- PAS 4** Projector Aluminised Steel 4 1,008 x 94 mm
- PAS 3** Projector Aluminised Steel 3 758 x 94 mm
- PAS 2** Projector Aluminised Steel 2 508 x 94 mm
- PAS 1** Projector Aluminised Steel 1 258 x 94 mm



INSTALLATION OF PILLARED ELEMENTS

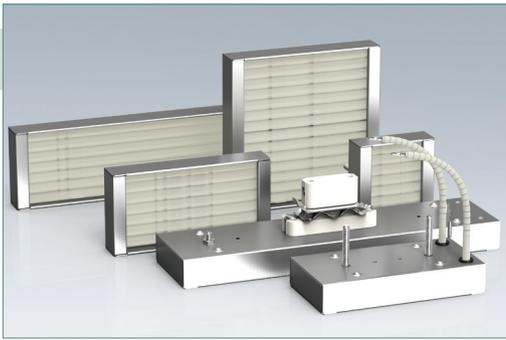
www.ceramicx.com/ceramic-bulbs/



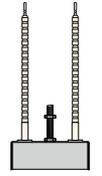
Recommended reflector
thickness 0.75 - 0.9mm
(minimum/maximum thickness 0.5 - 1.5 mm)



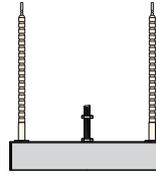
Slot hole size 42 x 15 mm



QUARTZ ELEMENTS



Standard



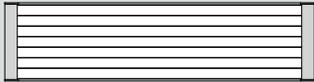
Square



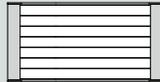
Pillar

STANDARD QUARTZ ELEMENTS

www.ceramicx.com/standard-quartz-element/



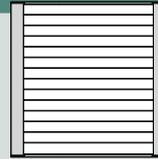
FQE



HQE



QQE



SQE

FQE Full Quartz Elements

247 x 62.5 mm

150W 250W 400W 500W 650W 750W 1,000W

HQE Half Quartz Element

124 x 62.5 mm

150W 250W 400W 500W

QQE Quarter Quartz Elements

62.5 x 62.5 mm

150W 250W

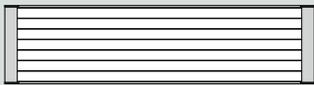
SQE Square Quartz Element

124 x 124 mm

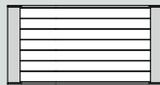
150W 250W 400W 500W 650W 750W 1,000W

PILLARED QUARTZ ELEMENTS

www.ceramicx.com/pillared-quartz-elements/



PFQE



PHQE

PFQE Pillared Full Quartz Elements

247 x 62.5 mm

150W 250W 400W 500W 650W 750W 1,000W

PHQE Pillared Half Quartz Element

124 x 62.5 mm

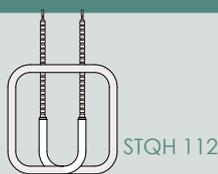
150W 250W 400W 500W

SQUARE QUARTZ TUBE ELEMENTS

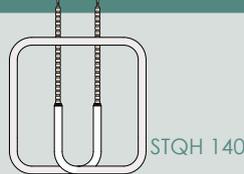
www.ceramicx.com/quartz-square-tube-elements/



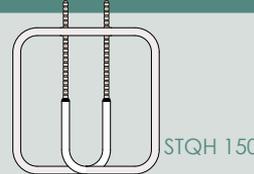
STQH 100



STQH 112



STQH 140



STQH 150

STQH100 Square Tube Quartz Heater

100 x 100 mm

150W - 400W

STQH112 Square Tube Quartz Heater

112 x 112 mm

150W - 400W

STQH140 Square Tube Quartz Heater

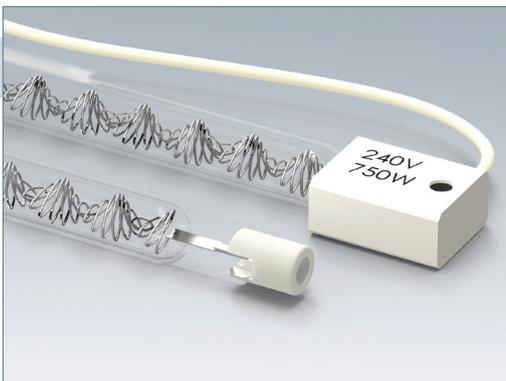
140 x 140 mm

150W - 650W

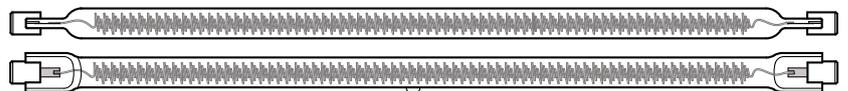
STQH150 Square Tube Quartz Heater

150 x 150 mm

150W - 650W



QUARTZ TUNGSTEN / HALOGEN



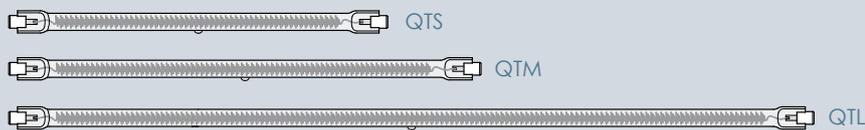
Quartz Tungsten



Quartz Halogen

QUARTZ TUNGSTEN TUBES

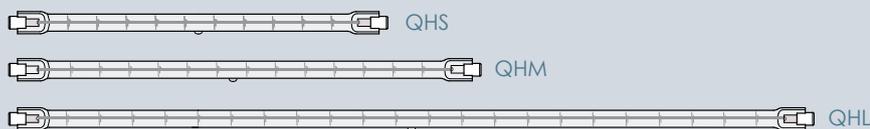
www.ceramicx.com/fast-medium-wave-emitters/



QTS Quartz Tungsten Short	Ø10 x 244 mm	750W
QTM Quartz Tungsten Medium	Ø10 x 277 mm	1000W
QTL Quartz Tungsten Long	Ø10 x 473 mm	1500W 1750W 2000W

QUARTZ HALOGEN TUBES

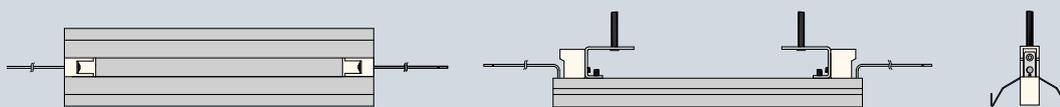
www.ceramicx.com/short-wave-emitters/



QHS Quartz Halogen Short	Ø10 x 244 mm	750W
QHM Quartz Halogen Medium	Ø10 x 277 mm	1000W
QHL Quartz Halogen Long	Ø10 x 473 mm	1500W 1750W 2000W

QUARTZ TUNGSTEN/HALOGEN REFLECTORS

www.ceramicx.com/reflectors/



QTSR Quartz Tungsten/Halogen Short Reflector	250 x 62 mm	(Suitable for QTS/QHS, Tubes supplied separately)
QTMR Quartz Tungsten/Halogen Medium Reflector	300 x 62 mm	(Suitable for QTM/QHM, Tubes supplied separately)
QTLR Quartz Tungsten/Halogen Long Reflector	497 x 62 mm	(Suitable for QTL/QHL, Tubes supplied separately)

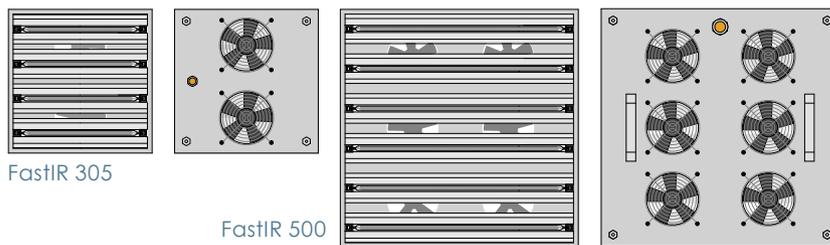
SPECIAL TUBE ORDERS

www.ceramicx.com/special-tube-orders/

Ceramicx can supply other types of Halogen/ Tungsten elements, of varying design, dimensions, length, coatings, terminations and electrical rating.



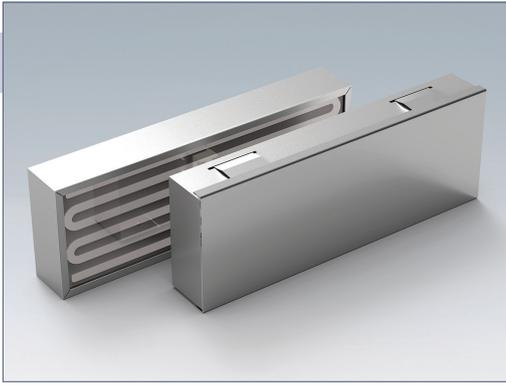
FAST IR



FAST IR

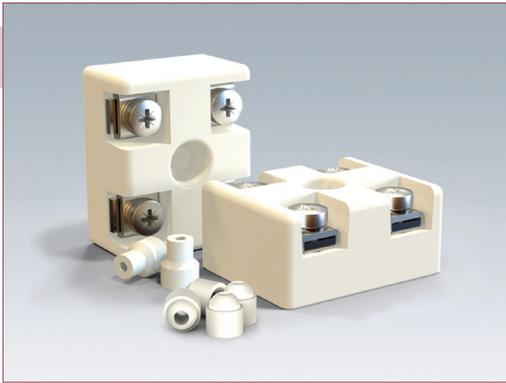
www.ceramicx.com/fastir-systems/

FastIR 305 Suitable for 1000W Quartz Tungsten/Halogen Heaters QTM/QTH (tubes sold separately)	305 x 305 x 150 mm	4 Tube 4kW	5 Tube 5kW
FastIR 500 Suitable for 2000W Quartz Tungsten/Halogen Heaters QTL/QTL (tubes sold separately)	500 x 500 x 150 mm	6 Tube 12kW	5 Tube 14kW



CUSTOM PANEL HEATERS

Custom Panel Heaters.
Available with anodised aluminium or ceramic glass face.
Range of Wattages and Voltages.
Multi-zone options with removable miniature thermocouple plug.



STEATITE

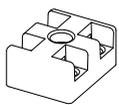
Steatite ceramic dust has proven itself to be the material-of-choice for the manufacture of electrical insulators. It has good mechanical strength with good dielectric properties and a high temperature resistivity of up to 1000°C.

Steatite is most commonly used in applications where a high temperature electrical insulator is required. It operates very well in cold switching applications and is also an excellent high voltage insulator.

STANDARD STEATITE COMPONENTS

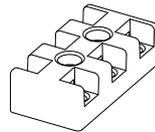
www.ceramicx.com/steatite-press-components/

2P Ceramic Terminal Block



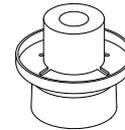
10 Pack
no Fittings
40 x 32 x 20 mm

3P Ceramic Terminal Block



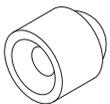
10 Pack
no fittings
62 x 32 x 20

Ceramic Grommet and Starlock



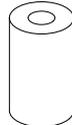
Fastener Set 100 sets per pack - used as an Insulator in sheet metal with 6mm hole
21 x 18 x 15 mm

Ceramic Beads



per kg
Loose or Strung
Ø5 x 6 mm
4.5 mm to shoulder

Ceramic Tubes



Ø5 x 11 mm

SPECIALISED STEATITE COMPONENTS

www.ceramicx.com/specialised-dust-press-components/

Ceramicx now offers the manufacture of specialist Steatite ceramic dust press components to companies that need quality insulators as part of their product manufacturing. For over twenty years Ceramicx has been shipping components and products to manufacturers in over 65 countries worldwide. Service, confidentiality and world class quality is offered, together with a unique know-how in developing and designing product solutions in Steatite Ceramic where needed.



Ceramicx manufactures dust press components on Dorst 20 and 15 tonne presses (shown above) and a Dorst 6 tonne press

A selection of parts that can be purchased



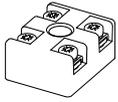
ACCESSORIES

HIGH TEMPERATURE CONNECTORS

www.ceramicx.com/high-temperature-connectors/

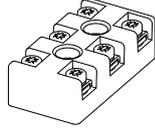
2P Ceramic Terminal Block

10 Pack
Stainless Steel
Fittings
40 x 32 x 20 mm



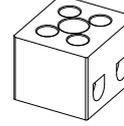
3P Ceramic Terminal Block

10 Pack
Stainless Steel
Fittings
62 x 32 x 20



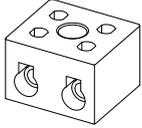
2P Mini Ceramic Terminal Block

10 Pack
Nickel Galvanised Brass
Inserts, Zinc-plated Steel
Screws
21 x 18 x 15 mm



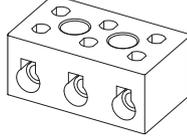
TB2 Ceramic Terminal Block

(closed) 10 Pack
Plated Brass Inserts,
Nickel Galvanised
Screws
34 x 30 x 22 mm



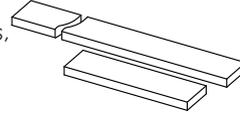
TB3 Ceramic Terminal Block

(closed) 10 Pack
Plated Brass Inserts,
Nickel Galvanised
Screws
51 x 30 x 22mm.



Stainless Steel Buzz Bar

used with the ceramic
terminal block to
produce a flexible power
distribution system
8 x 2 x 1000 mm

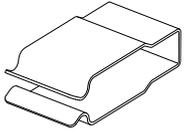


MOUNTING COMPONENTS

www.ceramicx.com/mounting-components/

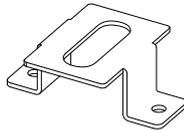
Flat Ceramic Base Holder

For Halogen/Tungsten
heaters fitted with flat
ceramic base



Mounting Bracket

For ceramic elements
72 x 57 x 28 mm.
slot 42 x 15 mm



R7s Ceramic Holder

For Standard Quartz
Tungsten/Halogen Tubes



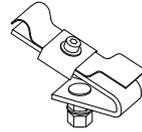
Steel Wave and Spring set

Used in the mounting
and installation of all
Ceramic elements
and the Pillared
Quartz elements



STQH Holder

For all types of square
tube Quartz Heaters
(STQH)

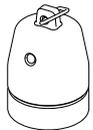


E27 ACCESSORIES

www.ceramicx.com/bulb-reflector-and-e27-holder/

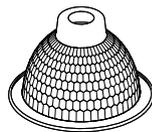
E27 Edison Bulb Holder

High temperature
porcelain holder used
with ceramic IR bulbs
Ø53 x 74 mm



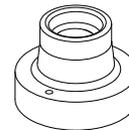
Ceramic Bulb Reflector

Highly polished
reflector for use
with ceramic IR bulbs
Ø220 x 110 mm



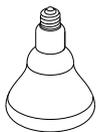
E27 Bulb Holder with Base

High temperature
porcelain holder used
with ceramic IR bulbs
Ø78 x 60 mm



Glass Infrared Bulb

225W
Ruby Double
mirror
123 x 170 mm

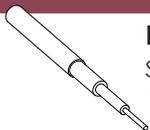


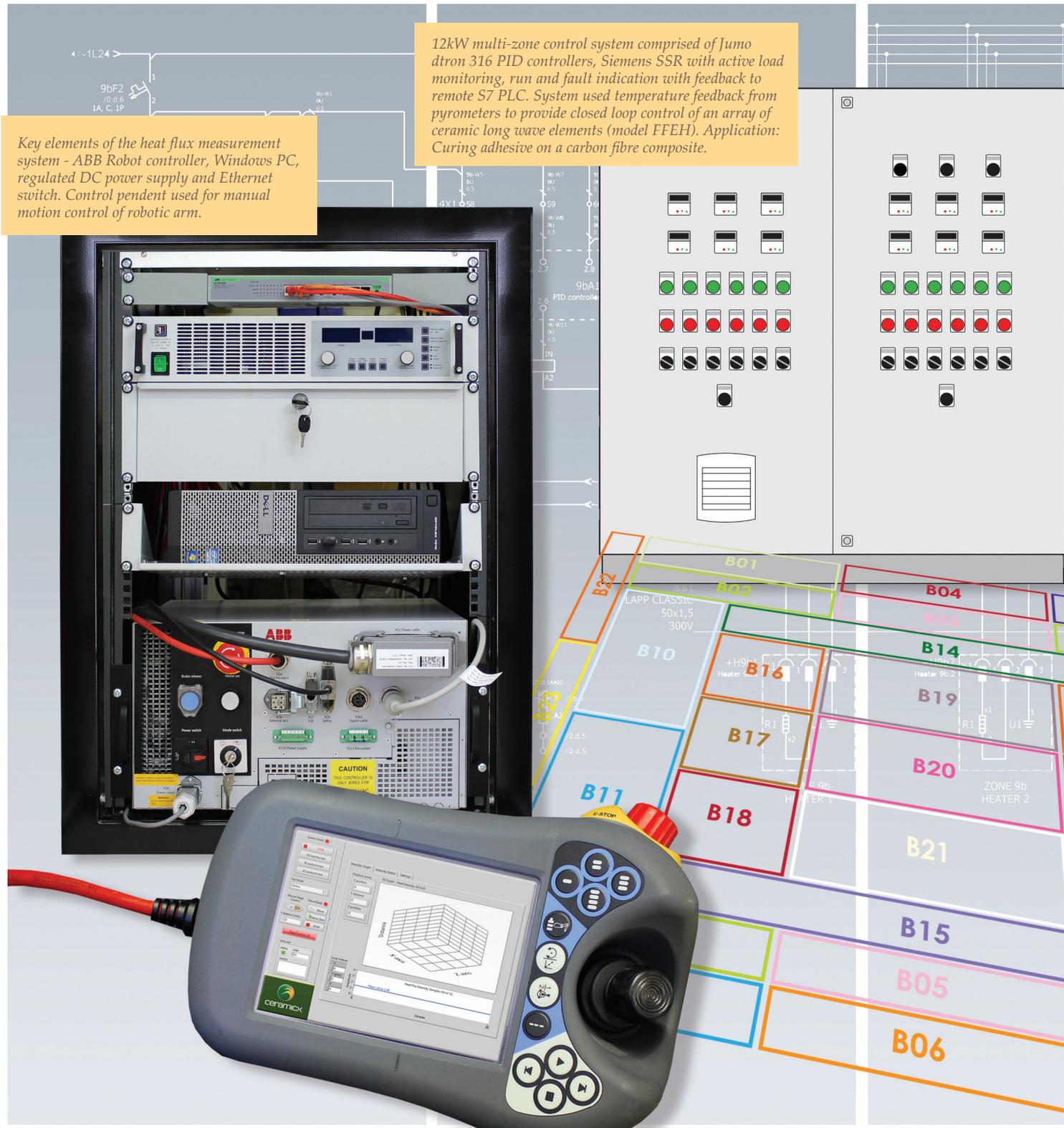
HIGH TEMPERATURE NPC CABLE

www.ceramicx.com/high-temperature-npc-cable/

High Temperature NPC Cable

Single Conductor Cable, Flexible Nickel Plated Copper Core, Glass Fibre Insulation, Silicone Coated Fibreglass Braid
0.75 mm, 1.5mm, 2.5mm, 4.0mm





12kW multi-zone control system comprised of Jumo dtron 316 PID controllers, Siemens SSR with active load monitoring, run and fault indication with feedback to remote S7 PLC. System used temperature feedback from pyrometers to provide closed loop control of an array of ceramic long wave elements (model FFEH). Application: Curing adhesive on a carbon fibre composite.

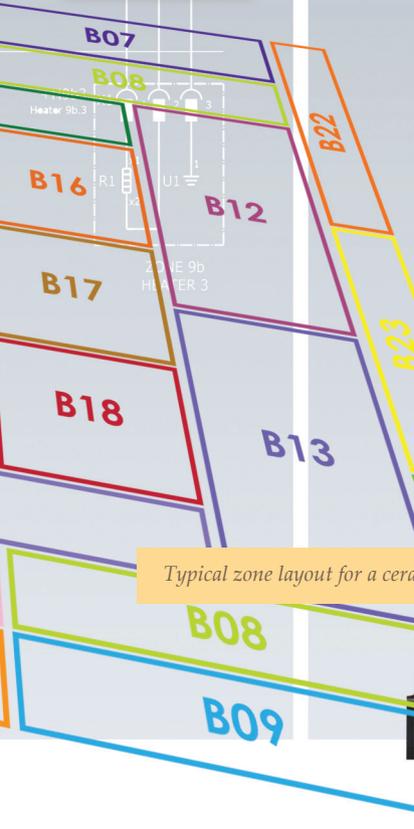
Key elements of the heat flux measurement system - ABB Robot controller, Windows PC, regulated DC power supply and Ethernet switch. Control pendent used for manual motion control of robotic arm.

Control Systems

It is rarely possible to match the installed heater load exactly to the process heat requirement. For this reason, a control system is normally a prerequisite in most industrial radiant heat applications. The ability to control heat output allows us to optimize the heating process. With all radiant heat transfer applications there is a limit to the amount of energy which can be absorbed by the target over a specific period of time. Modern manufacturing requires short process times with minimal energy usage.

Applying excess heat introduces the risk of surface scorch which is why it is critical that the heater output can be tuned to provide both process speed and high quality parts. Ceramicx can build custom control heat systems to provide this, from simple open loop percentage time based systems to closed loop PID. All our control systems utilise solid state power control (thyristor/triac), using zero-cross, SSR's or phase angle power controllers depending on heater load type. Applications vary enormously, from

160kW multi-zone control system comprised of Siemens S7-400 PLC, HETRONIK HC500 with solid state switching and active load monitoring for 130 control channels, optional open/closed loop control using air or product temperature, visualisation via 17" industrial touch-screen panel PC. System could be configured for 0-100% open loop control or closed loop control using temperature feedback from pyrometers and/or thermocouples to control ceramic long wave elements (model SFEH) combined with anodised aluminium panel heaters. Application: In-line/roll fed thermoforming machine.



Typical zone layout for a ceramic or quartz infrared heating platen.

small single zone systems to large multi-zone systems required in Thermoforming applications. Depending on the zone requirements of the application, we can use one or more 1/16 DIN temperature controllers or for larger systems a PLC with HMI is generally used. Control equipment / PLC's from different manufacturers (eg. Allen Bradley, Siemens and Cannon Automata equipment.) These can be combined with a Hetronik multichannel control system to

increase functionality and controllability and also provide valuable feedback on load status. Regardless of the size and complexity of the system required, Ceramicx has a solution to suit



ceramicx

HEAT SOLUTIONS FOR PLASTICS FROM FRIEDR FREEK

HeatWorks magazine is pleased to present this pre K 2013 show interview and synopsis about Freek process heating solutions for the plastics industries worldwide

Come see us at the K 2013 exhibition -
Düsseldorf, October 16 - 23!



FRIEDR FREEK
HALL 11
STAND A01

What do plastics moulders most like about dealing with Friedr Freek? What do they most like about your products?

Four general heating technologies in plastics injection moulding can be distinguished for nozzle-based heating – and all are available at Freek.

- Simple is the best solution: reflection tube heaters, particularly as they offer an attractive performance-price ratio
- Heat sink element solutions: ideal for smallest processing windows - patent pending involving the smart function of the axial slit
- Pressed-in heat solutions, involving elements with round, square section/surface profiles: even, braided, segmented / 3D bending expertise also available
- Cartridge heater solution, popular in flat in-line nozzles



Selection of cartridge heaters shown with round or square sections, straight or angled exits, extra slim cartridges are available for flat in-line nozzles (right)

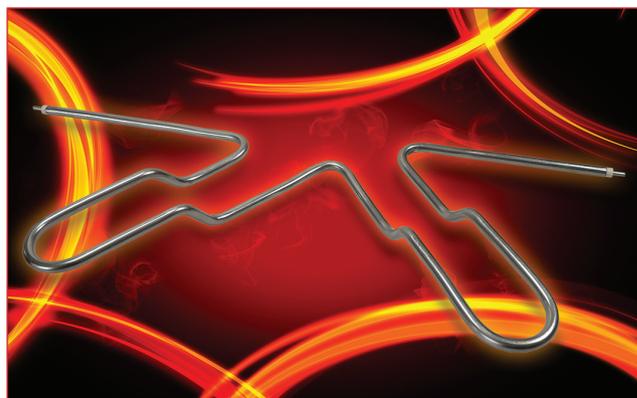
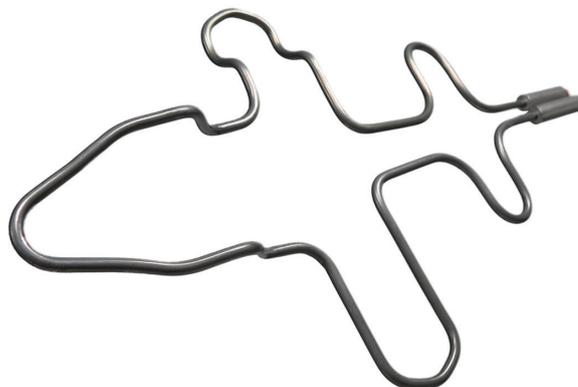
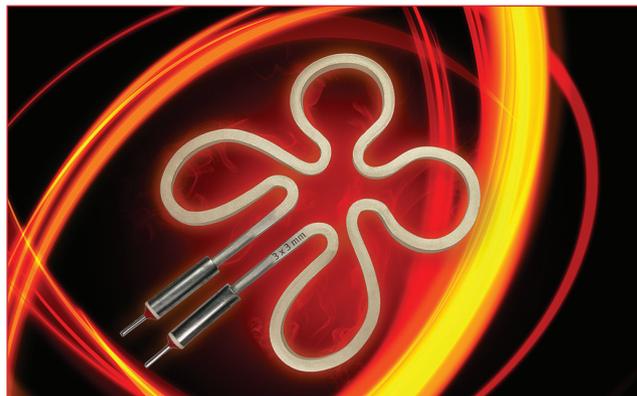
What about manifold heaters?

For manifold heating, tubular heaters are the heater type of choice:

Here Freek puts its faith in standard tubular heaters with even tube surface. These are titled Base-flex, Nickel-flex and Super-flex – this latter will be new at K 2013.

These three general types are distinguished by their tube material which provides the different attributes of the heaters with regard to ductility, formability, heat conductivity or corrosion resistance.

Alternative competitor products also use braided or segmented hoses pressed onto ordinary tubular heaters.



Miniaturised and 3D formed tubular manifold heaters

These are easier to bend as just the thinner core heater offers resistance but for the same reason it can't be as powerful as our flexible tubular heater.

Additionally Freek offers miniaturised tubular manifold heaters in cross sections dia. 3,3mm or 3,0 x 3,0mm (for tightest applications).

Besides some very clear strengths in plastics heating for moulders Freek also benefits from very strong partnerships in silicone/foil heating as well as IR heating – key partner, of course, Ceramicx!

What have been the main areas for Freek product development since K 2010 i.e. heating solutions for plastics molders and for other kinds of companies?

Heat sink nozzle heaters are now supplied by Freek as an alternative to reflection tube nozzle heaters - our trusted long-term best seller!



Reflection tube nozzle heaters - Freek's trusted long term best seller

There are basically two points of view in the market today. One is typically used to the former cast-in heater variety, hence swearing on the benefits of the successor heaters - using copper, brass and other heat-sink materials. These features help eliminate heat inhomogeneity wherever and why ever it may occur.

The other approach tries to distribute the generated heat very accurately by creating special coiling patterns or implementing cold sections into the heater. The suppliers of this approach judge heat-sink materials as contra-productive. However, Freek testing found merit and benefit in both approaches. Both of these principal solutions perform perfectly well, but only if the engineering is done correctly.

Our own Freek heat sink solution is patent pending because of two tricky ideas involved: State-of-the-art heaters are either closed or slit. If they are slit, the slit is for



Patent pending heat sink nozzle heater with smart slit function

clamping, hence it mustn't be wound over by the element. In that event it is very difficult to concentrate heat on the extremities of the heat-sink element as the heater can only be wound in a meandering pattern, and not allowed to place tracks side by side as minimum bending radii is a very limiting factor.

On the other hand, a closed specimen with tight cylindrical windings can often get stuck to the nozzle and can't be disassembled without being destroyed.

The Freek solution therefore uses the slit not for clamping but only for preventing the heater from sticking to the nozzle. And even if the heater got stuck chemicals or force can be applied easily along the slit. Using the slit in this way clearly enables a cylindrically tight over-winding, hence a best possible heat concentration where needed.



Hotcoil heater with clamp

SMA clamps "ThermoLock"

Efficient heat transfer to the injection nozzle or whatever object to be contact heated always depends on a perfect fit. Unfortunately this fit is at risk in the operating mode, and especially during heat-up, when the temperature gradient between heater and object is highest.

The natural heat dilatation causes the heater to grow faster than the object loosening the fit. As the resulting clearance normally does not spread evenly over the surface but shows up as a local gap or buckles. Critical hot-spots may occur, in the worst case destroying the heater, and at least reducing it's lifetime. There are many measures in the market to avoid the problem, but none of them as smart and simple as the Freek SMA solution.

Similar to bi-metals, shape memory alloys (SMAs) behave contrary to normal metals and tighten their fit when heated. But different to bi-metals this tightening effect is no linear function of temperature but similar to digital. This means that in its cold state the SMA clamp is loose and in the hot state it stays tight.

Unfortunately the devil is in the detail: The general effect with such state-of-the-art alloys to date has only been stable up to 300°C. With our own research partners we succeeded to shift this border line up to 400°C. However, this is still not enough for a robust heavy-duty application where technical plastics with steadily higher processing windows are moulded. Anyway, scientists are optimistic as there is a lot of current research on high-temperature SMA in progress. Apart from that, valuable side-effects of this long-term research project has been the development of



Miniaturisation in amazing perfection

MicroCoil - Nozzle Heaters

heaters that trigger SMA actuators where direct heating is not possible or doesn't make sense.

Continuous improvements in process and quality of our series production — Freek Xtreme and Freek Miniaturisation.

For more than 10 years Freek has concentrated on two development routes labelled Xtreme and Micro. While the latter led to nozzle heater elements with sections as tiny as 1,0 mm or 1,8 mm with tandem spiral or integral thermocouple the Xtreme route pushed border lines forward in regard to moisture, high-voltage or corrosion resistance. Today's Freek HotMicroCoil heaters lead the market by some distance both with regard to electrical needs, as well as dimensional figures and tolerances.

Steady incremental achievements have been the key to technology leadership. It remains part of Freek's credo not to waste valuable resources with patent application procedures. As a relatively small company we do not have the global market research and reach to reliably detect infringement, much less the power to pursue law suits all over the world. From time to time, however, Freek has applied for patents, simply to safeguard access to certain product ideas or research fields. Our project success rate speaks for itself.

What trends does Freek notice in the general and global plastics manufacturing market for heating solutions ?

- Performance requirements become ever more extreme and wire-wound resistance alloy heaters are often in the front line for solutions
- There is continuous research on alternative heater materials such as ceramics, carbon or conductive inks.
- Other research deals with the utilization of resistance alloys in alternative forms other than ordinary formed wire or tape. Keywords here are etched foil or thick film heaters.
- The problem with all the alternatives to resistance-based heating is to transform ideas into reliable, affordable, and practical products.

It is one thing to apply voltage to a material and to take pleasure from recognizing it gets warm. It's quite another thing to make an industrial heater of it; one that keeps the same heating effect reliable for years without any decline, aging, wear or tear. Pilot heaters of that type often have problems getting established in large scale. Very often they are inflexible with regard to design changes and small quantities – they are also often very fragile and not practical for industrial applications where heater handling and (dis) assembling does not have much to do with accompanying



Hotcoil Xtreme Power
with up to 1600W power



Principle HotMicroCoil heaters for nozzle heating (left); new Super-flex tubular heater (right)

manuals and instructions. Finally due to the sophisticated technologies involved such heaters have their price which most market players are reluctant to pay, especially when looking at the in truth little benefits they offer in comparison to our trusted wire wound heaters.

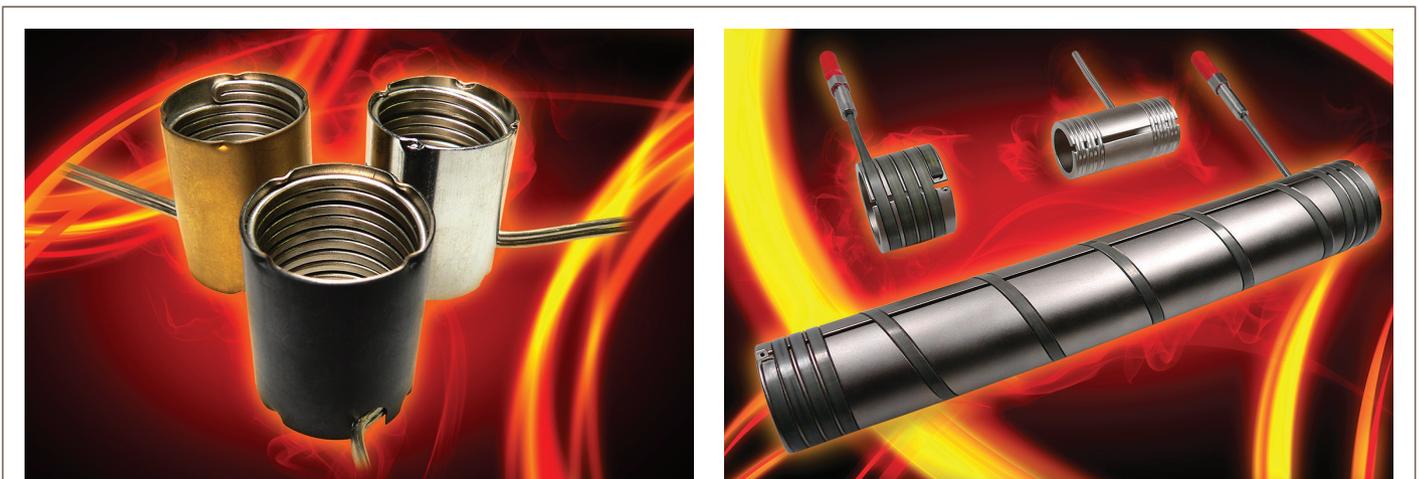
What new products is Freek launching at K 2013 ?

- New variants of our heat sink nozzle heater line
- New appealing surface finishes of our trusted reflection tube heaters
- Super-flex tubular heaters with new sheath material combining the softness of Ni-flex and the formability of Base-flex heaters at a most attractive price
- Various 3D formed samples of our smallest tubular specimen
- Miniaturisation achievements on various heater types to demonstrate the possibilities
- Xtreme options all across the range to demonstrate the possibilities
- Various research achievements implemented into our series heaters (graphs and figures will be available at the booth in slide shows and test reports)

What particular heat products for plastics manufacturing is Freek showing at K 2013 ?

- Hot-runner heaters for nozzles, manifold and bushing: HotMicroCoils, cartridge heaters, tubular heaters
- HotMicroCoil variants: heat sink elements, reflection tube elements, clamped or clad elements, not to forget just straight or pre-bent elements with wall thickness's from 1,0 mm up to 4,0 mm in round, square or rectangular section.
- State-of-the-art PET heaters on a state-of-the-art hotrunner, an exhibit on loan from an acknowledged market player.
- Full range of bendable tubular heaters with round or square sections from 3 x 3 mm (resp. dia. 3,3 mm) up to 8 x 8 mm (resp. 8,5 mm).
- Full assortment of standard and special cartridge heaters from dia. 4 to 20 mm.

Remember - come and see us at the K 2013 exhibition, Düsseldorf, October 16 - 23 !



New variants of heat sink nozzle heaters (left), new appealing surface finishes for reflection tube nozzle heaters (right)

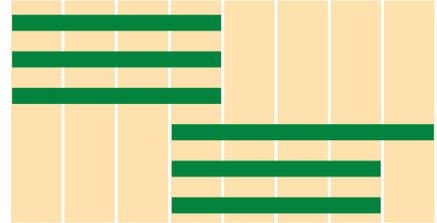
K 2013 - Stand A01, Hall 11 - Who and when !

October/Oktober

WED	THUR	FRI	SAT	SUN	MON	TUE	WED
16	17	18	19	20	21	22	23

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 Gráinne Wilson *Director*
 Patrick Wilson *Production Manager*
 Dr. Cáthál Wilson *Director*
 Tadhg Whooley *Technical Sales Manager*
 Amanda Murphy *Sales & Logistics*



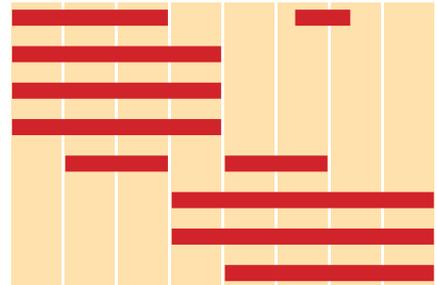
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 Dr. Tony Robinson



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www.kshow2013.com



BERNARD LASOTA

21.05.68 - 24.08.13

Skibbereen, Ireland - Opoczno, Poland

Unexpectedly passed away at his home in Skibbereen. Sadly missed by his Family, Friends and Ceramicx Colleagues.

Ceramicx would like to welcome to the team.



Stephen O'Brien
Machinist



Maurice Malone
Mechanical Engineer



Dr. Gerard McGranaghan
Senior Development Manager.



Visitors from Friedr. Freek - Jan and Ronja Kaiser recently spent a week in Ceramicx for work experience



On 26th July Ceramicx celebrated it's annual barbecue.

Eimear Wilson and newly minted Dr. Cáthál Wilson are met by Gráinne Wilson as they arrive at the barbecue, fresh from Cáthál's Viva Voca exam at the University of Limerick.



The Ceramicx team would like to Congratulate our good college and friend Hasan Duman from Ser Rezistans, Turkey who recently celebrated his marriage to Şebnem.



Talk to us today about your infrared heating needs.



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Infrared heating elements direct from the manufacturer

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▶ Flat Elements

▶ Ceramic Bulbs

▶ Thermocouples

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▶ Quartz Heaters

▶ Single Tube Quartz Heaters

▶ Pillared Quartz Heaters

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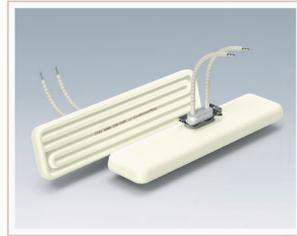
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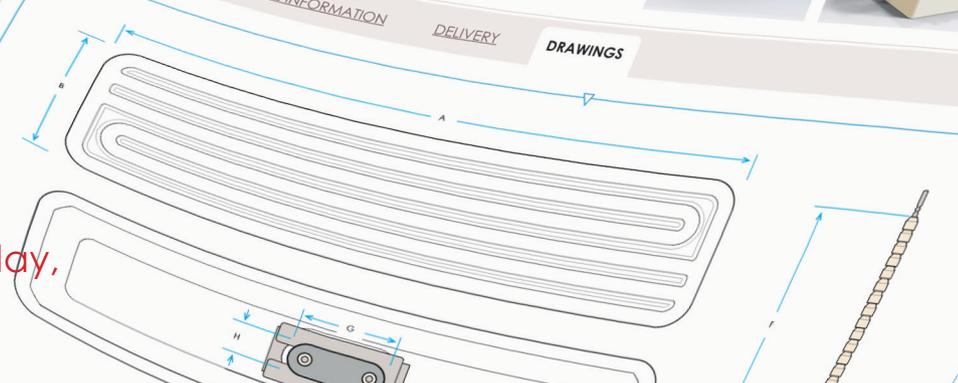
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