The Contract Heat Treatment Association Newsletter
HOTLINE
Issue No. 126
December 2011

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CHTA is affiliated to the Surface Engineering Association

CHTA at the House of Lords

Hosted by Lord Hoyle, Honorary President of the Surface Engineering Association, the latest SEA Briefing Luncheon took place at the House of Lords in October. Including former CHTA Chairmen Paul Handley and Richard Burslem, SEA's delegation was drawn from its National Committee, of which Richard is now Vice-Chairman.

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A voice at Westminster

CHTA Vice-Chairman
***Richard Burslem** comments…*

One of the benefits for CHTA being part of SEA is the access to facilities that a relatively small trade association like ours could otherwise neither achieve nor afford. The briefing luncheon at the House of Lords is an excellent example.

In practice, the briefing is a microcosm of Government, but carried out at a vastly accelerated rate. The luncheon is hosted by Lord Hoyle, a great supporter of British manufacturing who is fully aware of the value that heat treaters and electroplaters add to British industry. Other Lords with empathy for manufacturing also attend.

Various MPs are invited and usually have a heat treatment or plating factory in their constituency. High-ranking civil servants from relevant departments, such as the Environment Agency (EA), Health and Safety Executive (HSE), Department of the Environment Farming and Rural Affairs (DEFRA) and Business Innovation and Skills (BIS), are present.

Lastly, the humble commoners are represented by SEA and CHTA committee members, occasionally accompanied by European guests who will comment about how things are done in their own country.

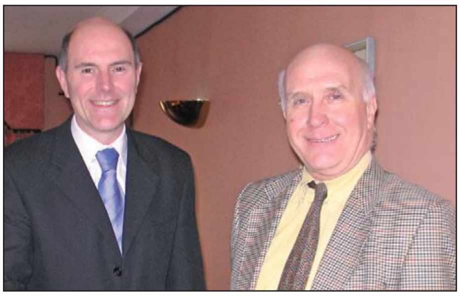
FAST EFFECTIVE COMMUNICATION

So why do we do it? Simply put, it is a very fast and effective method of communication.

Imagine you go to a restaurant, you wait a long time for the food, the meal is cold. As you leave, you grumble to the waiter knowing this will have little effect. Later you feel moved to write to the restaurant, pointing out your disappointment, but the letter is tossed in the bin by the receptionist. Nothing changes at the restaurant and slowly it loses custom and closes.

What if your original observations were discussed at the time with the owner, the chef, the waiter and a few other diners? “This is not what I intended, I wanted a satisfied customer” says the owner. “The food was hot when it left the kitchen” says the chef. “We have the same experience too” say the other diners. “I’m just told to deliver the food”, says the waiter, “I didn’t realise there was such a problem, I can hurry up a bit”. The customers are happy and the restaurant continues to prosper. An over-simplified picture I agree, but you get the drift.

“CHTA members are encouraged to put forward topics for discussion at these briefings”



Richard Burslem and Paul Handley, CHTA’s representatives at the SEA House of Lords Briefing Luncheons.

SUBJECTS THAT MATTER TO US

Topics we have discussed at the briefings over recent months have included the duplication of registration with the EA of sites subject to COMAH (control of major accident hazards) regulations, the relentless march of the REACH directive (registration, evaluation, authorisation and restriction of chemicals), the proposal for HSE to recover costs relating to factory visits, unfair energy pricing and supply contracts, climate change agreements and their administration.

Sometimes these discussions have a very positive outcome for us, issues even being concluded satisfactorily during the briefing itself. At the very minimum, all parties leave the briefing with the same information, having had a lively discussion about subjects that matter to us. Relaying this information individually to MPs and civil servants would have been much slower and less effective, particularly without the firm arbitration that the Lords bring to a discussion.

“If you find your” constituency MP is interested to attend, this can often be arranged.”

THANKS TO SEA

None of this would be possible without the organisation of David Elliott and his team at SEA, to whom CHTA must extend its thanks. CHTA members are encouraged to put forward topics for discussion at these briefings via the CHTA Management Committee. If you find your constituency MP is interested to attend, this can often be arranged.

Proposed professional qualifications

“ Where is the next generation of technicians and metallurgists coming from? If we don’t find a solution that is nationally recognised, all our companies could suffer in the long term.”

CHTA Chairman **Chris Kenward** has been busy seeking answers to the question he posed in *Hotline* 123. In a message recently circulated to all CHTA members, he reported:

“The Qualifications Credit Framework (QCF) has recently been introduced as a more flexible route for gaining formal professional qualifications. It enables progression to be achieved in steps through the accumulation of credits for completion of modules.

The Contract Heat Treatment Association, with the assistance of the National Metals Technology Centre (NAMTEC) and SEMTA, the Sector Skills Council for Science, Engineering and Manufacturing Technologies, is proposing to develop QCF courses by which individuals may gain nationally-recognised professional qualifications in heat treatment metallurgy.

A modular approach is proposed, in which individuals would attend approximately one training day per month over a period of 1-2 years. The courses will be delivered at two or more central locations within convenient travelling distance for most employers. Although this is still at the planning stage, conceptual qualifications might be:

- **Metallurgical Technician Certificate** – based on ‘old’ Met. Technicians Cert. (equivalent to ‘A’ level)
- **Diploma in Heat Treatment Metallurgy** – equivalent to HNC/HND”

Preliminary content lists (subject to further input) have been developed for both of these courses.

In order to gauge potential demand for these qualifications, and to support applications for public funding, CHTA members have been asked to indicate the number of candidates they might put forward for these courses over the next five years. NAMTEC is also seeking to establish the potential level of support from the wider metals processing industry.

Other *Hotline* readers wishing to express an interest should contact Chris at *CKenward@ajaxtocco.com*.

Operational efficiency improvements resulting from monitoring and trim of industrial combustion systems

Damian Bratcher, *Director International Operations, Super Systems Inc (SSi), and* ***Matthew Cross****, Managing Director, Super Systems UK Ltd, outline the benefits of optimising excess oxygen levels.*

High natural gas prices, including the effect of the UK's Climate Change Levy, mean that reduction of gas usage by heat treatment plant should be a major focus for cost-cutting in commercial and in-house heat treatment facilities. By reviewing the basic chemistry of combustion and then looking at the effects of optimising excess oxygen, this article hopes to show how small air/fuel ratio changes can have enormous impacts on thermal efficiency and CO_2 emissions.

Optimising operational efficiency, minimising production costs and maximising utilisation means a competitive advantage in good economic conditions. In leaner times, it is a basic necessity. Periodic checking and resetting of air/fuel ratios is one of the simplest ways to get maximum efficiency out of fuel-fired process heating equipment. In heat treatment facilities, potential efficiency improvements would be found on endothermic gas generators, radiant tubes, furnaces, ovens, heaters, and boilers.

The two main areas where heat treatment facilities benefit from combustion optimisation are fuel savings and throughput improvements. Here, combustion optimisation is reviewed first. Next, the impact these improvements have on throughput and utilisation is explored.

COMBUSTION

Combustion is the exothermic chemical reaction (in which heat is given off) of hydrogen and carbon atoms, contained in fuels, with oxygen (in air). In this reaction, the carbon is oxidised to form carbon dioxide (CO_2) or, if insufficient oxygen is available, carbon monoxide (CO). If there is an excess of oxygen present, non-reacted O_2 will be in the products of combustion (*Fig.1*). Excess O_2 makes heating inefficient, thus requiring more gas for the same results. In addition, excess air also allows for the formation of pollutants such as nitrous oxide (NO) and nitrogen dioxide (NO_2). Together, NO and NO_2 make up what is referred to as NO_x.

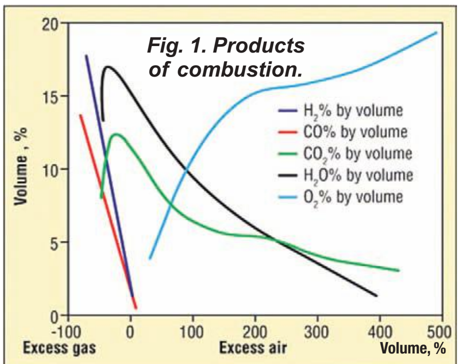


Fig. 1. Products of combustion.

According to the US Department of Energy, most high-temperature direct-fired furnaces, radiant tubes and boilers operate with about 10 to 20% excess combustion *air* (not oxygen) at high fire. While this might seem high, we have no reason to suspect that the figure is much different in Europe. It is estimated that precise control of air to fuel ratio will yield improvements of 5 to 25% or more in heat generation.

The air/gas ratio can be determined by analysing the exhaust gas and, with this information, the mixture for combustion can be altered to produce the cleanest and most efficient heat for the process. Our logged results from exhaust gas analysis have shown that burners are typically running with excess O_2 greater than 4%, which gives great scope for cost reduction, as we will show.

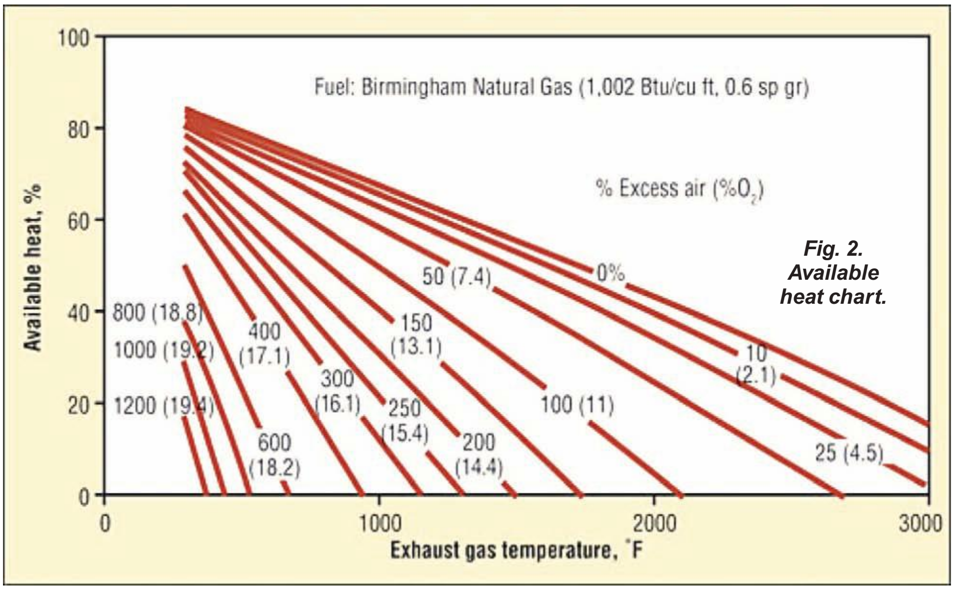


Fig. 2. Available heat chart.

Combustion Efficiency

Most high-temperature direct-fired furnaces, radiant tubes and boilers are designed to operate with 10 to 20% excess combustion air at high fire. This excess air helps prevent the formation of carbon monoxide and soot deposits which can affect heat-transfer surfaces and radiant tubes.

For the fuels most commonly used in Europe, including natural gas, propane, and fuel oils, approximately one cubic foot of air is required to release 100 British thermal units (Btu) in complete combustion (approximately 1m³ air to release 1kWh). Process heating efficiency is reduced considerably if the air supply is significantly higher or lower than that theoretically required.

In the September 1997 *Process Heating* magazine, Mr. Richard Bennett provided calculations and an "available heat" chart which are an excellent basis to determine potential savings in a combustion process. To determine the potential savings, you will need the following information:

- exhaust gas temperature as it exits the furnace, tube, etc;
- % excess air or oxygen in the flue gas (actual);
- % excess air or oxygen in the flue gas (target).

Using the chart, shown in *Fig.2*, determine the percent available heat (AH) under actual and target conditions. The intersection of the measured exhaust gas temperature and % excess air (%O_2) curves provides these values. The potential fuel savings would be calculated as follows:

% Fuel saving = 100 x ((%AH target - %AH actual) / %AH target)


Fig. 3. Forge furnace

DOCUMENTED SAVINGS

In order to illustrate the value of combustion optimisation, two case studies are presented.

Forge Furnace

A gas-fired 6mmBtu/h (1758kW) car-bottom furnace (*Fig.3*), used for open-die forge reheating, was equipped with a high-temperature SSi *SuperOX* oxygen sensor, reference-air system and 9120 oxygen controller. Baseline readings of excess O_2 and fuel consumption were collected over a three-month period. Based upon these data, monthly fuel consumption was determined along with the average high-temperature O_2 readings (6.5% average at 1200° C).

The control and operations personnel were concerned about over-trimming the excess O_2 level. Lowering O_2 levels can lead to reduced uniformity on the heated ingot. Thus, the O_2 levels were lowered incrementally to ensure that no impact occurred on product quality.

At the end of the first incremental change and after process verification, the customer has lowered his excess O_2 from 6.5 to 5.5%. After numerous runs at this O_2 level, the customer documented a 20.5% reduction in metered gas consumption. Using the data shown in *Fig.2*, the % available heat at 5.5%O_2 and 1200ºC (2200ºF) is ~25%. Similarly, at 6.5%O_2 and 1200ºC, it is ~20%. The potential saving is ~20% [100 x (25-20)/25]. The actual results are very similar to the expected results.

For this customer, the 20.5% reduction in fuel cost corresponded to a saving of $15,000 (£9,375) per year for this single furnace, based upon its existing utilisation rate. At full utilisation, the savings would be $53,874 (£33,671).

The customer has a goal of reducing the excess O_2 by several percent. At his target level, he would reduce his fuel costs by an estimated 37%. At the current utilisation, the savings would be $27,750 (£17,343) per year. At full utilisation, the savings reach $98,550 (£61,593) for this furnace. For all 14 furnaces in the facility, the fuel savings have the potential to exceed $1million (£625,000).

A further benefit to the fuel savings is a documented CO_2 reduction. For each MCF (1000ft³) of methane burned completely, 117 pounds of CO_2 is produced (1.87kg CO_2 per 1m³ of methane). In this particular case, the customer was able to document a reduction of 175,500 pounds or 87.75 US tons (79.6 tonne) of CO_2. At full utilisation, on this one furnace with a 1% reduction in excess O_2, the reduction would be 630,006 pounds or 315 US tons (286 tonne). If the customer has similar success on other furnaces, and is able to achieve the O_2 target, his potential CO_2 reduction is 8000+ US tons (7260+ tonne).

Batch Furnace Utilisation and Fuel Savings

The initial R&D on batch furnaces was initiated by John Keough at his Applied Process' Wisconsin and Kentucky facilities. Mr. Keough recognised the value in operating burners at an optimum level to save on fuel. He also recognised the even greater value in creating operational efficiencies by increasing load throughput, based on increasing the available heat produced during high fire with the optimal air/gas ratio.

Mr. Keough and Applied Process challenged Super Systems to develop a system that would monitor high-fire air/gas ratios and provide operators with alarms and trending to monitor the burner performance. The two test sites demonstrated and proved out the sensor and control technology and provided the initial data regarding combustion efficiency and utilisation improvement. This project resulted in the SSi *eTrim* system, now CE-marked and available for installation in Europe.

Subsequently, Queen City Steel Treating in Cincinnati, Ohio, worked with Super Systems to document savings relative to varying O_2 levels in combustion exhaust gases. The tests were conducted using *eTrim* on a sealed-quench furnace with four radiant tubes, using the same load density with identical initial conditions. Each burner is rated 250,000 Btu/h (73.25kW).

Four tests were conducted with excess O_2 levels ranging from 2 to 5%. The test results are shown in *Table 1*.

The two significant highlights evidenced by the data are the substantial improvement in ramp rate (4.90 versus 3.75°C/min) and the reduction in the amount of high-fire time.

Table 1: Furnace trial test results.

Test number	1	2	3	4
Load in (customer supplied)	4/8/2009 11:30	4/9/2009 13:40	4/22/2009 10:50	4/24/2009 12:25
Load out (customer supplied)	4/8/2009 13:13	4/9/2009 15:40	4/22/2009 12:55	4/24/2009 14:35
Target % excess O_2	**5**	**4**	**3**	**2**
Min temperature, ºC	614	611	546	617
Target temperature, ºC	860	860	860	860
Heat-up rate of change, ºC/min	**3.75**	**4.06**	**4.19**	**4.90**
Time to heat, at 5%O_2 or 3.75ºC/min, minutes	65.67	66.56	83.75	64.78
Time to heat, at 4%O_2 or 4.06ºC/min, minutes	60.64	61.46	77.34	59.82
Time to heat, at 3%O_2 or 4.19ºC/min, minutes	58.78	59.58	74.97	57.99
Time to heat, at 2%O_2 or 4.90ºC/min, minutes	50.21	50.89	64.04	49.53

Actual results | Theoretical time to heat | *Note: test 3 come-to-heat time longer due to lower minimum load temperature.*

Table 2: CO_2 production and fuel cost.

Excess O_2 level	5%	4%	3%	2%
Soak cost per hour	£2.50	£2.18	£2.00	£1.76
CO_2, lbs per hour	97.60	84.79	77.96	68.44
Soak cost per day	£60	£52.32	£47.93	£42.08
CO_2, lbs per day	2342.4	2035.0	1871.0	1642.6
Soak cost per year	£19,710	£17,187	£15,745	£13,823
CO_2, lbs per year	769,478	668,484	614,621	539,597

Table 3: Utilisation improvement.

Cycle time, hours	3	4	5	8
% of cycle with 15-minute saving	91.67	93.75	95.00	96.88
Utilisation improvement, %	109.09	106.67	105.26	103.23
Optimal loads per year	2920	2190	1752	1095
Max increase loads per year	265	146	92	35

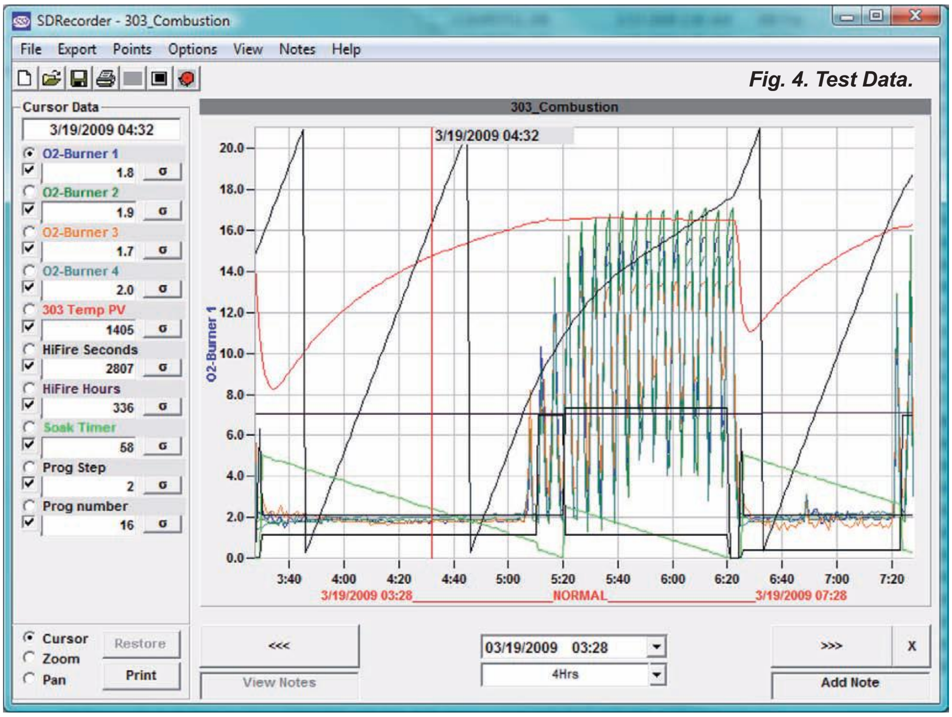


Fig. 4. Test Data.

The improved heating rate shortens the time required for the load to reach temperature and shortens cycle time by 15 minutes per load. The come-to-heat time was calculated based upon the 2% and 5% excess O_2 rate and the saving was consistently more than 15 minutes.

The improved efficiency means that more heat is transferred to the furnace for each period of high fire. Therefore the time at high fire required to maintain the soak temperature is also reduced *(Fig.4)*.

The reduction in high-fire time reduces fuel and operating costs along with minimising CO_2 emissions. *Table 2* provides a summary of CO_2 and fuel savings for the reduction in high-fire time. The burners' total hourly demand on high fire is 1million Btu or 293kWh (one decatherm). The calculations are based upon a kWh cost of £0.011 (decatherm cost of $5) and a 90% uptime availability.

The cost to maintain temperature is reduced by 30% as are the CO_2 emissions. Over the course of one year, the savings will exceed £5,625 and 200,000 pounds (90.7 tonne) of CO_2 by reducing the excess O_2 from 5% to 2% in the combustion process.

Table 3 provides a summary of the improved utilisation that is achieved by reducing the excess O_2 in the radiant tubes for various cycle times. The calculations are based upon a 15-minute saving in come-to-heat time. Cycle times will impact the improvement in utilisation and the number of additional loads that can be pushed through the furnace on an annual basis.

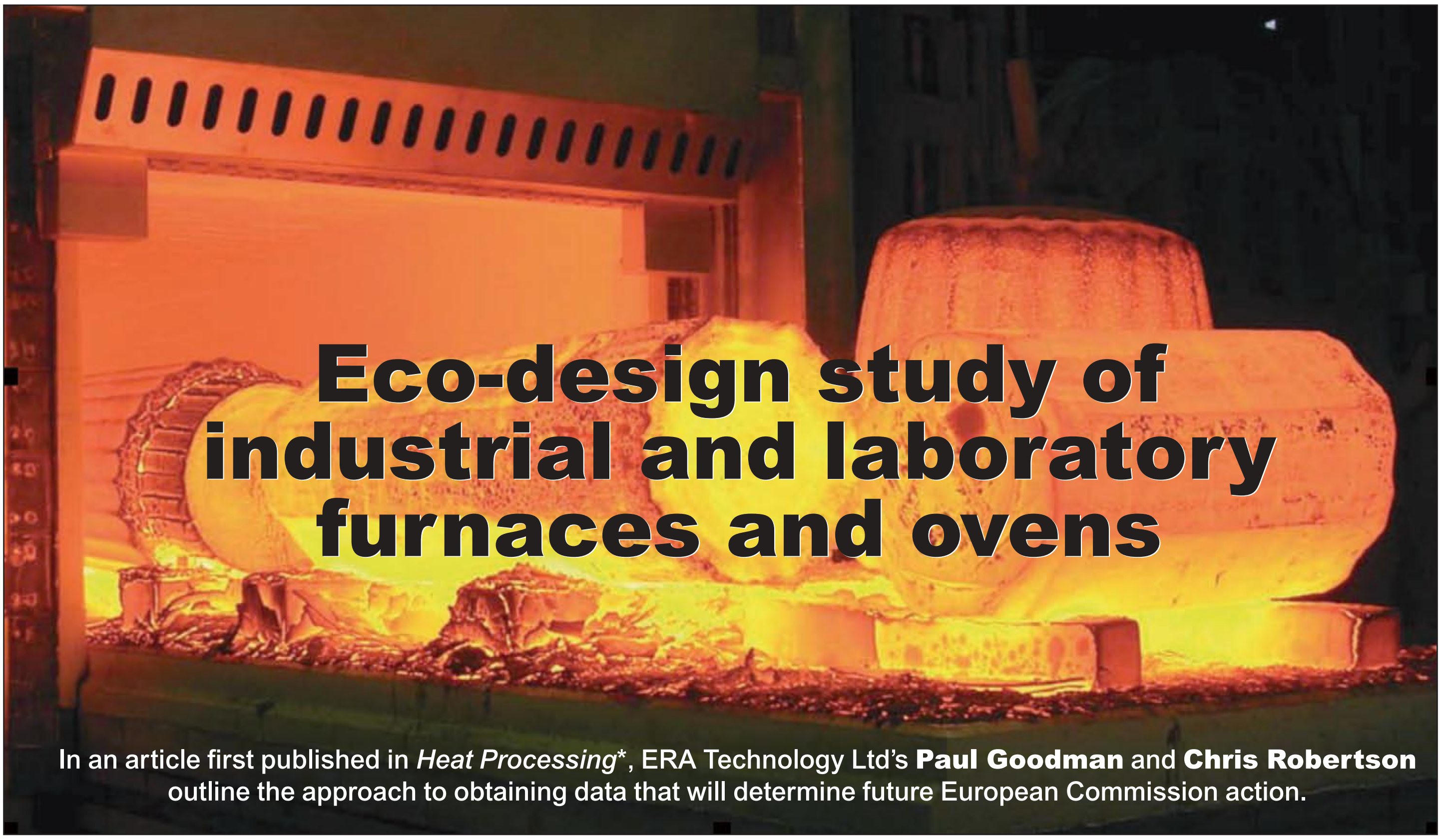
As the cycle times decrease, the utilisation improvements become more significant. For a typical one-hour come-to-heat and three-hour soak (four-hour total cycle), the improvement is 6.67% and 146 additional loads per year.

SUMMARY

Continuous monitoring and adjustment of excess O_2 levels in combustion applications provides significant fuel savings, reduced emissions and improved utilisation, as well as other benefits we haven't discussed, like improved temperature uniformity. The savings and improvements will vary from facility to facility and from furnace to furnace, depending upon how the combustion system is currently tuned and maintained. As process temperatures increase, the fuel and emissions savings rise exponentially.

Even without grants which might be available through the Carbon Trust, against the installation of oxygen-monitoring equipment, heat treaters could see paybacks from fuel savings in between 6 and 18 months, excluding gains in utilisation.

By optimising combustion efficiency, companies will have a competitive advantage over those who overlook this part of their process.



Eco-design study of industrial and laboratory furnaces and ovens

In an article first published in *Heat Processing**, ERA Technology Ltd's **Paul Goodman** and **Chris Robertson** outline the approach to obtaining data that will determine future European Commission action.

Introduction

The Eco-design of Energy-related Products Directive (2009/125/EC, which replaced the "EuP" directive 2005/32/EC) aims to improve the environmental performance of products sold in EU that have the largest impact. In most cases, this is by reduction of energy consumption and, so far, over forty studies have been started or completed and thirteen EU regulations have been adopted.

A study carried out for the European Commission (EC) showed that industrial and laboratory furnaces and ovens were very large consumers of energy and that significant improvement is possible. The EC awarded a contract to ERA Technology Ltd (previously Cobham Technical Services), working with Bio Intelligence Service, to carry out a preparatory study of all types of industrial and laboratory furnaces and ovens.

The purpose of the study is to provide the Commission with sufficient data to enable it to make policy proposals which may include regulation. As such, it is crucial that industry and other stakeholders are actively involved to ensure that the evidence reflects reality, such that sensible policy proposals can be made.

The EU has committed to reducing carbon dioxide emissions by 20% by 2020 and by 80% by 2050. This will be very challenging and so not only will all industry sectors have to play a role but large reductions in the use of fossil fuels may be the only way to achieve this target: small changes will not be enough!

**This article first appeared in* Heat Processing (www.heatprocessing-online.com)*, issue 3, 2011. Kind permission to reproduce here is gratefully acknowledged. Photograph courtesy of Andritz Maerz GmbH.*
***The text under "Further information" was updated by Dr Goodman in November.*

Industrial and laboratory furnaces and ovens

Research carried out for the EC found that industrial and laboratory furnaces and ovens are the fourth largest consumer of energy in the EU and it is clear that industrial furnaces do consume very large quantities of energy. This study is considering all types of ovens and furnaces, ranging from small laboratory ovens to steel blast furnaces.

Previous eco-design studies have reviewed relatively narrow ranges of standard products, such as televisions, computers, refrigerators and electric motors, but furnaces and ovens are far more varied, with many custom-designed non-standard furnaces being installed in the EU. The huge variety of designs is inevitably making this study rather complex.

Eco-design preparatory study tasks

The European Commission uses a standard procedure for all preparatory studies, although this was originally designed for consumer products and so has not been straightforward to follow for furnaces and ovens. The procedure comprises seven tasks:

Task 1. Definition and classification: Definition is important so that the scope of any future legislation is clear. The main defining characteristics of furnaces and ovens are that they have enclosed chambers and their interiors are heated. Classification of types is also important as it is common with these studies that different obligations are applied to each classification. For example, gas- and electrically-heated equipment may need to be considered differently.

Standards and legislation are also reviewed, as part of task 1, as these may provide useful definitions and classifications as well as methods for measurement of energy consumption. Legislation is important as future eco-design requirements must not contradict existing legal obligations.

As part of task 1, the Japan Energy Act was identified as an option for regulation of energy consumption by industrial furnaces and ovens. This imposes limits on the main performance parameters of large fossil-fuel furnaces.

Task 2. Market information, including sales, prices and running costs, is being collected and used for subsequent tasks. These are essential data for the study because it is necessary to determine the current environmental impact of this sector and the size of the improvement possible. The European Commission will impose eco-design requirements if significant improvement is achievable, providing that this would not harm EU industry. Data from this task are important to determine the likely impact of eco-design options which are considered in later tasks.

Task 3. User behaviour is reviewed. It is important to understand how furnaces and ovens are actually used. This helps to determine, for example, EU energy consumption and provides information on any constraints that exist.

Task 4. Current technology used for new and refurbished furnaces and ovens is reviewed. This is used to select representative furnaces and ovens for calculation of their environmental impacts. The impacts of a laboratory oven, a selection of medium-size furnaces and ovens and a large furnace and one large oven have been calculated. Unsurprisingly, the largest impacts are from energy consumption in the use phase.

This task also estimates total EU energy consumption which is about 1400TWh/year, a very significant percentage of total EU energy consumption (about 6%), especially as most of this is from fossil fuels. Another conclusion from these calculations is that energy costs during the lifetime of the furnace or oven are far greater than the original purchase price.

Task 5. Reviews the best-available technology in the EU. With the results from task 4, this task determines the potential for reducing energy consumption in the EU. The potential energy consumption saving from replacement of existing older furnaces and ovens with new is very large, possibly 150TWh/year or more. There is also potential for further energy reductions, by using technology that is available but frequently not used, and this also appears to be very significant. However, achieving this is not straightforward, due to a variety of complex and sometimes competing issues.

New and refurbished furnaces and ovens could be constructed having lower energy consumption than are actually installed in the EU, although at a higher cost. The size of this cost is important but in many cases, the payback time to achieve significant energy savings is relatively short, often less than two years. However, customers of furnace manufacturers are often unwilling to make, or constrained from making, this investment for a variety of reasons that are being investigated as part of this study.

Task 6. The potential for eco-design improvements will be determined by comparison of new furnaces and ovens being sold in the EU using the best-available technologies (irrespective of cost) and also consider possible future technologies. Eco-design studies determine best-available technology (BAT) irrespective of cost, which is different to the definition of BAT used by the IPPC (now IED) directive. Eco-design options will be identified that could be used by the European Commission to formulate legislation. This needs to determine the size of the potential energy saving and the cost.

Task 7. The policy and impact analysis determines the overall impact on the EU from the design options identified in task 6. Policy options will include legislation that regulates the design of new furnaces and how existing furnaces are rebuilt. Incentives are also considered.

Possible approach

The aim of this study is to provide the data that the European Commission needs to determine what action to take. The main approaches being used after completion of previous eco-design studies are:

- Legislation to ban the least-energy-efficient products;
- Minimum energy-efficiency requirements;
- Energy labelling and improved performance information (possibly suitable for laboratory equipment);
- Voluntary agreements by industry (this option is not popular with the furnace industry).

Industrial and laboratory furnaces and ovens are, however, very different to the types of product considered by previous studies and so alternative approaches are being considered. It is possible for laboratory standard designs to be regulated by minimum energy performance standards that will remove the least-efficient products from the market. However an EU standard measurement method will be required first.

For industrial furnaces and ovens, which include custom designs, it is not possible to regulate in this way and so the approach used in Japan is being considered. The Japan Energy Act imposes minimum performance targets on industrial furnaces such as the percentage of heat recovered from flue gases. A similar approach could be used in the EU, but cover a wider variety of furnaces and ovens, including all sizes and electrically-heated as well as fossil fuel.

Also, a wider range of performance parameters could be employed. Regulation using a particular performance parameter is an option if it is likely that it could result in a sufficiently large energy consumption decrease. Reliable data are essential to determine where eco-design requirements can be beneficial. Industry has a crucial role to play in providing this so that any requirements that may arise will be achievable – providing significant environmental benefit while minimising the cost to industry.

Conclusions

This study can be viewed by industry as either a threat or an opportunity. It clearly would constitute a threat if unsuitable legislation were to be introduced as a result of an incorrect understanding of the furnace and oven industry. Some industry sectors have had serious difficulties, after completion of several previous studies, where they did not become fully involved and provide the data that were required to develop workable eco-design options.

However, there appears to be enormous potential for reduction of energy consumption, both by replacement of old furnaces and ovens as well as by installing new furnaces and ovens using the best technology that is available from manufacturers. A wide variety of novel technologies have been developed that can give large reductions in energy consumption, making processes more competitive by reducing the cost of energy throughout the life of furnaces and ovens. The study has identified examples where savings of up to 50% are achievable by replacing old inefficient furnaces with new designs.

There are also differences in the energy efficiency of new furnace designs. For example, recuperative and regenerative gas burners are far more efficient than standard cold-air burners and, although these add to the price, payback times are relatively short. The main limitation on installing the most energy-efficient processes appears to be limits on capital availability and this will not be easy to overcome.

Further information**

This study is due to finish in early 2012, after which the European Commission will consider what action to take. This could include legislation.

ERA has completed the second draft report on tasks 1-5 and this can be downloaded from the project website at *www.eco-furnace.org*. A revised version of this report will be published on this website to include performance parameter data provided by industry when these data are available.

Furnace manufacturers and users are invited to register on the website to receive updates on progress and opportunities to engage. More data are needed from industry to complete this study and so manufacturers and users are invited to contribute and make sure that their views are taken into account.

Authors

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Latest consultaton on new Climate Change Agreements

*SEA's **Dave Elliott** reports…*

The latest consultation on the new Climate Change Agreements closed on 28 October 2011. The executive summary from the consultation outlines the main proposals:

1. The Climate Change Agreements (CCAs) Scheme was introduced in 2001 in response to the Marshall Report on "Economic Instruments and the Business Use of Energy" and the introduction of the Climate Change Levy (CCL) which is charged on non-domestic energy supplies. The Agreements were introduced as it was recognised that the Levy could impact on the competitiveness of energy-intensive industry. CCAs enable energy-intensive industry to benefit from a 65% reduction in the CCL in return for meeting demanding energy-efficiency targets. The Agreements offset competitive disadvantage and reduce energy use across participating sectors.

2. The first CCAs Scheme expires in March 2013. Government committed, in the Annual Energy Statement in July 2010, to consider the future of CCAs, in tandem with a review of the CRC Energy Efficiency Scheme (CRC), to ensure delivery of significant improvements in energy efficiency with minimal complexity and policy overlap. The Budget Statement in March 2011 announced that a replacement Scheme will be implemented and is scheduled to commence in April 2013, subject to State Aid approval. The new Scheme will run until 2023, which will provide certainty for industry and encourage long-term investment in energy-saving strategies.

3. The previous Administration consulted on changes to CCAs in March and December 2009 and March 2010. These consultations included proposed changes to simplify and streamline the operation of the new Scheme.

4. The proposals in this consultation document include a review of those included in the previous consultations. The Coalition Government has reviewed the proposals and decisions and this document presents our conclusions and revised proposals. Additionally, as part of Government's drive to reduce the administrative burden on business, new proposals have been identified which are also included in this consultation document.

At October's Conservative party conference, Chancellor George Osborne voiced reservations about the UK having the world's toughest targets for cutting carbon emissions.

In his November 29th Autumn Statement, he announced that, in 2013, the Government will increase the level of relief from the Climate Change Levy on electricity, for CCA participants, to 90%.

5. These proposals aim to simplify and improve the operation of the Scheme as well as increase transparency and accountability. In summary, these proposals will:
   - Amend legislation to **guarantee the rights of the existing 54 sectors** to remain within CCAs. This action has been taken in order to reduce administrative burdens on both industrial sectors and Government and to provide certainty for industry.
   - **Lower the current threshold from 90% to 70% of the minimum eligible energy use of a site based on which the CCL discount can be granted for the whole site**. This means that around 450 more participants who currently claim CCAs will be able to get the CCL discount for the whole of their site
   - **Reduce the burden on industry** by retaining the biennial performance assessments, aligning the reporting year for the Scheme into the calendar year already used by the EU Emissions Trading System, simplifying the Scheme's agreements and introducing rules so that the Scheme is simpler to administer
   - **Remove the overlap with the EU Emissions Trading System** by splitting the CCA targets into two elements:
     (a) emissions within a CCA and covered by the EU Emissions Trading System (EU ETS) (not subject to a CCA target and eligible for the CCL discount), and
     (b) a negotiated CCA target covering non-EU ETS emissions and electricity.
     This will reduce the admin burden, for the target units which are also in the EU ETS, by not having to apply a complicated rule to adjust their target for the overlap before their performance gets assessed at reconciliation.
   - Close the UK Emissions Trading Scheme (UK ETS) and replace it with a simpler system **to enable risk management by participants when meeting targets without jeopardising their levy discount**. This will save participants the costs of maintaining trading accounts, verifying allowances and trading.
   - Introduce a **voluntary financial penalty system** which will avoid businesses losing the CCL discount for minor infringements

The expected timetable for the introduction of the new agreements is:

- December 2011 - Government response to the first consultation;
- Early 2012 - Second consultation to begin;
- Spring 2012 - Target negotiations with sectors to begin;
- Autumn 2012 - Underlying agreements signed with sectors;
- April 2013 - New scheme starts.

New approaches to furnace atmospheres

Hotline *Editor **Alan J. Hick** comments.*

This October was marked by a plethora of international heat treatment conferences/ exhibitions in Glasgow (19th IFHTSE Congress), Wiesbaden, Germany (67th Härterei-Kolloquium) and Cincinnati, USA (26th ASM Heat Treating Society Conference & Exposition).

A couple of specific items from the latter shows especially caught my eye as someone having a particular interest in controlled furnace atmospheres. I was intrigued to learn of innovations aimed at optimising atmosphere gas usage, reducing emissions and lowering operating costs…

RECYCLING CARBURISING ATMOSPHERE

According to Ipsen, the "atmosphere-efficiency" of conventional gas carburising treatments is appallingly low. They observe that: "Of the process gases used, such as endogas or nitrogen/methanol, only 2% actually diffuses into the workpieces; 98% remains unused and is finally burnt off to form CO_2 ".

In view of gas price trends as well as current and threatened regulations for the avoidance of CO_2 emissions, the engineers at Ipsen asked themselves whether it would be possible to reduce this waste and increase efficiency.

Their answer is *HybridCarb*, an innovative recycling/reconditioning system in which the used gas is passed through a "preparation" chamber, where the loss of carbon during carburising is compensated for precisely, before being fed back into the furnace heating chamber. The impressive outcome claimed is an increase in efficiency to 20%, a reduction in CO_2 emissions by a factor of 10 to 15 and a reduction in process gas costs by up to 98%.

Ipsen say that the new technology can be used not only to equip new furnaces but can also be readily employed to upgrade systems already in service, soon including non-Ipsen equipment.

PLASMA-ACTIVATED ATMOSPHERES

At the Cincinnati exhibition, Air Products demonstrated the concept of plasma activation of furnace atmospheres.

An experimental technology, plasma activation of processing atmospheres is a potential alternative for the heat treatment of low- and high-alloy steels, including stainless steels. It is said that, for heat treaters looking to improve part quality or considering replacement of their old endo/exo-generators, the technology can offer a lower-cost option.

In carburising, the technique involves activation of non-flammable mixtures of low-percentage methane and nitrogen during injection into the furnace, at atmospheric pressure, by a novel non-thermal electric discharge (cold plasma) method.

Customer carburising trials have proven the feasibility of using this technology for minimising internal oxidation, lowering emissions and optimising the use of hydrocarbon gases.

An in-depth description of a theoretical and experimental investigation into the benefits of activated carburising can be found in the article "Atmosphere carburizing using electric discharge-activated nitrogen-natural gas mixtures" at *www.airproducts.com/activated*.

HybridCarb on display at the Wiesbaden exhibition.

SEA news

NAME CHANGE

The Surface Engineering Association's parent body, the British Jewellery Giftware & Finishing Federation (BJGF) has changed its name to the **British Allied Trades Federation** (BATF).

BUYERS GUIDE

SEA in the process of revising its hard-copy *Buyers Guide*, which includes CHTA members. Expect a request for your updated input.

MEMBERS DAY

The House of Lords will be the venue, on 16th March 2012, for an open "members day" celebrating SEA's 125th anniversary. The event will encompass the BGM at which CHTA Vice-Chairman Richard Burslem will become Chairman of SEA's National Committee.

AWARDS

The House of Lords will also host SEA's *Gala Dinner & Awards* event on 19th October 2012.

LETTER TO THE EDITOR

Recruitment

As technical recruitment officer at NAMTEC, I was interested in the article (*"The recruitment opportunity"*) that features in September's *Hotline* 125.

We have actually worked with Wallwork Heat Treatment, along with various other organisations such as Firth Rixson and Johnson Matthey, helping them find the right technical skills through our recruitment service (*www.namtec.co.uk/recruitment*).

Well aware that the industry struggles to find the right skills, we have developed excellent links with universities across the country. Throughout October and November, we attended some 30 engineering and materials careers fairs and presented in-department specific lectures to urge candidates to apply to our graduate programme. We then competency-assess the candidates in order to identify the best people and link them to companies in the industry.

We also have the ability to source experienced metallurgists and materials scientists through our extensive industry links and recruitment network.

Jacob Gray,
The National Metals Technology Centre

Always welcome, letters to the Editor should be addressed to mail@chta.co.uk. The deadline for March's Hotline *127 is February 23rd.*

Member news

NEW MAN AT CTP

CHTA member Clayton Thermal Processes Ltd has announced the addition of Mr Les Hickens to their sales and technical team at Oldbury. He has joined to give support to the existing staff and to ensure the future progress of the company by the injection of younger blood.

Les says: "After graduating from the University of Manchester this summer, with a bachelor degree in chemical engineering, I was keen to begin a career in the manufacturing industry. I was given the opportunity to join Clayton Thermal Processes (CTP) in October and felt my background, although not strictly in heat treatment, gave scope to develop an understanding of the processes provided by the company.

In particular, the focus on the use of fluidised beds at CTP, in both heat treatment and thermal cleaning of organic deposits, tied in with my experience of solid-fluid systems and heat transfer at university.

Since arriving, I have already been involved in numerous projects at varying stages of development, from continuous furnace design to the production of nanomaterial. Alongside in-house training in heat treatment and guidance from management, this has bolstered my interest and proficiency in the field.

My experience so far at CTP has provided me with clear opportunities to learn and to progress, and has encouraged me to pursue a long and, hopefully, successful career in heat treatment".

One of the first jobs Les had to do was to man an exhibition stand at the "*Made in the Midlands*" exhibition held at the Banks's Stadium, the home of Walsall Football Club. *Made in the Midlands* comprises a group of about 200 local companies, whose aim is to promote their products and to improve the profile of the Midlands' manufacturing sector.

Les Hickens (right) and Dave Walker are pictured here with an award, presented by *Made in the Midlands*, which recognises the success of Clayton Thermal Processes in manufacturing in general and for the supply of a large fluidised bed to Taiwan. The order for the fluidised bed, the largest ever built for the quenching and tempering of tool steels, was won, against intense opposition from the Far East, due to the knowledge and experience of the staff at CTP and its associated company Beta Heat Treatment.

Dave Walker, Managing Director of Clayton Thermal Processes, is pleased that Les has "bucked the trend" to choose a career in engineering and in heat treatment in particular. "We are glad to welcome him as a member of the team; he is already making a valuable contribution to the many projects we have on the go and we wish him well for the future."

CHTA MEMBERSHIP FEES

Annual CHTA membership fees for 2012, invoiced via SEA/BATF, remain at the same level as in 2011.

AIR PRODUCTS SPONSORSHIP

CHTA is delighted to announce that Air Products plc will again be kindly sponsoring both the Association's website and *Hotline* in 2012. Their much-valued support now extends to an unbroken period of thirteen years.

WALLWORK'S SALES TEAM STRENGTHENED

With high demand and growth in aerospace and commercial processing, Wallwork Heat Treatment are delighted to announce the appointment of Ian Lacey to promote new business development for their Manchester site. He brings with him more than 30 years experience and knowledge of heat treatment over all sectors and processes within the industry.

Ian joins newly-promoted sales manager Howard Maher who will now head up commercial and aerospace sales for Wallwork Manchester. The sales team there is completed by Luke Collins (business development commercial sales) and John Copple (internal sales).

Wallwork sales director Simeon Collins says: "The promotion of Howard to sales manager and the addition of Ian will strengthen the company as a whole and give current and potential customers access to quality technical information and experience. In this challenging environment, it is essential that the customers get to speak to the right people with the correct knowledge and understanding to advise; Howard, Ian, Luke and John are there to do this."

Hotline is sad to record the death, in early October, of **Roger Middleton** (61) of Lowestoft-based CHTA member Middleton Heat Treatments Ltd.

Metallurgist Roger had been Managing Director since the company's formation in 1988, following purchase of the business and assets of the East Anglian Division of British Heat Treatments where he was previously General Manager.

Our sincere condolences go out to Roger's son Simon, now a Director who has taken over at the helm, and the rest of his family.

CHTA AT "UNDERSTANDING HEAT TREATMENT"

Pictured below, delegates from CHTA member companies again figured in a good turn-out for the latest Wolfson Heat Treatment Centre course (11-13 October).

Wolfson Manager Derek Close tells us that the next *Understanding Heat Treatment* course (the 77th) is scheduled for **9-11 October 2012.**

Back row (l. to .r.): Steve Hammersley (Wallwork Heat Treatment Ltd), Adam Haynes (Alpha-Rowen Ltd) and Steve Dutton (Wallwork Heat Treatment). Front: Adam Morton (Wallwork Heat Treatment) and CHTA Secretary Alan J. Hick, speaker on controlled furnace atmospheres.

Wallwork's Manchester sales team: (l. to r.) Ian lacey, John Copple, Luke Collins and Howard Maher.

ADVERTISING

Advertising in *Hotline*

Hotline welcomes advertising (other than recruitment) from CHTA members and suppliers to the trade.

2012 RATES

Single-insertion charges for black-and-white ads:

Size	Dimensions	Charge
Quarter page	121mm high x 86mm wide	£190 +VAT
Half page	121mm high x 178mm wide or 254mm high x 86mm wide	£335 +VAT
Full page	254mm high x 178mm wide	£600 +VAT

For **full-colour** ads, add an extra **£253**+VAT to each of the above charges.

Advertisers in four consecutive quarterly editions of *Hotline* are entitled to a series rate where all of the above prices are discounted by 20% per insertion.

Deadline for booking ads in March's *Hotline* 127:

February 16th

For further details, contact *Hotline* Editor Alan J. Hick

Tel: 0121 329 2970;

e-mail: *mail@chta.co.uk*

STATESIDE STATS

NORTH AMERICAN 2011 HEAT TREATMENT SALES UP 21.8% IN FIRST NINE MONTHS

CHTA counterparts participating in the Metal Treating Institute's Monthly Sales Statistics Program reported heat-treating sales of $731.9million for the first nine months of 2011, a gain of 21.8% from the $600.8million posted for the same period in 2010. This September billings amounted to $85million, a rise of 15.7% compared with September 2010's $73.4million.

The latest returns indicate October sales of $85.5million, an increase of 14.8% over October last year when billings amounted to $74.5 million.

FORTHCOMING EVENTS

Diary

January 17-18 2012
METALLURGY FOR NON-METALLURGISTS
Rotherham, England *www.namtec.co.uk*

January 26 2012
CHTA PUBLICITY SUBCOMMITTEE*
Birmingham, England

February 2 2012
METALLURGY FOR BEGINNERS
Rotherham, England *www.namtec.co.uk*

February 9 2012
CHTA MANAGEMENT COMMITTEE*
Birmingham, England

March 7 2012
BIFCA Technical Series:
BURNER TECHNOLOGY
West Bromwich, England *www.bifca.org.uk*

March 14-15 2012
METALLURGY FOR THE ENGINEER
Rotherham, England *www.namtec.co.uk*

March 15 2012
BIFCA SAFETY & STANDARDS SEMINAR
West Bromwich, England *www.bifca.org.uk*

March 22-23 2012
EUROPEAN CONFERENCE 2012:
COMBINED TREATMENTS TO IMPROVE SURFACE PROPERTIES
Strasbourg, France
Conference on duplex treatments co-sponsored by the major European heat treatment associations: A3TS (France) / AWT (Germany) / AIM (Italy) / SVW (Switzerland) / VWT (Benelux) / ASMET (Austria) / ATZK (Czech Republic): *www.a3ts.org*

March 28 2012
INTRODUCTION TO HEAT TREATMENT
Rotherham, England *www.namtec.co.uk*

April 10-11 2012
HEAT TREATMENT FOR PROFESSIONALS
Rotherham, England *www.namtec.co.uk*

April 17 2012
BIFCA Technical Series:
FURNACE MODELLING
West Bromwich, England *www.bifca.org.uk*

April 22-25 2012
5TH INTERNATIONAL BRAZING AND SOLDERING CONFERENCE
Las Vegas, Nevada, USA
www.asminternational.org/content/Events/ibsc/

April 26 2012
CHTA PUBLICITY SUBCOMMITTEE*
Birmingham, England

April 25-26 2012
METALLURGY FOR NON-METALLURGISTS
Rotherham, England *www.namtec.co.uk*

May 9-12 2012
METAL + METALLURGY 2012
Beijing, China
Includes 11th China International Industrial Furnaces Exhibition: *www.mm-china.com*

May 10 2012
CHTA MANAGEMENT COMMITTEE / AGM*
Birmingham, England

May 16 2012
BIFCA Technical Series:
FURNACE AND BURNER CONTROLS
West Bromwich, England
www.bifca.org.uk

June 6-7 2012
A3TS 2012
Grenoble, France
French-language 40th Congress on Heat Treatment and Surface Engineering: *www.a3ts.org*

June 12-14 2012
SUBCON 2012
Birmingham, England *www.subconshow.co.uk*

July 19 2012
CHTA PUBLICITY SUBCOMMITTEE*
Birmingham, England

June 25-27 2012
1ST INTERNATIONAL CONFERENCE ON ENERGY AND THE FUTURE OF HEAT TREATMENT AND SURFACE ENGINEERING (IFHTSE)
Bangkok, Thailand *www.mtec.or.th/EFhtse2012/*

July 26 2012
CHTA MANAGEMENT COMMITTEE*
Birmingham, England

September 10-12 2012
4TH INTERNATIONAL CONFERENCE ON THERMOMECHANICAL PROCESSING OF STEELS
Sheffield, England *www.iom3.org/events/TMP2012*

September10-13 2012
6TH INTERNATIONAL QUENCHING AND CONTROL OF DISTORTION CONFERENCE /
4TH INTERNATIONAL DISTORTION ENGINEERING CONFERENCE
Chicago, Illinois, USA
www.asminternational.org/content/Events/qcd/

October 2-3 2012
FURNACES NORTH AMERICA 2012
Nashville, TN, USA
The Metal Treating Institute's conference and exposition: *www.furnacesnorthamerica.com*

October 9-11 2012
UNDERSTANDING HEAT TREATMENT
Birmingham, England
77th repeat of Wolfson Heat Treatment Centre's course. Details from Derek Close: tel: 0121 237 1122; e-mail: derek.close@sea.org.uk; *www.sea.org.uk/whtc*

October 9-11 2012
ALUMINIUM 2012
Düsseldorf, Germany *www.aluminium-messe.com*

October 10-12 2012
68TH HÄRTEREI-KOLLOQUIUM
Wiesbaden, Germany
German-language heat treatment conference and exhibition: *www.awt-online.org*

October 19 2012
SEA AWARDS
London, England *www.sea.org.uk*

October 25 2012
CHTA PUBLICITY SUBCOMMITTEE*
Birmingham, England

November 8 2012
CHTA MANAGEMENT COMMITTEE*
Birmingham, England

**Members wishing issues to be raised at CHTA meetings should notify CHTA's Secretary, well beforehand, at mail@chta.co.uk*

Spread the word by proclaiming your CHTA membership

For use on company letterheads, literature, websites and advertisements, members can download CHTA's logo from the Members Area of the Association's website.

Please send comment and news items for March's *Hotline* 127 to: *mail@chta.co.uk*
Deadline: February 23rd

The Contract Heat Treatment Association

Season's greetings to all our readers

www.chta.co.uk

MEMBER PROFILE

Heat Treatment 2000 Limited

*Managing Director **Paul Handley** outlines the company history and reports latest developments.*

The West Bromwich site now occupied by CHTA member Heat Treatment 2000 Ltd was originally that of Electro Heat Treatments Ltd, the company founded in 1953 by Phil Griffiths (an early CHTA Chairman) and Fred Handley.

Electro operated aluminium solution and precipitation ovens, mesh-belt bright-annealing furnaces, shaker-hearth harden-and-temper lines and high-frequency equipment. Having been the first to utilise sealed-quench furnaces in the sub-contract market, the company installed a continuous carburising furnace in the mid-1960s.

In 1994, Electro's merger with Heat Treatment 2000 was arranged with a view to strengthening the group position, particularly in the field of the bulk hardening and tempering of fasteners.

Heat Treatment 2000 Ltd had been formed in 1992 on the acquisition of Atlas Bolt's remote heat treatment works in Darlaston. Initially, Atlas Bolt was the sole customer, but the company's reputation for quality and reliability soon enabled it to enter the bulk harden-and-temper marketplace and greatly increase its market share.

In 1998, it became clear that, in order to survive in the bulk market and meet automotive cost targets, a new furnace, considerably bigger than anything available in the UK, was needed.

Accordingly, an order was placed with Can Eng Furnaces Ltd of Canada to acquire a 2.7tonne/hour continuous furnace line; at the time, this was the largest of its type in Europe.

The furnace was installed in 2000. However the bolt market started to contract and therefore the Darlaston site, with its less-efficient equipment, was closed. At about this time, other well-established heat treaters, including Temperset and the bolt-hardening division of Express Treatments, also ceased to trade.

Paul Handley alongside HT2000's 2.7tonne/h line

With the quality standards BS EN ISO 9001:2008, CQI-9 and TS16949, Heat Treatment 2000 now operates two divisions at West Bromwich, one offering the heat treatment of bolts, fasteners and pressings, the other processing aluminium alloys.

Latterly, the company realised that, following an upsurge in demand, weekend working was becoming the norm rather than the exception. Therefore, in April this year, an order was placed for a one-tonne/hour mesh-belt furnace to augment the existing 2.7tonne line and offer valuable back-up capability.

The resulting increase in capacity means that, whilst weekend working will become the exception, the company will be able to offer surplus capacity of about 100tonne per week if required. More specialised treatments, such as case-hardening and carburising of small parts, can also be offered. The delivery date for this new equipment is mid-December, with a start-up scheduled for February 2012.

With the automotive sector increasing the use of aluminium, in its efforts to reduce vehicle weight and increase fuel efficiency, Heat Treatment 2000 intends to remain in the forefront of suppliers to the aluminium casting industry. Thus the company expects to make considerable investments into its non-ferrous division in 2012.

Market Movements

ANALYSIS OF QUESTIONNAIRE REPLIES RELATING TO 30 CHTA MEMBER SITES

"THIS QUARTER" =

1 JULY – 30 SEPTEMBER 2011

= TURNOVER INDEX 100

OVERALL ANALYSIS (30 SITES)	Mean index
This quarter last year	**86.4**
Last quarter	**98.8**
Predicted next quarter	**98.3**