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WS Thermal Process Technology

INNOVATIVE BURNER TECHNOLOGY







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We are successful

WS Wärmeprozesstechnik GmbH is a medium-sized enterprise with headquarters in Baden-Württemberg in Southern Germany, which can look back with pride over its 30-year history. WS Wärmeprozesstechnik GmbH has secured a leading position on the global market with its innovative and highquality products, ongoing research and development work and customerorientated approach. A team of highly qualified employees is behind the company's success, whose inventiveness, talents, enthusiasm and energy, along with their willingness to work hard and their experience combine to create expertise that meets our customers' needs in every respect and makes us a strong and fair partner.

We are pleased to be able to use this brochure to communicate our entrepreneurial spirit, our products and the people who work in our company.

THERMAL PROCESS TECHNOLOGY



Dr.-Ing. Joachim A. Wünning, co-founder of WS Wärmeprozesstechnik GmbH. Dr.-Ing. Joachim A. Wünning is the owner of a large number of original patents and inventor of the FLOX® combustion process. He is an inspirational and trusted adviser.







We are inventors

The birth of FLOX[®]. The huge potential of FLOX[®] was recognised as soon as the effect had been discovered. The disappearance of a visible flame and its typical associated noise, as well as the massive reduction in NO_X emissions with complete combustion.

Fire without flame - it sounds like a contradiction and yet, at the same time, it is a trailblazing discovery. The many different versions of this combustion principle, which have a wealth of applications especially in the steel industry and with burners for thermal treatment, have unbeatable benefits. Unlike conventional burners, the sophisticated mixing of fuel gas, combustion air and recirculating exhaust gas with WS burners in FLOX® mode avoids peak combustion

»FLOX[®]« ► »FLameless OXidation«: The registered trademark and patented technology of WS Wärmeprozesstechnik GmbH. Potential problems with NO_X are finally eliminated and energy-efficient and functionally safe operation is established for long-term productivity.

THERMAL PROCESS TECHNOLOGY

Drastic reduction of nitric oxides Permits maximum air heating No need for flame monitoring



temperatures. In spite of the use of high air pre-warming rates to significantly improve efficiency, this prevents an associated rise in NO_X emissions. In addition, the uniform temperature spread in the furnace produces high-grade products and reduces the wear of the burner. All key factors for environmentally-orientated thinking, economical action and the production of high-quality products.

The potentials of FLOX remain huge: Current research in various national and international projects, which are partly supported by public funding, is focused on new fields in thermal processing and energy technology.



- Optimum at high process temperatures (> 850°C / 1,550°F)
- Increased service life of components due to lower thermal stress



We are WS

The knowledge and motivation of every single employee contributes to our success and to the satisfaction of our customers.

Our outstanding products are the reason for the continuous growth of WS. However, they can only be as good as the people who invent, design, manufacture, test, sell and maintain them. We think and talk, ask questions and find answers. We question and understand. We hold firm and get going. We know which proven paths are worthwhile and the ones we wish to pursue anew. We like working for our company. And we are happy to show it.

»The fact that we are supported in such a motivated way by so many skilled workers, unequivocally confirms our decision to select WS as our burner supplier.«

Long-standing WS customer



THERMAL PROCESS TECHNOLOGY

German Environmental Award

WS Wärmeprozesstechnik GmbH was presented with an award for the key technology in energy-efficient hightemperature processes that reduces their impact on the environment – FLOX®, the development of an ultra-low emission process which can also be economical superior to other conventional processes.

»The prize-winners won the award based on their inventiveness, perseverance, dedication and courage ... They are presented with the most lucrative European environmental award for this outstanding commitment.« Hubert Weinzierl,

Chairman of the Board of Trustees of the

»Deutsche Bundesstiftung Umwelt«

DBU

We are proud to be the inventors of the worldwide patented combustion process: FLOX[®] – fire without flame. Our invention is at the heart of many national and international research projects with a wide range of partners from the fields of industry and research, and also forms the subject of numerous papers in scientific literature. This unique combustion process - systematically translated into products has been successfully used in many diverse ways the world over. We regard it as a challenge and a responsibility to continue to achieve prestigious research and development results to fulfil our role as a leader of innovation in the field of thermal process technology.

We are innovative

Our excellent products are used in a wide range of applications, particularly in the steel industry, and have found specific use in energy-saving gas heating systems for industrial furnaces. We continue to remain open to further energy sources, like hydrogen, biogas and coal. The highly efficient use of energy sources and minimum pollutants guarantee minimum energy costs for our customers and underline our environmentally-orientated approach. »We carried on despite scepticism from scientific circles, the huge volume of work and setbacks. And we pass on our knowledge and expertise to jointly achieve one goal: the preservation of our environment.«

Dr.-Ing. Joachim G. Wünning, Technical Director of WS Wärmeprozesstechnik GmbH

RESEARCH AND DEVELOPMENT















FLOX[®] Micro Power System





GAS TURBINES

The use of FLOX[®] in gas turbines was thought to have been impossible for some time. Research findings now show the opposite and indicate solutions for typical applicational problems.

STIRLING ENGINES

Small units for the self-generation of power have always held a fascination for scientists. We are also enthusiastic about this and have developed a productionready heating system and licensed it to manufacturers.

BIOGAS

Our subsidiary »e-flox GmbH« has demonstrated the exceptional compatibility of the unique combustion properties of biogenic gases with FLOX[®]. A future-centric vision due to the growing share of biogenic fuels.

COAL COMBUSTION

One of the major potential methods of reducing CO₂ is in the efficient combustion of coal. For the first time FLOX[®] is used with solid fuels in an international project to develop a CO₂ emission-free coal combustion process for power generation.

A further international research project demonstrates the high level of fuel recovery in the combustion process due to the burner's outstanding efficiency. The reduced noise emissions from the combustion process represent a further benefit.

FLEXIBLE USE OF FUEL

The aim of the research is to determine the relationship between the ratio of fuel and oxidising agent to the increase in efficiency in single and multi-burner furnaces using the FLOX® process.

CERAMIC HEAT EXCHANGERS Ceramic heat exchangers have been developed for high-temperature heat recovery, the size and weight, as well as the production costs of which, are significantly lower and the manufacturing of which enables a range of different sizes of heat exchanger.

GAP-FLOW TECHNOLOGY

WITH LOW TEMPERATURES WS is extending the range of possible applications for WS burners, based on what is known as »gap-flow« technology, with a burner range suitable for use at temperatures up to 700°C / 1,300 °F and which is also extremely energyefficient.

FLOX[®] hydrogen reformer Together with our subsidiary, WS Reformer GmbH, we develop systems and solutions for the hydrogen and fuel cell technology market: open^E is a technologically open platform for the decentralised local supply of power and

heat to households without mains power

supply or external control by the power plant operator. A key aspect of this is the self-generation of power, particularly

beneficial when using electric vehicles. The WS FLOX® Micro Power System, which obtains hydrogen from natural gas using a FLOX® Reformer unit, thereby generating power energy efficiently for local household supply using fuel cell technology with minimal air pollution, is suitable for use with open^E. This electrical energy is temporarily stored in high-performance batteries until it is needed and is available

on demand.

We are leaders

Knowledge represents progress. It also motivates us to underpin our technical expertise with in-depth grass roots research to improve and develop principles and technologies for technical implementation by state-of-the-art testing and computational methods in our in-house R&D Centre. Moreover, we extend our knowledge through cooperation and communication with national and international universities and research institutes.

Our customers benefit from our work, as they can weather the competition they face today and tomorrow with our innovative products. Our products represent quality, as they are reliable and profitable. For entrepreneurial success.





The biggest incentive for our customers to buy our products is their excellent cost efficiency. Companies have to consider every aspect to behave economical: the investment as well as the cost of maintenance and power consumption. Due to the outstanding efficiency of our products and their associated energy-savings, an investment in WS burners pays for itself within a short time.

EFFICIENCY AND PRODUCTIVITY



We lower energy consumption

Our energy-efficient products are successfully represented in national and international markets and have satisfied customers in various new fields of application, such as the glass and ceramics industry and in the chemical industry and energy engineering.

A key to our expansion is our motivation to think and act innovatively, including the optimisation of work processes and the use of state-of-the-art machinery. Our specialists use only high-quality components and materials for the manufacture of our products in our own factories, ensuring that we can guarantee on-schedule production and the consistently high quality of our products.



Dr. Georg Schönfelder, Commercial Director. Dr. Georg Schönfelder is co-founder of WS Wärmeprozesstechnik GmbH and is the initiator for the development of new sales markets and the expansion of a global sales network.



We enable a return on investment

Investment: 6%

Total cost of ownership of a burner in productive Maintenance: 1% operation over five years. Energy: 93%



The facts speak for themselves: The typical total cost of ownership of a burner in productive operation shows that over 90 percent comes from the burner's energy consumption, around six percent from investment and one percent maintenance costs.

This fact makes our burners extremely profitable, as: WS burners are unbeatable in terms of energy-efficiency. The investment pays for itself within a short period of time due to the enormous savings in fuel and emissions.

EFFICIENCY AND PRODUCTIVITY



Total Cost of Ownership

We look for maximum energy efficiency







EFFICIENCY AND PRODUCTIVITY



WS sales and project engineers are specialists in the most diverse fields of thermal process technology. Together with our customers, they develop optimum solutions for the use of our products in production and heat processing lines.

DESIGN AND CONSTRUCTION







Our experts determine all the requisite parameters in an in-depth exchange of information and visit the plant to offer customers detailed and professional advice to ensure that the very best technical and economical solution is found time after time. Our engineers' technical knowledge and expertise includes thorough knowledge of industrial processes and incorporates feedback about practical experiences from our WS service technicians who look after our burners in the most diverse applications.





We operate globally

world. Customers can either contact our offices in Germany and the United States or get in touch with the many contacts in our overseas agencies, who are professionally and reliably supported by our technical sales team.

Typical global applications for our burner technology include: annealing, curing, tempering, sintering, forging, enamelling, galvanising and chemical processes.

DESIGN AND CONSTRUCTION

WS products are in demand all over the

»We received extraordinary support on our Canadian project. That's when it shows how important an open and partnership-based business relationship is, like that one that we have maintained with WS for several years.«

WMU Wärmebehandlungsanlagen für Industrie und Umwelttechnik GmbH, Bönen, Germany – for a pilot project in Canada





We challenge ourselves

Quality is our priority, which is why we focus on quality assurance and consistently pursue this approach. This means strategic planning: far-sighted considerations and fact-based decision-making. This includes optimised processes: defined procedures and clear responsibilities. This is based on open communication with our employees, with our suppliers and with our customers.

We keep a keen eye on things. Regular external tests by a quality management certification centre guarantee continuous further development and optimisation in accordance with recognised quality standards.

We have also set up a reliable qualityapproved supplier network to ensure that we complete customers' orders in a short time. Our products are produced by our motivated skilled professionals with state-of-the-art machinery in our own factories, therefore achieving a depth of manufacturing that meets our own high quality standards and those of our customers.



PRODUCTION AND QUALITY ASSURANCE

We build burners

The idea is the trigger moment – but it is a long journey after that. Initial basic tests, feasibility checks, sketches and plans. Component manufacture. Then the prototype. Each step accompanied by innumerable tests and evaluations. It all comes down to optimisation. The most accurate documentation. Ultimately a small series run. Simulated malfunctions in our R&D facilities. Then delivery to the customer, who will put it to the acid test. Conditions are tough in production. WS engineers check, document, adjust and optimise on site. Finally we are there. The WS burner passes with distinction. And goes into series production.

WS BURNERS







»WS has been our reliable and professional partner for 10 years – we use over 500 WS burners. We particularly appreciate the in-depth exchange of experience with their well-trained employees.«

Joachim Baumeister, Burner Maintenance, Erbacher Härtetechnik, Erbach, Germany





We meet demand

All burner components are configured according to the requirements of their use and are designed and constructed as a compact unit. The fully assembled burners are checked for quality and undergo special WS testing procedures. Once delivered, the burners are installed by WS service technicians or by the customer's skilled operatives trained by WS specialists. Our proven products have a long service life and low maintenance requirements, which can be performed by our service team on request. All components are standardised, guaranteeing long-term availability of spare and wearing parts.

WS BURNERS



WS REKUMAT[®]s with gap-flow recuperator. The next generation of high-performance and highly efficient WS burners is based on new patented WS burner technology and is ideal for use with radiant tubes or direct heating. Like all WS burner systems, the WS REKUMAT[®]s is available in a series of various sizes. The output of the system can thus be sized and adapted specifically for the required use.











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> Gap-flow technology with low temperatures. The WS REKUMAT®NT burner range is designed for temperatures of up to 700 °C / 1,300 °F. It is winning customers over with its outstanding energy efficiency and extends the range of uses of WS burners.

WS BURNERS

Achieves maximum efficiency Lowest NO_X emissions Long service life Low maintenance requirements









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We incorporate functional principles in proven products

There are many sizes and models of WS burners available, as every application demands a special solution. Whether burners with metallic or ceramic recuperators, with a regenerative or special design – our products are always geared toward maximum cost savings and optimum operational reliability for our customers.

WS BURNERS











Wherever indirect heating of a material is called for, gas-heated radiant tubes are the cost-effective alternative to electric heating. We are setting new benchmarks in terms of productivity and efficiency with this product line – gas-heated ceramic radiant tubes. Ceramic radiant tubes are suitable for use with the highest temperatures and guarantee uniform temperature distribution with a high radiation output.

WS CERAMIC RADIANT TUBES









We are the masters of our trade

Our patented system of ceramic-based radiant tubes opens up the highest temperature ranges and makes us the world leader in this product segment. We have also mastered to perfection the technically demanding task of connecting ceramic tubes to metallic flanges, and have secured yet another leading position for our company owing to their proven use in many thousands of applications.

WS CERAMIC RADIANT TUBES

Thermal shock-resistant SiSiC ceramics Dimensionally stable even at the highest temperatures of up to 1,250°C/2,300°F Uniform temperature distribution at high radiation output Excellent oxidation and corrosion resistance Self-supporting horizontal or vertical installation possible Minimal maintenance requirement

WS ceramic radiant tubes guarantee excellent permanent stability due to their material properties at high temperatures, are extremely oxidation and corrosion-resistant and, when fitted with WS burners, demonstrate their unique performance with minimal maintenance requirement. In large belt conveyors, in protective gas furnaces for the heat treatment of steel, in sintering, enamelling or in the ceramics industry.



A number of different sizes and designs of WS radiant tubes are available – developed and tested depending on the use of the industrial furnace system. Their internal exhaust gas circulation is the main feature of WS radiant tubes, guaranteeing uniform temperature distribution over the maximum radiation area. These proven products make a significant contribution to our customers' productivity as complete systems with burners with a FLOX® or flame design.

Simple to assemble Low-wear system configuration Minimal maintenance requirement



WS SYSTEMS AND COMPONENTS



Uniform temperature distribution at high radiation output



Our formula is as follows: The better the burner system is sized and configured, the higher its efficiency. This is the reason why WS engineers precisely the ideal configuration for the thermal processing system at an early stage in close cooperation with the customer. Thereby we achieve the best results possible.

If required, WS offers complete heating systems from one source, i.e. burners combined with Double P or P radiant tubes and other components as readyto-install functional units. These system configurations are extremely suitable for use in large-volume chambers owing to their huge thermal radiation surfaces.







We make it as simple as possible

We have learned how to overcome the challenge of configuring complex control mechanisms to meet customers' requirements with aplomb, at the same time guaranteeing a high level of userfriendliness. Our perfectly coordinated system unit, consisting of a WS burner and a WS control, is developed to meet requirements and is equipped with all the necessary components, which have been professionally tested for their functionality in line with the applicable standard.

»The installation of WS burners is easy and can always be performed without delays. Moreover, they are very popular with our customers thanks to their well thought-out functions and ease of operation.«

Michael Scheffler, Project Management and Sales, KOHNLE Wärmebehandlungsanlagen GmbH, Birkenfeld, Germany

WS BURNER CONTROL

THE REAL PROPERTY IN CASE













We think of everything

Our focus is on the reliable and fast integration of our perfectly coordinated and precisely configured system – burner and control – into our customer's equipment. To do so, we carefully plan, manufacture, parameterise, inspect, and document everything down to the last detail, to ensure that we can offer fast and professional help in the event of questions.

WS BURNER CONTROL

Unit made of reliable, proven and innovative components Customer-specific designs Tested plug-and-play equipment Simple support with comprehensive documentation

»Unpack it, plug it in, connect to the system and you can control and monitor your burner straight away.«

Andreas Gerber WS Electrical Engineering, Development



We are the experts

»People should enjoy working with our burners. They can only do this if they know how to handle them correctly and get the best possible out of them.«

Meinhard Mühlbach, Process Engineer, WS Training Team

ADVICE AND TRAINING.

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We share our expertise

WS burners are synonymous with maximum energy efficiency and performance. To ensure that customers can use this potential to the fullest, our WS experts communicate their in-depth knowledge and expertise and offer personal and technical support in assembling, commissioning, adjusting, controlling and maintaining burners as well as troubleshooting them, either in the customers' plant or in our wellequipped training facilities. We leave no question unanswered.

ADVICE AND TRAINING



We are ready

»The entire procedure of troubleshooting problems in the process line was highlighted, in our view, by the company's above-average availability until late in the evening, as well as the remarkable coordination between the WS service team from the parent company and the US office.«

WMU Wärmebehandlungsanlagen für Industrie und Umwelttechnik GmbH, Bönen, Germany – for a pilot project in Canada

SERVICE AND MAINTENANCE





We know more

»The process from reporting the damage to eliminating the damage was managed quickly and professionally. We had the feeling that we were in good, safe hands, with a reliable partner at our side at all times.«

Kübler & Essig GmbH, Automation und Maschinenbau, Ebhausen, Germany

We understand the importance of the reliable availability of a production plant and are there when we are needed. Customers can contact our offices in Germany and the United States directly or get in touch with our many global representatives.

Our expert service technicians help by offering remote diagnostics or provide fast solutions on site even under the most difficult conditions. Standardised components and extensive stock levels guarantee fast availability of spare parts.

SERVICE AND MAINTENANCE

Of course, customers also receive detailed recommendations regarding maintenance of our products, either from maintenance manuals or through detailed training by our service team, either at the customer's site or in our well-equipped training facilities. Both based on a service and maintenance contract, or on an as needed basis, WS service technicians will be happy to inspect the plant.

Owing to our extensive product range, we fully document each case and every system configuration, enabling the WS service team to limit faults or causes of damage and effectively coordinate spare parts logistics.









We service our customers

There are many reasons why WS products are used all over the world:

Thanks to their perfectly coordinated configuration, the burners precisely meet the requirements of the production plants.

The investment pays for itself within a short period of time, thanks to the system's unbeatable energy efficiency.

The burners and complete systems have an outstanding service life based on their excellent quality of material and machining, robust control technology and our quality assurance system and, even with round-the-clock operation, they run reliably and require minimal maintenance.

LOGISTICS AND AVAILABILITY.

We guarantee the long-term availability of our standardised components and have many spare parts in stock in our warehouse so that they can be fitted as required by WS service technicians.

We make experts out of our customers and train them down to the last detail in all practically relevant skills for the optimum use of our burners.

Our overseas branch offices are located in Europe and Asia, North and South America and South Africa, so that we can be on-site within a very short period of time.

Our aim is to have satisfied customers around the world – we will not be be satisfied with less than that.







We are local

Performance and speed are elementary building blocks for entrepreneurial success. For this reason, we are continuously expanding our global availability, creating a presence and a capacity to act reliably and quickly to our customers' needs.

www.flox.com

Please contact our head offices in Germany and the United States for the current contact details for our overseas offices or visit www.flox.com

PRESENCE AND COMMUNICATION



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