

"Seven-league boots for environmental and climate protection"

On 30 October 2011, Dr. Joachim Alfred Wüning and Dr. Joachim Georg Wüning, directors of WS Wärmetechnik GmbH, of Renningen, received Europe's highest-value environmental award from the hands of President of the Federal Republic of Germany Dr. Christian Wulff. The award by the Deutsche Bundesstiftung Umwelt (German Environmental Foundation, abbreviated: DBU) was made in recognition of a highly committed medium-sized company and its development of an environmentally friendly burner technology for industrial furnaces. gaswärme international (gwi) interviewed one of the two prize-winners, **Dr.-Ing. Joachim Georg Wüning**, on the award, the special features of flameless oxidation (FLOX®) technology in the context of energy-intensive high-temperature processes and on the future potentials for energy-efficiency and the efficient use of resources in thermal processing facilities.

*Interview conducted by editor-in-chief Stephan Schalm

Dr.-Ing. Joachim G. Wüning and
Dr.-Ing. Joachim A. Wüning, winners of
the 2011 German Environmental Award
(l. to r.)



Dr. Wüning, your father, Dr. Joachim Alfred Wüning, and yourself received the "German Environmental Award 2011" at a ceremony held recently in Stuttgart, Germany, (see Info Box). Let me firstly take this opportunity of congratulating both of you most sincerely on behalf of our publishing house and the editorial staff of our journal on this most significant honour.

Wüning: Thank you. We ourselves were also naturally most pleased to receive this award.

The jury's verdict states that the prize was awarded to you for setting international standards in innovative environmental technology. Dr.-Ing. E. h. Fritz Brickwedde, General Secretary of the DBU, in fact spoke of "seven-league boots for environmental and climate protection". How does the award-winning FLOX® process work, and what benefits can be achieved using it?

Wüning: FLOX®, our trademark, stands for "FLameless OXidation". Combustion processes, i.e., the high-speed reaction of fuels and oxygen, the latter generally being supplied in the combustion air, are usually stabilised by flames. The flame assures heating and ignition of the reactants and simultaneously serves to mark the reaction. The unusual thing about the FLOX® process is that it functions without a flame. Thermal generation of oxides of nitrogen is largely suppressed, since the temperature peaks otherwise occurring in the flame are eliminated.

The diminution of oxides of nitrogen is necessary, in particular, if the combustion air has been preheated to enhance efficiency.

Your father founded WS Wärmeprozessstechnik GmbH, of Renningen, with Dr. Schönfelder in 1982 (see Info Box). In 1990, he observed flameless oxidation in the context of systematic tests aimed at the reduction of emissions. How did the technical world react to his discovery?

Wünning: The tests performed then, and their results, really were a surprise! Everyone was hoping for emissions reductions, of course, but the effects achieved went well beyond expectations. Reactions varied between "Rub-bish, totally impossible" and "It's been known for a long time, ..."; but there was, of course, also genuine interest, and a large number of people who supported us. For me personally, the timing of this invention couldn't have been better, as I'd just completed my university studies in Aachen. Together with Prof. Woelk, of Aachen, we submitted a research-project application to the Federal Ministry for Research and Technology (the present-day Federal Ministry of Education and Research), which was also approved. My thanks also go out again to Dr. Börner, of the Jülich Research Centre, who recognised the potential of our process, and provided us with great support for our application. I was thus able to dedicate all my time and energies to investigating and recording the principles of flameless oxidation for several years.

Despite a number of initial difficulties, you were able, in a relatively short time, to develop the process up to market maturity and establish it as one of the key technologies in low-emissions energy-efficient combustion. What was the decisive breakthrough here?



FLOX® in progress – flameless oxidation in the combustion process

Wünning: Yes, some customers are only interested in using technology that has been tried and proven over many years, but there are also others who are more adventurous. It's possible with some customers to build up a basis of confidence which will then also allow you to try out new technology. Of course there are problems occasionally, and you have to learn from your mistakes, but that's the only way that new know-how can be gained. We were able, for the first time, to install a larger number of FLOX® burners in a horizontal annealing furnace for electrical strip at TKES in Bochum, and a project like that is a good reference for other plants, of course.

WS Wärmeprozessstechnik GmbH is a medium-sized, owner-managed enterprise. How important is co-operation across generations for success?

Wünning: Well, up to now, this cross-generation co-operation has only happened once. We're still a very

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THE DBU Award:

The DBU's German Environmental Award – an independent environmental award and, at 500,000 euros, Europe's most valuable – recognises achievements which have contributed in exemplary fashion to the protection and conservation of the environment or will, in future, achieve a significant reduction in the burden on the environment. Individual persons, commercial companies and other organisations are eligible for the award, which may be presented for specific projects, provisions, or for a person's lifetime achievement. Candidates for the German Environmental Award are nominated to the DBU. Employers' confederations, the unions, churches, environmental and nature conservation groups, scientific groupings and research corporations, the craft trades and economic and industrial associations are eligible to submit nominations. Self-nomination is not allowed. A jury nominated by the DBU Board of Advisors and consisting of outstanding independent experts from industry, science, technology and social groups recommends the prize-winners for each year to this board, which then makes the ultimate decision: www.dbu.de.

young company, but our co-operation works extremely well. It's much easier to take difficult technical decisions if you can discuss them thoroughly in advance. My father possesses a very great deal of experience, and totally undiminished creativity. I do really hope that our co-operation can continue for many, many years.

Your corporate vision is that of establishing flameless oxidation as the global combustion technology for high-temperature processes. What steps, both technical and entrepreneurial, can we expect from you in future?

Wünning: I sincerely believe that FLOX® technology is the superior combustion process for many sectors. There are various ways of implementing it. Our company, WS GmbH, can certainly play its part, by opening up new markets, for example. We're enjoying great success in

the USA at present, mainly as a result of ever more stringent environmental regulations and continuously rising energy prices.

The FLOX® process and the regenerator and recuperator burners that you manufacture are nowadays in use in the steel and metallurgical industries, in the ceramics and glass industry, and also in the chemicals industry. Where do you see new markets and applications for this combustion technology?

Wünning: There are many new applications for FLOX®, and we intend to develop these either ourselves or via our subsidiary companies. Reformers for fuel-cell cogeneration plant units and biogas facilities are good examples. We are also co-operating with other companies and the universities, and there is a possibility of issuing licences. I foresee great potentials for FLOX® burners in



Federal Minister of the Environment Dr. Norbert Röttgen, Prime Minister of the Federal German State of Baden-Württemberg Winfried Kretschmann, Jürgen Schmidt, Dr.-Ing. Joachim Georg Wünning, Dr.-Ing. Joachim Alfred Wünning, Federal President Dr. Christian Wulff, DBU Board of Advisors Chairman Hubert Weinzierl and DBU General Secretary Dr.-Ing. E. h. Fritz Brickwedde (l. to r.)

the field of decentralised power generation, in particular.

Practically 40 % of all industrially used energy in Germany is consumed in industrial furnaces. Other innovative companies have also impressively refined and improved thermal processing systems in recent years, in addition to the FLOX® technology which we are focussing on here. Where do you see mid-term potentials for further improvement of efficiency and conservation of resources?

Wünning: My view is that there is enormous potential for improvements in efficiency even now. Ultimately, this potential will only be exhaustively exploited if it is economically worthwhile. Energy will have to become more expensive if we want to have this improved efficiency right now. I'm advocating a graduated, but nonetheless significant, increase in taxes on fossil energy sources here. I'm no friend of CO₂ trading.

You have supported our journal as an editor on the external editorial board for many years, are the author of the "Handbook of Burner Technology for Industrial Furnaces" and, in addition, you are a frequently invited speaker at technical seminars and other events. But how would you motivate young, technically orientated people who are just starting out looking for a career to take greater interest in thermal processing technology?

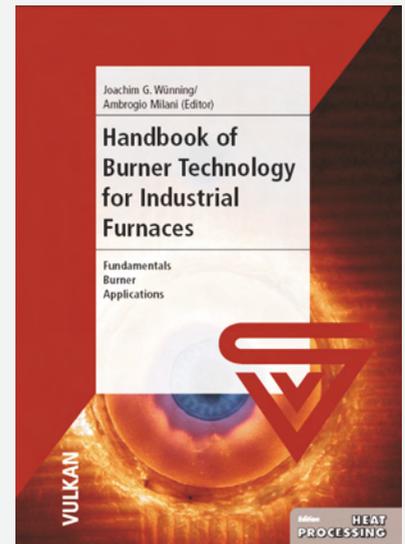
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WS Wärmeprozessstechnik GmbH, Renningen

The enterprise founded in 1982 and headed by owners Dr. Joachim G. Wünning and Dr. Georg Schönfelder specialises in energy-saving low-pollution burner systems for industrial furnaces. Since the year 2000, Senior Dr.-Ing. Joachim A. Wünning has concentrated primarily, as a technical consultant, on the necessary development work. Dr. Joachim G. Wünning has been executive officer with responsibility for technology within the company and at various subsidiaries since 2000. The company's main base is at Renningen, near Stuttgart, and accommodates research & development, design, production, marketing/sales and service in a single complex. The company employs sixty-five persons in Renningen; the WS Inc. branch was founded in the state of Ohio, USA, in 1997.

The specialist technical title "Handbook of Burner Technology for Industrial Furnaces" (eds. Joachim G. Wünning and Ambrogio Milani) provides a detailed overview of fundamental theoretical principles, combustion concepts, pollutant formation, heat recovery and significant designs, with the focus at all times on enhancement of energy-efficiency.

ISBN: 978-3-8027-2431-2,
1st edition 2009.



Wünning: We have no lack of applicants, thanks to our intensive co-operation with the universities. This latest environmental award has, of course, also helped to make us interesting to these candidates. Our young engineers are required to prove their capabilities in commissioning of installations and trouble-shooting for a number of years; this work is often strenuous but, generally, our employees – and I, too – obviously enjoy it a lot.

Where do you see the obligations of the political world and industry?

Wünning: In my opinion, Germany is an excellent location for our industry. Co-operation within the industry, and with the universities, functions much better here than abroad.

From the politicians, I would wish for unequivocal boundary conditions. The lobbying of individual industries should not result in incomprehensible laws with innumerable exceptions. I think the available financial subsidies are adequate. Excessive outside funding can even be a hindrance sometimes, if it leads to the prolongation of research activities instead of a market launch.

Dr. Wünning, thank you for this interview. I wish you much continuing enjoyment of the environmental award you have received, and further impetus for new innovative and entrepreneurial achievements.