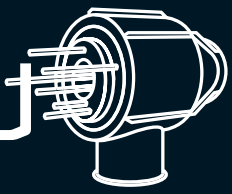
THE CS GUIDE TO

firing up efficiency



COMBUSTION SOLUTIONS

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FIRING UP EFFICIENCY

Table of efficiency

why efficiency matters

Efficiency is not a luxury, but a necessity.
In a word of limited resources, it is crucial for companies to achieve the best possible results with the means at their disposal. Efficient processes reduce production costs, increase returns and demonstrate responsibility towards nature and society.

On the following pages, discover how we at **Combustion Solutions** live efficiency and how we can support your company in realising it.

SPECIALIZED IN EFFICIENCY

If others can do it better - let them.

Every process involves generalists and specialists. Generalists have an overview of the entire process and know one thing above all else: that they need specialists to achieve maximum efficiency.

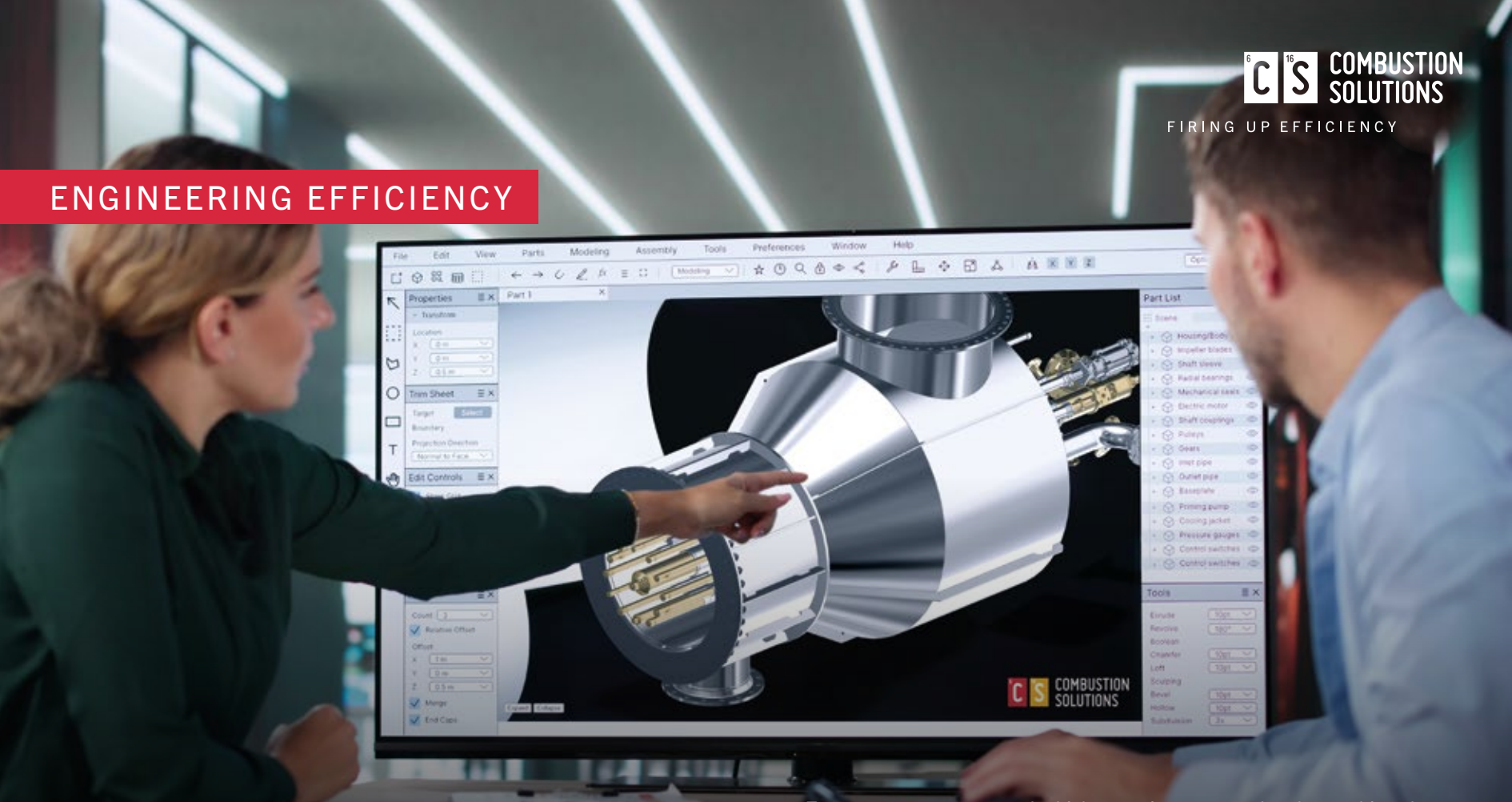
At Combustion Solutions, we are specialists in planning, producing and implementing highly efficient combustion solutions quickly and reliably.

True to the motto: **Burn tasks, not time!**

Firing up efficiency in this applications:

- Sulphur and sulphuric acid
- Alternative fuels
- Combustion of liquid residues
- Exhaust gas and air combustion
- Hot gas generation
- Low NOx

ENGINEERING EFFICIENCY



Efficiency is predictable. Decimal-accurate.

To ensure you can expect the highest savings, we need to do one thing above all else: calculate. Efficiency does not happen by chance, but through analysis, optimization and consistent improvement. Our engineers have the necessary knowledge and tools to make complex systems transparent and optimize them down to the last detail. In fact, even beyond the decimal point.

With clear figures, reliable models and practical solutions, we create the basis for your company to reduce costs in the long term and thus secure competitive advantages.

You can count on CS.

Combustion Engineering
Starting with technical feasibility ("nothing is impossible"), selecting the optimal material, and implementing in compliance with all applicable standards, our many years of experience enable us to find the perfect solution for your process.

Combustion Calculation
CS is not only highly efficient in combustion, but also in calculation. To this end, we have co-developed the 'Combustion Designer' programme, which has enabled us to perfect combustion calculation.

Plant and process optimization
Whether you want to have a complete plant redesigned by CS or optimize your existing plant,we offer solutions tailored to your needs.

Computational Fluid Dynamics (CFD)
With our sophisticated Computional Fluid Dynamic simulations, we find the best possible combustion solution for your process, not only to ensure maximum efficiency, but also to identify and avoid critical situations in advance. At the same time, we can also simulate existing systems and identify opportunities for improvement.

Electrical measurement, control and regulation technology
Our in-house I&C department enables us to offer customized solutions that are specifically tailored to your applications. This means that you can not only operate your plant at optimum capacity, but also benefit from flexible fuel supply and even cross-plant interconnections.
(Feel free to challenge us!)

Combustion control engineering
We offer not only control concepts, but also the associated components. Together with our partner companies, we supply the appropriate software, as well as the associated hardware.

Our Combustion Solutions

We develop, supply and install industrial burners for applications in the power range between 1 and 90 MW.

Each burner system is individually manufactured to meet your needs and requirements, adapts to the form and function of your plant and can use an immense range of fuels.

Fuels

- Standard fuels such as natural gas, diesel, heavy fuel oil, ...
- Waste acid, acid, black liquor and sulphur
- Gas coke, lean gas, synthesis gas, H_2S gas, exhaust gas
- Nitrogen-containing waste
- Waste water, solvents, chlorinated & halogenated liquids
- Tar residues, resins & plastic granulates
- Pure hydrogen
- NH_3 ammonia (ultra low NOx)

Features

- Various materials for the burner (unalloyed steel, stainless steel, alloys ...)
- Compliant with EN, ASME and ERC standards
- High-temperature and high-pressure applications
- Various nozzle systems for optimum atomization
- Highly corrosion-resistant atomization systems
- Low atomizer consumption
- Generates high turbulence

Swirl burner SWB

The continuously developed swirl burner is an all-round talent and can be adapted to any system thanks to its modular design. Its high-precision adjustment and stable flame make it ideal for burning special fuels in boiler systems.

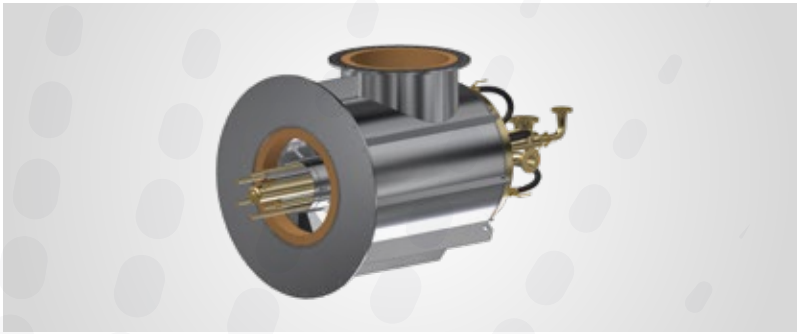
- Suitable for multiple fuels – up to 10 fuels
- Maximum adaptability (front firing, top-down, bottom-up, ...)
- Optimized combustion ensures low emission values
- Compact design
- Fine adjustment and change of swirl direction possible during operation

Swirl pressure burner SWP

Just as flexible as the SWB burner, but optimized for pressure applications: The SWP burner is the perfect choice for stable and low-emission combustion in continuously charged processes, adiabatic combustion chambers and special applications.

- Suitable for multiple fuels – up to 10 fuels
- Durable design – few moving parts
- Swirl intensity can be adjusted during operation
- Available in numerous sizes

High temperature burner HTB

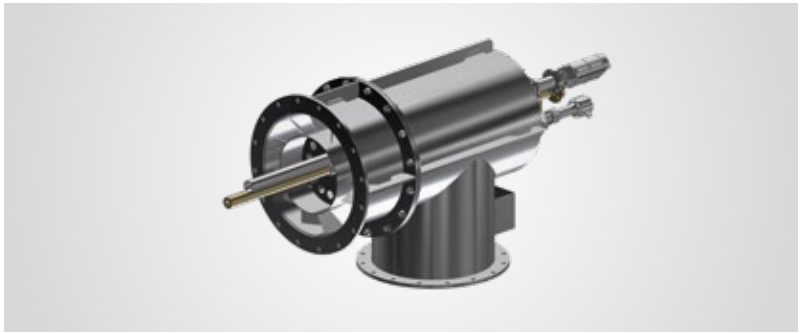


Based on the swirl pressure burner, but specially developed for operation with preheated combustion air: The high temperature burner guarantees maximum resilience, even at temperatures of up to 600 ° C.

Robust mechanics, refractory concrete lining and smart design (flame detection via optical fibre) ensure a long service life.

- Suitable for multiple fuels – up to 10 fuels
- Maximum temperature resistance
- Flame monitoring via optical fibre
- Swirl intensity can be adjusted during operation

Rotary kiln burner RKB



The rotary kiln burner is our robust and cost-efficient burner series, which was developed for use in rotary kilns and afterburners. The dual-flow burner is perfectly suited for a power range of up to 15 MW.

Although the swirl body is fixed, combustion can be optimized during operation by changing the lance position.

- Robust and cost-efficient design
- Ideal for the power range up to 15 MW
- High flexibility and operability

Combustion chamber systems

Combustion chambers

Our customized combustion chambers are designed for a wide range of applications, from sulphuric acid and SO_2 production to waste acid regeneration. Thanks to decades of experience, we guarantee robust designs with optimized refractory lining, high corrosion resistance and maximum service life.
Using CFD analyses, we calculate the perfect flow path for our combustion chambers, thus guaranteeing compact designs and maximum efficiency.

- Tailor-made design for every application
- Refractory lining using a multi-layer process
- Complies with international standards (AD2000, ASME VIII, ERC)
- Suitable for acidic, alkaline, halogenated and abrasive media
- Long service life even at extreme temperatures and pressures

Hot gas generators

Thanks to our many years of experience and continuous development, our hot gas generators achieve maximum efficiency in the provision of process heat – whether for drying products or for starting up and temperature control of plant components such as catalysts. Their compact design, flexible fuel selection and suitability for high-pressure operation make them a universal solution for a wide range of industries, including cement, lime, paper, fertilizer, sewage sludge, food, refineries and future industries.

- Suitable for conventional and alternative fuels
- Extremely compact and robust design
- Can be used up to 6 bar overpressure

Injection systems

At the heart of our combustion solutions are our innovative injection systems. They determine how the fuel enters the combustion chamber, is atomized and mixed with the combustion air – and it is precisely this step that determines the efficiency, stability and environmental compatibility of the combustion process.

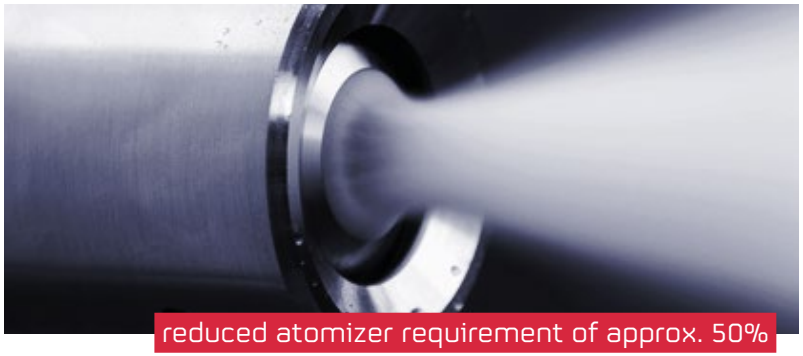
High-precision injection not only ensures complete and clean combustion, but also directly influences fuel consumption, emission values and operational safety, thus playing a key role. At the same time, our injection systems are characterised by maximum material resistance and durability, ensuring maximum plant availability.

Ultrasonic atomizing nozzles

Our ultrasonic nozzles are the ideal choice for highly viscous and heavily contaminated liquids. They do not clog even during long-term operation and impress with their extremely fine, homogeneous droplet distribution, stable spray pattern and uniform atomization.

- Suitable for a wide variety of fuels
- Extremely low maintenance due to the absence of moving parts
- Extended service life, less abrasion
- Impressive control range of up to 1:10
- Modular system allows easy conversion from tulip to jet nozzle
- Flexible atomization medium (compressed air, steam, nitrogen, ...)
- Ultra-fine atomization – droplet size 100 µm
- Ideal for boosting on-demand systems

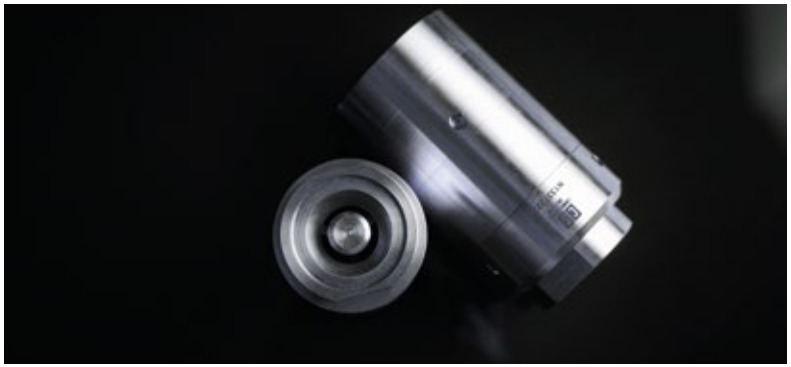
JULIP™ – The optimized ultrasonic atomizer nozzle



The patented JULIP™ combines all the advantages of a typical ultrasonic nozzle with a dramatic reduction in atomizer requirement of approximately 50%. This means: lower operating costs and increased efficiency in thermal oxidation and sulphuric acid plants.

- Up to 50% less atomization media required
- Higher efficiency in sulphuric acid and oxidation processes
- High particle tolerance
- All the advantages of the classic ultrasonic nozzle

Pre-mix nozzles



SR-P is our ideal solution to the problems of traditional pressure atomizers and sulphur guns. Excellent atomization quality that stays consistent over a turn-down ratio of 1:5 increasing plant operation flexibility. Tolerance to ash and moderate contaminants in liquids ensures long lifetime of nozzles. OPEX similar or lower to traditional sulphur guns due to very low atomizer requirement.

- SR-P pre-mix nozzle
  - For clean and moderately contaminated media
  - Mass flow rate up to 10,000 kg/h
  - lowest consumption of all CS nozzles

VARISPRAY™ atomizing system

The VARISPRAY™ atomizing system provides uniform atomization without clogging and also allows operators to adjust the flame shape during operation. This opens up new possibilities for optimizing combustion. The advantages become especially clear when retrofitting existing combustion chambers or working with fuels of varying quality, where flexibility is essential.

Better flame control helps increase combustion efficiency. With VARISPRAY™ technology, the flame shape can be adjusted as needed. The automatic fine-tuning of the spray cone allows operators to create customized flame patterns. This leads to improved heat distribution, lower emissions, and higher thermal efficiency. This capability is particularly important in retrofit projects, where the goal is to improve performance without major changes to the existing system.

As the industry continues to focus on efficiency and sustainability, the combination of ultrasonic atomization and adjustable flame control becomes a key technology for the future-guiding us toward more optimized industrial processes.

- Flexible flame shape adjustment – directly during operation
- Maximum adaptability for varying fuel qualities and retrofit applications
- Higher efficiency through intelligent, dynamic flame control
- Automatically optimized spray cone enabling customized flame patterns
- Uniform heat distribution for improved thermal performance
- Reduced emissions thanks to precise atomization and targeted flame modulation
- Ultrasonic atomization + variable flame control: a pathway to sustainable, future-proof processes
- Enhanced safety: no lance removal required, minimising the risk of injuries and accidents

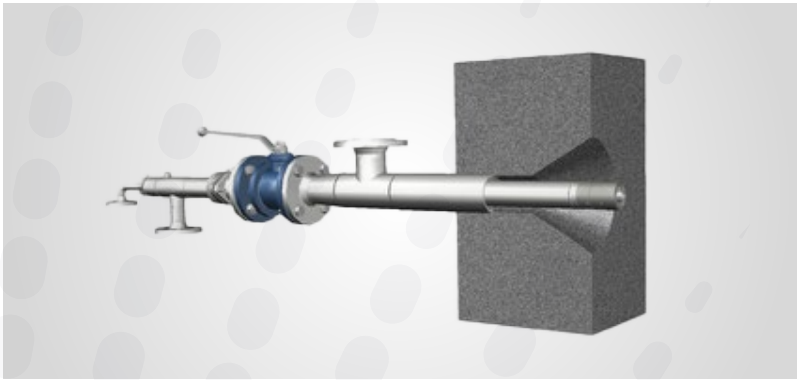
VARIEX™ lance

The patented VARIEX™ lance was developed specifically for explosive gases. Thanks to its variable geometry, the outlet velocity always remains higher than the flashback velocity – without the need for inert gas.

This means that VARIEX™ is considered a mechanical flashback arrestor in accordance with TRBS 2151. Like all fuel lances, the VARIEX™ lance is available in various sizes, material configurations and approvals (PED, ATEX, etc.).

- Constant outlet velocity across the entire control range
- Geometry adjustment via pneumatically adjustable cone body
- Mechanical flashback arrestor in accordance with TRBS 2151
- Extremely high control range up to 1:40
- High operating cost optimization

OXISPRAY™ & OXIJET™ – Process improvement with oxygen



In order to achieve higher output and stable partial load conditions with existing combustion systems, CS has developed the OXISPRAY™ and OXIJET™ series. The innovative nozzle systems work with oxygen instead of compressed air or steam and guarantee highly efficient combustion even under extremely difficult conditions.

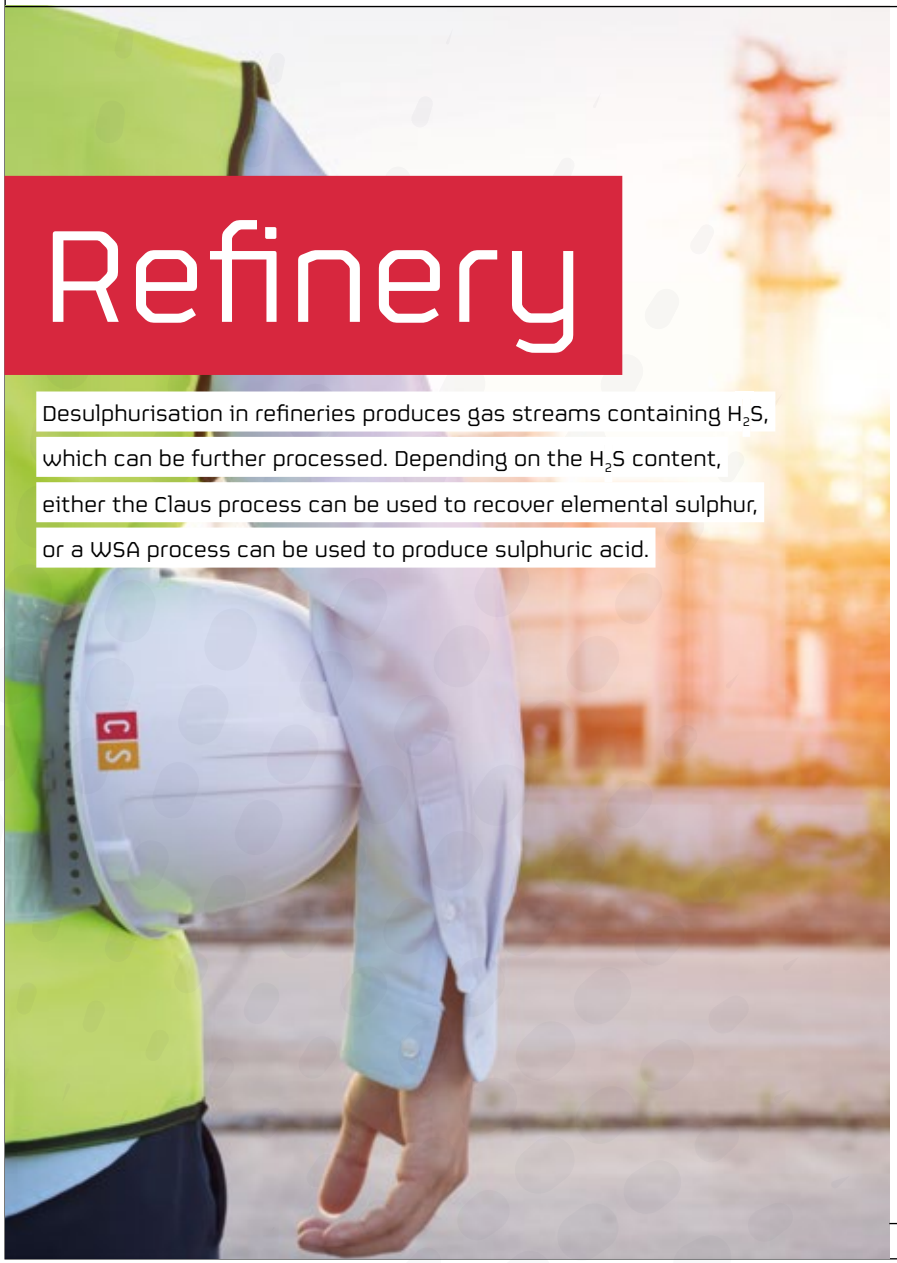
- Stable flame even at low calorific values
- Easy to retrofit without a new burner stone
- The pre-combustion chamber allows additional exhaust gas flows/fuels (OXIJET)

Burner control and valve systems

Our in-house I&C department will be happy to take care of the technical planning and design of the instrumentation required for your burner system. CS supplies everything from individual valves to fully piped, frame-mounted stations for fuel control. We use products of the highest standards from our valve and measurement technology partners, or use manufacturers specified by the customer. Design and manufacture are carried out in compliance with the most common global norms and standards in this field. On request, we also supply our stations including turnkey burner control.

industries we're firing up

Combustion Solutions develops, designs and optimizes systems for a wide range of industries. Discover how we can help your plant achieve greater efficiency and economic sustainability through careful planning, innovative systems and high-quality materials.



Refinery

Desulphurisation in refineries produces gas streams containing H_2S, which can be further processed. Depending on the H_2S content, either the Claus process can be used to recover elemental sulphur, or a WSA process can be used to produce sulphuric acid.

Desulphurisation in the Claus process

When processing H_2S-containing gas streams in sulphur recovery units (SRU), maximum operational reliability is crucial. Fluctuating loads, high temperatures and corrosion require robust burner technology for stable, energy-efficient sulphur recovery that is extremely durable in the long term.

CS products:

SRU burners, hot gas generators, combustion chamber

Firing up efficiency

- Minimal pressure loss and thus excellent overall performance
- Exceptionally high controllability (turndown ratio up to 1:20)
- High-temperature-resistant materials guarantee maximum durability

Desulphurization in wet gas sulphuric acid process (WSA)

Our burner systems are perfect for efficiently and reliably burning sulphurous gases to produce SO_2-rich flue gas. Our specially developed ceramic lances, CERAMICS™, have been designed specifically for highly corrosive combustion processes to increase their resistance to sulphidation. Ideal for retrofitting!

CS products:

SWP burners, CERAMICS™, combustion chamber

Firing up efficiency:

- CERAMICS™ enables up to 10 times longer service life
- Maximum tolerance to fluctuating gas composition
- Low maintenance thanks to wear-free components

Alkylation – Spent acid regeneration

In thermal regeneration, spent sulphuric acid plays the burner used plays a decisive role in operational safety and the achievable output. The innovative designs of our solutions guarantee you maximum efficiency and product quality while complying with even the most stringent emission limits.

The ultrasonic atomizer lances reduce the required combustion chamber volume and require minimal maintenance.

CS products:

SWP burner, JULIP™ ultrasonic nozzle, combustion chamber

Firing up efficiency:

- CS atomization technologies enable compact combustion chambers with up to 50% less combustion chamber volume
- High-quality materials extend the service life of acid nozzles tenfold
- Low-NOx operation even with nitrogen-contaminated acids

Oxygen enrichment

Targeted oxygen addition can dramatically increase the capacity of existing plants without the need for costly and time-consuming reactor modifications – ideal for retrofit projects!

CS products:

OXYSPRAY™ systems, combustion chamber

Firing up efficiency:

- Highly flexible O_2 dosing
- Capacity increase without major conversion
- Replacement of atomizer air for efficiency gains
- Easy to retrofit

Cracking unit – Hot gas generator

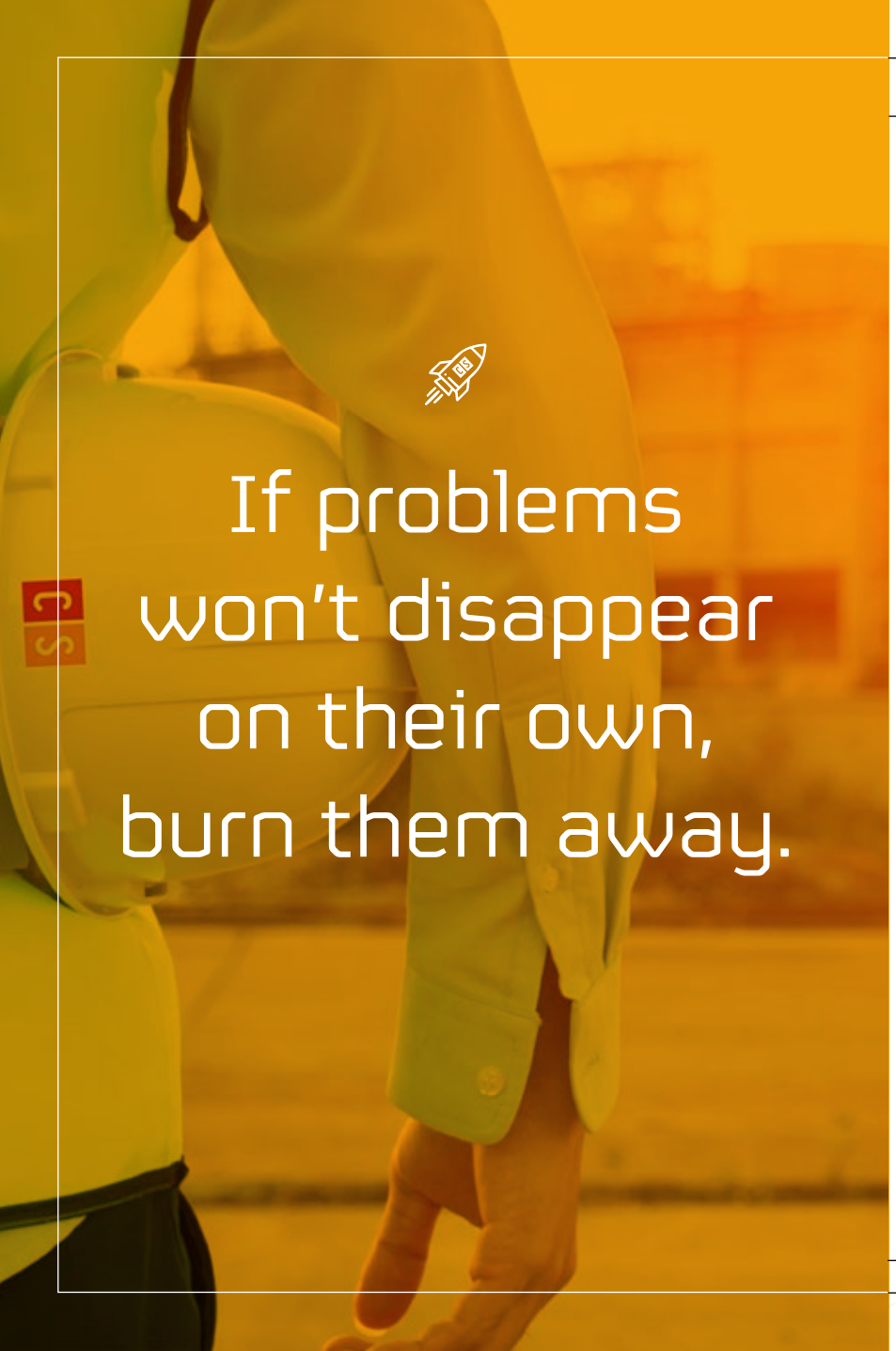
In a thermal cracking unit, it is extremely important to provide the necessary process heat under exactly the right conditions. Our solutions for this are not only reliable and efficient, but also offer economic and future-oriented advantages.

CS products:

Hot gas generators, pressure vessels, combustion chamber

Firing up efficiency:

- Low acquisition costs thanks to compact design
- Support for alternative fuels such as process gas or refinery gas
- H_2-ready – prepared for future fuels



If problems won't disappear on their own, burn them away.

Visbreaker combustion

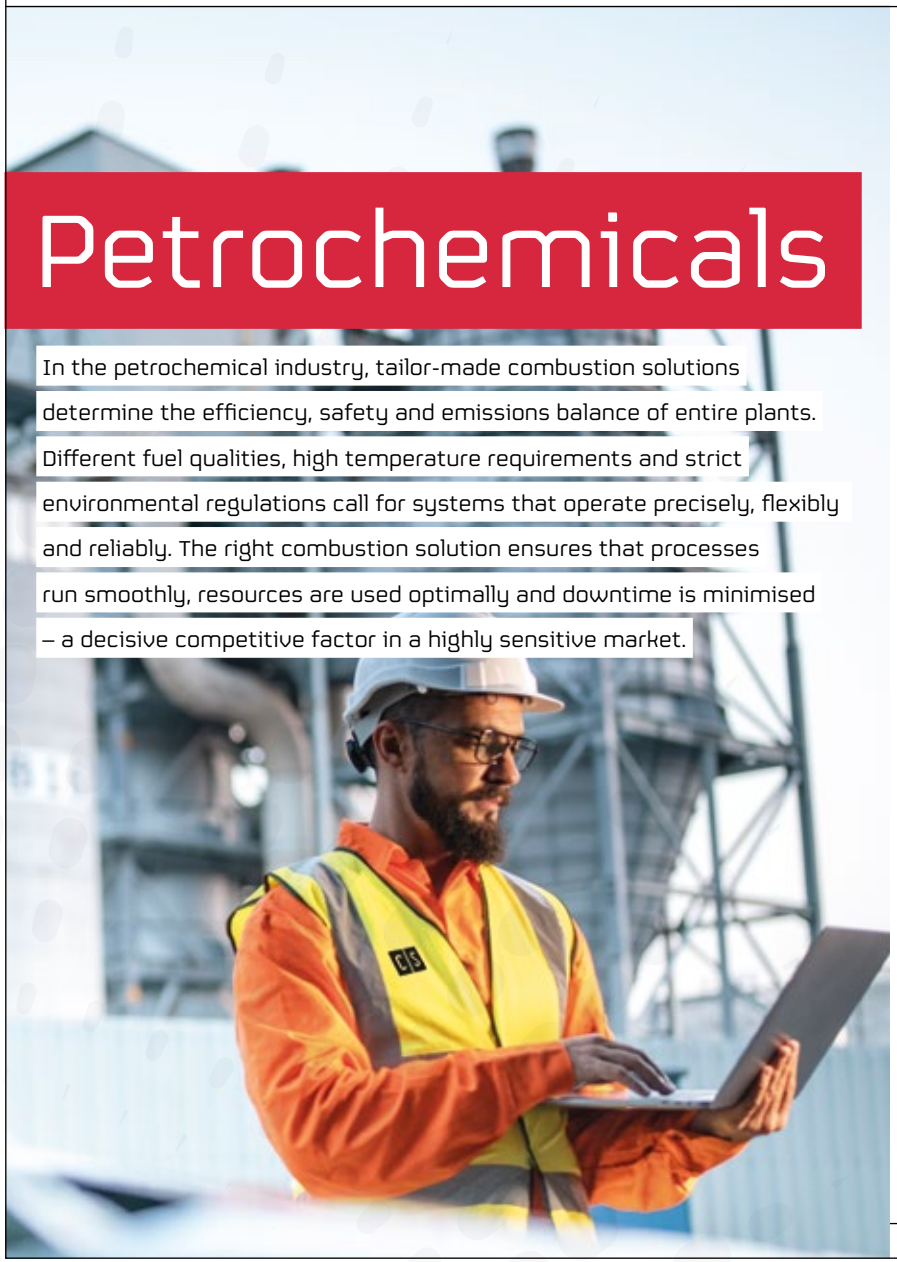
Cleanly burning heavy liquid residues from the visbreaking process is extremely challenging, both technically and in terms of emissions. The CS atomizer system and associated burners make CS solutions the ideal choice for high-viscosity residue combustion – whether for thermal disposal or energy recovery.

CS products:

SWB/SWP burner, ultrasonic atomization systems, combustion chamber

Firing up efficiency:

- Finest atomization of even highly viscous residues
- Lowest CO and soot emissions
- Increased flame stability with variable fuels
- High plant availability due to low risk of clogging



Petrochemicals

In the petrochemical industry, tailor-made combustion solutions determine the efficiency, safety and emissions balance of entire plants. Different fuel qualities, high temperature requirements and strict environmental regulations call for systems that operate precisely, flexibly and reliably. The right combustion solution ensures that processes run smoothly, resources are used optimally and downtime is minimised – a decisive competitive factor in a highly sensitive market.

Residue combustion in polymer production

CS offers efficient solutions for burning liquid or gaseous residue products in polymer production, which are not only extremely low-maintenance, but also reduce the need for inert gas and protective equipment.

CS products:

SWB/SWP burners, ultrasonic atomization systems
VARIEX™ lance, combustion chamber

Firing up efficiency

- The wide control range enables inert gas savings of up to 100%
- Customized designs also allow the combustion of difficult fuels
- Flame-proof flow control eliminates the need for an additional detonation protection
- Low maintenance thanks to wear-free components
- Ceramic-coated ultrasonic atomization systems for highly corrosive liquids

PSA exhaust gas combustion in H_2 production

The highly fluctuating exhaust gas composition in the pressure swing adsorption process leads to uneven calorific values and combustion properties. For stable operation, a uniform temperature distribution in the combustion chamber is therefore crucial. This compensates for irregular gas quality and ensures high process stability.

CS products:

High swirl burner, combustion chamber

Firing up efficiency:

- Individually developed burner solutions for optimum results
- Uniform temperature at the combustion chamber outlet
- Stable combustion under fluctuating conditions

Energy generation through residue combustion

The combustion and energetic utilisation of waste products and residual materials is the ideal way to reduce CO_2 emissions. The challenge here lies in burning even fuels with low calorific values safely and with low residue.

CS products:

SWB/SWP burners, ultrasonic atomization system, combustion chamber

Firing up efficiency:

- Injection system insensitive to fluctuating particle sizes
- Use of waste materials as fuel
- Safe combustion even at low calorific values
- CO_2 reduction through efficient combustion

Offgas combustion in syngas production

Maximum flexibility is required to burn residual gas efficiently. Combustion Solutions combines the right manufacturing materials for housings, nozzles and lances, integrates perfectly balanced special steels and develops customized special nozzle systems to ensure maximum durability even under aggressive conditions.

CS products:

SWP/SWB burners, CERAMICS™, combustion chamber

Firing up efficiency:

- Wide range of options for gas injection
- Long-lasting investments thanks to special steels and ceramic materials
- Individually developed special nozzles for aggressive media (CERAMICS™)

Energy cannot be lost – only wasted.

Chemistry & Pharmaceuticals

The chemical and pharmaceutical industries have the highest requirements for process reliability, product purity and energy efficiency. Different raw material qualities, complex reaction conditions and strict regulatory requirements call for tailor-made combustion solutions: precise, reliable and flexible. This is the only way to keep sensitive production processes stable, minimise emissions and ensure competitiveness in an innovation-driven market.

Caprolactam/Oleum production, SO_2

The production of caprolactam, oleum and SO_2 generates highly corrosive, sulphur-containing process gases with high temperatures and variable composition. These pose extreme challenges in terms of material selection, temperature control and exhaust gas treatment. Refractory lining and optimal combustion technology guarantee highly efficient combustion, high plant availability and long service life.

CS products:

SWP burner, combustion chamber, OXYSPRAY™, ultrasonic atomization system

Firing up efficiency

- Up to 75% less atomizer air required thanks to innovative nozzle technology
- High-temperature-resistant materials guarantee maximum durability
- Exceptionally high controllability (turndown ratio up to 1:20)

Residue incineration

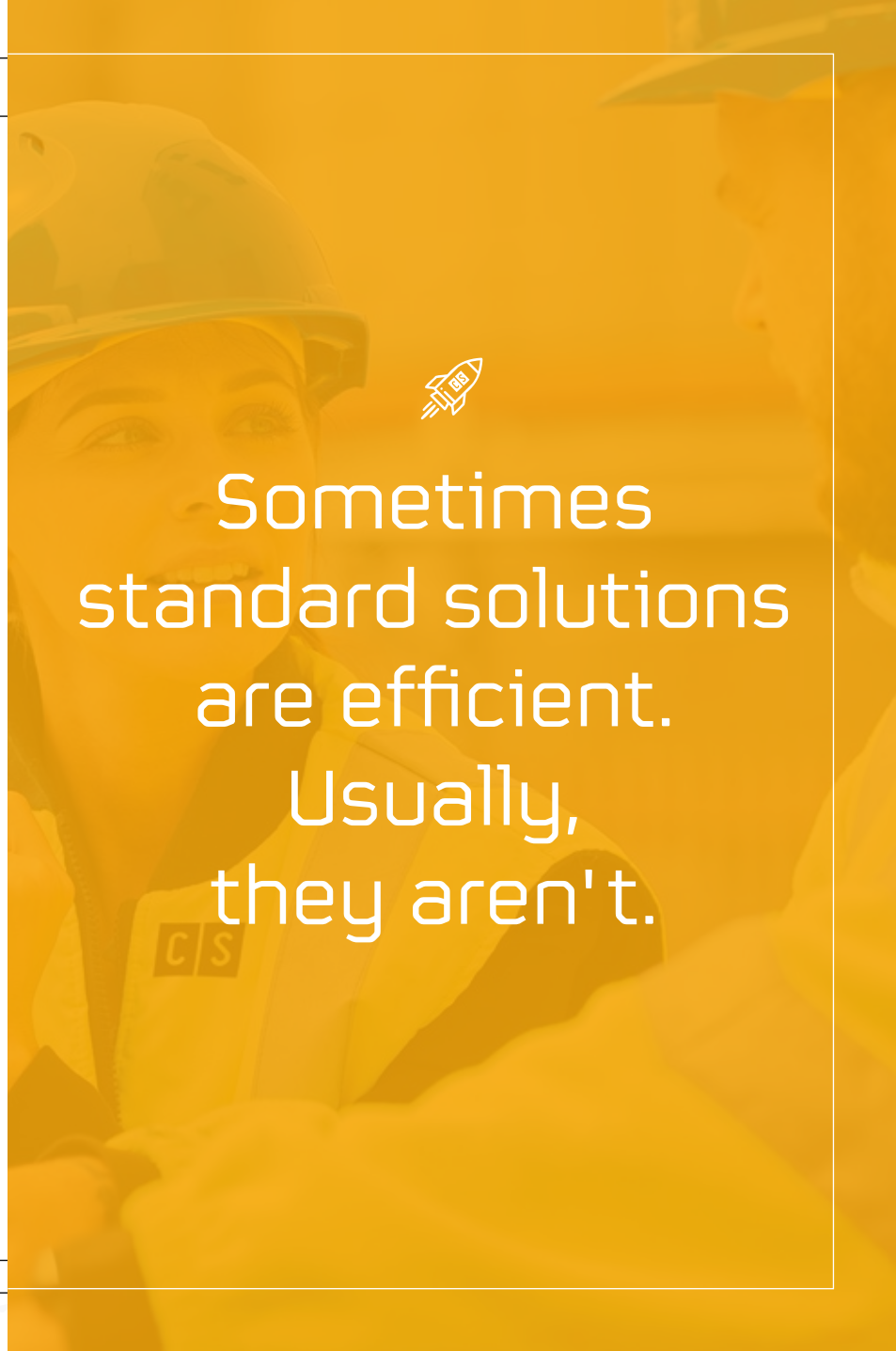
Combustion Solutions offers the right systems for chemical and pharmaceutical production to incinerate and thermally recycle residues. Our customized solutions ensure efficient incineration with maximum safety for silane-containing or halogenated exhaust gases.

CS products:

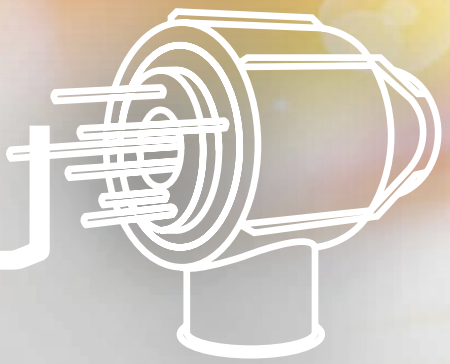
SWB/SWP burner, atomization system, combustion chamber

Firing up efficiency:

- Flexible gas supply according to space and quantity requirements
- Maximum material diversity, from special steels to ceramic materials
- Customized special nozzles for aggressive media
- Large exhaust gas volumes, e.g. tail gas with low calorific value

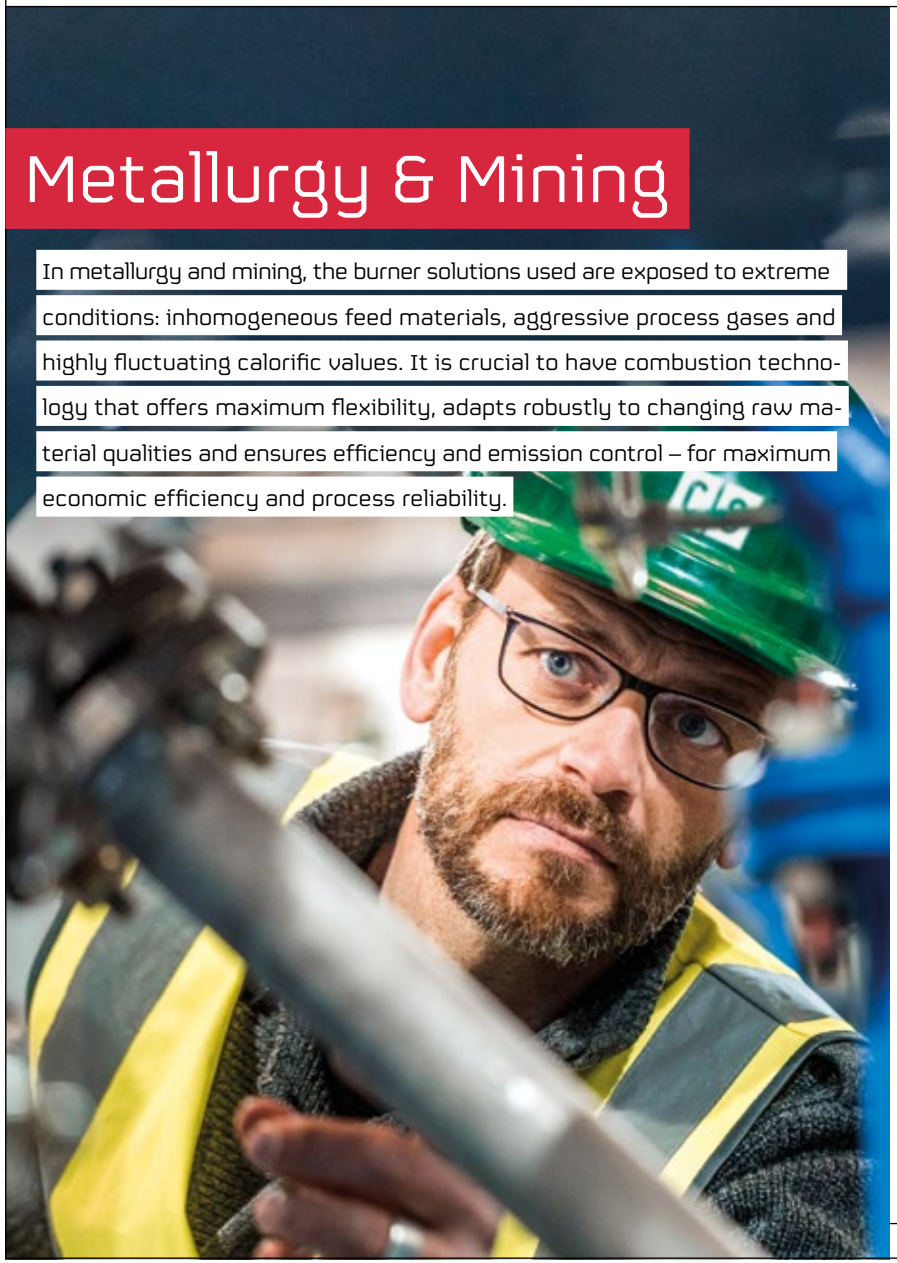


firing up efficiency



Metallurgy & Mining

In metallurgy and mining, the burner solutions used are exposed to extreme conditions: inhomogeneous feed materials, aggressive process gases and highly fluctuating calorific values. It is crucial to have combustion technology that offers maximum flexibility, adapts robustly to changing raw material qualities and ensures efficiency and emission control – for maximum economic efficiency and process reliability.



Urban mining – pyrolysis combustion

In the field of urban mining – particularly when recovering metals from complex waste streams such as electronic scrap, composite plastics or metal-containing electronic scrap – the residual materials from the recycling processes are often inhomogeneous. Robust burner systems that can react flexibly to the respective inputs play a central role in economical and low-emission plant operation.

CS products:

Burner, ultrasonic atomization system, combustion chamber

Firing up efficiency

- High fuel flexibility with inhomogeneous input materials
- Maximum economic efficiency through the use of waste residues as fuel
- Stable combustion with variable calorific values and extreme air deficiency

Roaster/smelter conversion

If ore availability is interrupted or additional sulphur needs to be added to the combustion process, converting the plant is often the most efficient solution. We are experts in developing lifetime extensions or second life solutions, which offer you numerous advantages in terms of investment costs, permits and plant availability.

CS products:

SWP burner, ultrasonic atomization system, combustion chamber

Firing up efficiency:

- Lifetime extension of existing furnace and reactor components

Leaching – sulphuric acid production

For efficient metal leaching, sulphuric acid must be available at all times. For the combustion of sulphur to produce sulphuric acid, we have developed combustion solutions that not only guarantee significant capacity increases, but also an enormously extended service life and maximum plant availability.

CS products:

SWP burner, ultrasonic atomization system, combustion chamber

Firing up efficiency:

- Highly resistant materials for up to 10 times longer service life
- Insensitive to contamination
- Maintenance of individual lances possible during operation
- Ultrasonic atomization enables up to 50% less combustion chamber volume

Low-calorific gas combustion (BFG/coke oven gas)

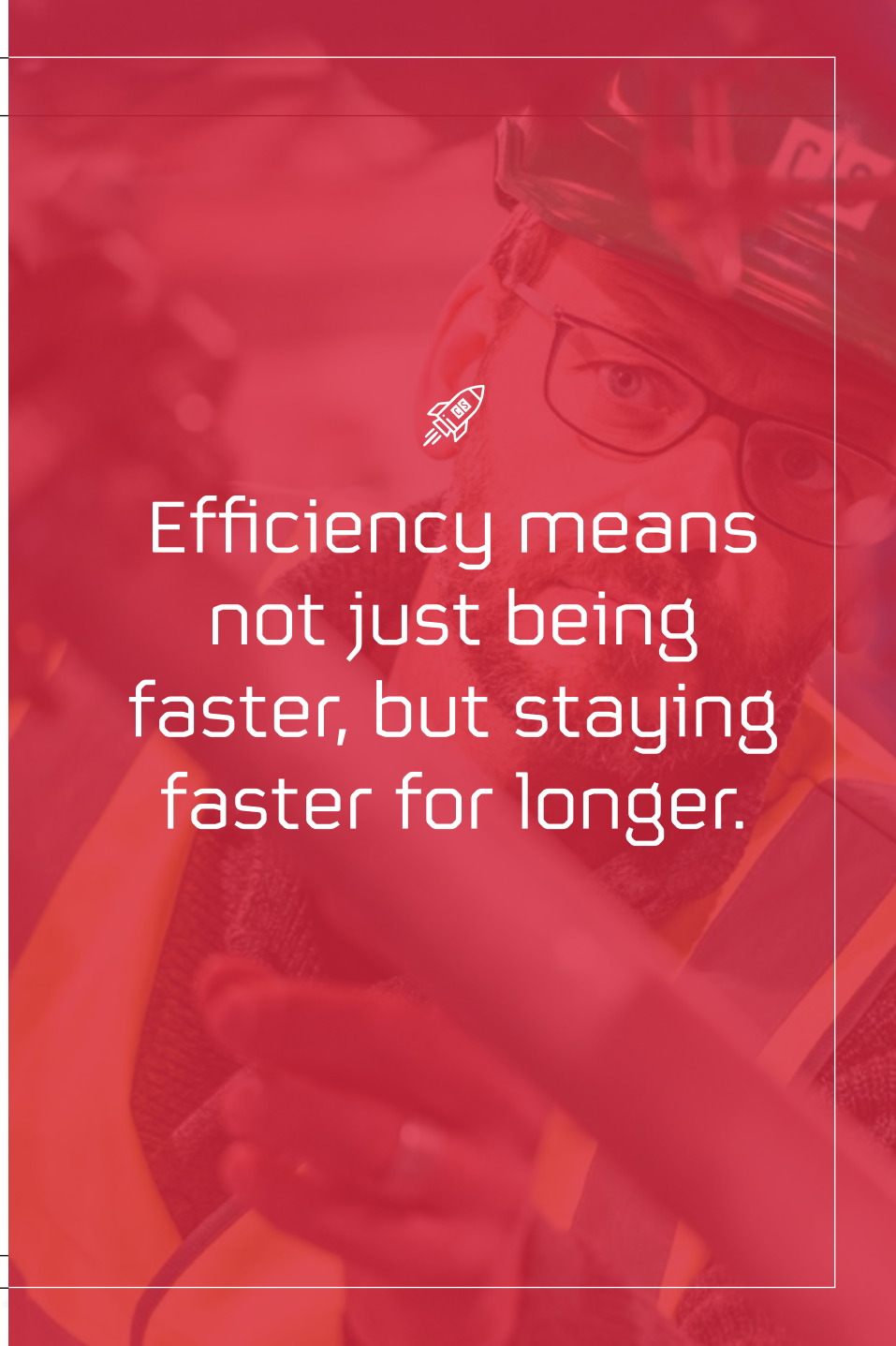
Gases with low calorific value, such as blast furnace gas or coke oven gas, require sophisticated burner technology that guarantees stable combustion, preferably without the use of auxiliary firing. Our innovative design guarantees industry-leading mixing of fuels and combustion air, ensuring stable flame formation with minimal CO and NOx formation.

CS products:

Combustion chamber design

Firing up efficiency:

- Complete combustion at the lowest calorific value (from 3-4 MJ/Nm³)
- Minimal auxiliary firing leads to lower energy costs and a better CO_2 balance
- Homogeneous temperature distribution and stable flame formation



Pulp & Paper / Viscose

The pulp and viscose industry requires tailor-made solutions for sulphurous by-products generated during production. Processes such as CNCG combustion or the recovery of sulphuric acid from H_2S-containing waste gases place high demands on emission control, efficiency and plant integration. This calls for compact, reliable and durable systems that reduce operating costs while complying with environmental regulations.

CNCG combustion

CNCG exhaust gases containing H_2S from pulp cookers and evaporation are often inefficiently co-combusted in steam boilers. Our combustion solutions helps you to combust the gases separately. This reduces SO_2 emissions and operating costs while producing in-house sulphuric acid.

CS products:

SWP burner, ultrasonic atomization system, combustion chamber

Firing up efficiency

- Extremely compact design for easy integration
- 50+ systems successfully in use worldwide
- Wear-free gas nozzles
- Maximum tolerance to fluctuating fuel qualities
- Efficient combustion of low-energy exhaust gases with maximum availability

SO_2 production for bleaching processes

A high, stable SO_2 content is crucial for consistent bleaching processes. This requires ultra-fine atomization, short residence times and a compact, powerful combustion chamber. With its experience, Combustion Solutions guarantees an SO_2 content of up to 19% in the dry flue gas. In addition, low maintenance costs and long operating cycles.

CS products:

SWP burner, ultrasonic atomization system, combustion chamber

Firing up efficiency:

- Droplet size <= 100 µm for minimum reaction time
- Guaranteed SO_2 content of up to 19%
- Minimal maintenance
- Ultrasonic atomization enables up to 50% less combustion chamber volume

Viscose – sulphuric acid production from H_2S exhaust gases

In viscose production, sulphuric acid is used in the spinning process and then recovered from extracted H_2S-containing exhaust gases. CS technology offers the optimal solution for sulphuric acid recycling – with decades of experience, innovative technology and highly efficient results.

CS products:

SWP burner, ultrasonic atomization system, CERAMICS™ lances, combustion chamber

Firing up efficiency:

- Stable SO_2 content for subsequent processes
- Maximum plant service life without replacement of wear parts
- High efficiency in the smallest of spaces

Fertilizer

Phosphate fertilizer production

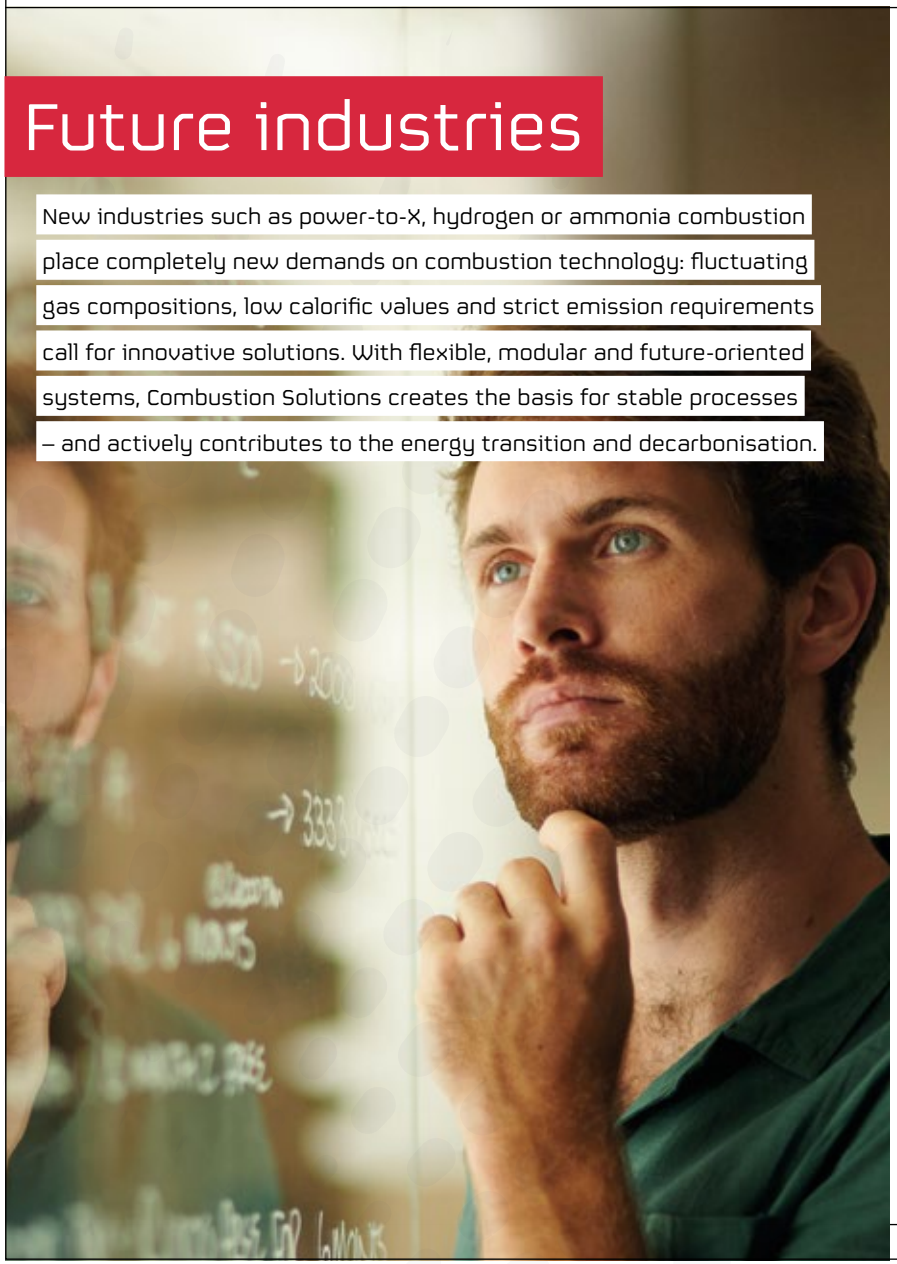
Sulphuric acid is a key component in the production of phosphate fertilizers. It is used in particular in the manufacture of phosphoric acid – a crucial raw material for the production of highly effective fertilizers for global agriculture. The use of CS ultrasonic atomizers and SWP burners can increase combustion efficiency by up to 30%.

CS products:

SWP burner, ultrasonic atomization system, combustion chamber

Firing up efficiency:

- +30% capacity through optimization package
- Hotspot avoidance & lower pressure loss
- Lance replacement possible without shutting down the plant
- Long service life of wear parts



Future industries

New industries such as power-to-X, hydrogen or ammonia combustion place completely new demands on combustion technology: fluctuating gas compositions, low calorific values and strict emission requirements call for innovative solutions. With flexible, modular and future-oriented systems, Combustion Solutions creates the basis for stable processes – and actively contributes to the energy transition and decarbonisation.

Power-to-X – NH_3 exhaust gas combustion

Thermal processes such as ammonia cracking or high-pressure electrolysis produce highly reactive exhaust gases with extreme NH_3 concentrations. Combustion Solutions has the perfect answer: the specially developed NOXOUT™ burner enables complete and stable exhaust gas combustion with pure NH_3, even without a downstream DeNOx system.

CS products:

NOXOUT™ burner, combustion chamber

Firing up efficiency

- NOx significantly below limit values – even without SCR/SNCR
- Suitable for NH_3 content up to 100%
- Compact, modular & low maintenance
- Also ideal for existing plants

Hydrogen combustion

Hydrogen production by means of electrolysis generates highly variable exhaust gas streams (between 100% N_2 and 100% H_2), with extremely fluctuating calorific values and ignition behaviour. Burning such mixed gas streams safely and efficiently in flare systems, clean gas furnaces or boilers requires maximum flexibility and technological precision. The high swirl burner system developed by CS guarantees intelligent adaptation to variable compositions, ensuring maximum flame stability and efficient combustion.

CS products:

SWP burner, combustion chamber

Firing up efficiency:

- Stable flame with extremely variable calorific values
- Automatic adaptation to gas composition
- Flexible use and modular configuration

NH_3 as a fuel

Ammonia (NH_3) is becoming increasingly important as a carbon-free energy source. In addition to its role as a storage medium for green hydrogen, NH_3 is increasingly being used directly as a fuel for generating process heat. However, the thermal utilisation of ammonia places high demands on combustion technology: NH_3 is difficult to ignite, has a low calorific value and potentially high emissions.

Combustion Solutions is setting new standards here: the two-stage NOXOUT™ high-performance burner works catalytically and oxidatively – and falls below even the strictest NOx limits – without any SNCR or SCR exhaust gas aftertreatment.

CS products:

NOXOUT™ burner, combustion chamber

Firing up efficiency:

- Two-stage reaction for minimal NOx values
- No additional catalyst required
- Stable and complete combustion despite low calorific value

Synfuel & ReOil – Pyrolysis gas combustion

Synfuel and ReOil processes are innovative and sustainable combustion solutions, but they do present a number of challenges, such as fluctuating exhaust gas compositions, highly viscous liquid residues and condensates containing particles.

Combustion Solutions offers proven and tailor-made solutions for this, which burn even critical fuels efficiently, stably and with low emissions.

CS products:

SWP burner, ultrasonic atomization system, combustion chamber

Firing up efficiency:

- Fine atomization even with heavy fractions
- Stable flame with fluctuating calorific value
- Wear-free nozzles

Only those who think tomorrow, can be efficient today.


INNOVATIONS FOR EFFICIENCY
Every best solution is temporary.

INNOVATIONS FOR EFFICIENCY

Patents and innovations

Fire. Although it is humanity's first cultural technique, we work every day to improve it even further. We think outside the box, recognise the challenges and find a solution. And if the optimal solution does not exist, we simply develop it. With our innovations, we set industry standards and benchmarks for durability, economy and efficiency.

OXIJET

Enhancement of gaseous media combustion through oxygen enrichment.

JULIP

The integration of the ultrasonic atomization system significantly reduces the consumption of atomization media for efficient verification.

CERAMICS

Injection systems made from finely tuned ceramic materials for highly corrosive applications.

AMONOX

Low-NOx process for the direct combustion of ammonia in industrial combustion plants, with the aim of replacing fossil fuels and decarbonizing existing processes.

OXISPRAY

Enhancement of the liquid media atomization system through the use of pure oxygen as the atomization medium.

VARIEX

Controllable lance for combustion and injection of exhaust gas and explosive material streams with high flow rate variation. Without addition of nitrogen in low-flow cases.

AMINOX

The advanced AMONOX process for recycling all amines, which are usually disposed of as waste, as substitute fuel.

VARISPRAY

A further development of the ultrasonic nozzles with variable atomization angle to fully automatically readjust the flame shape.

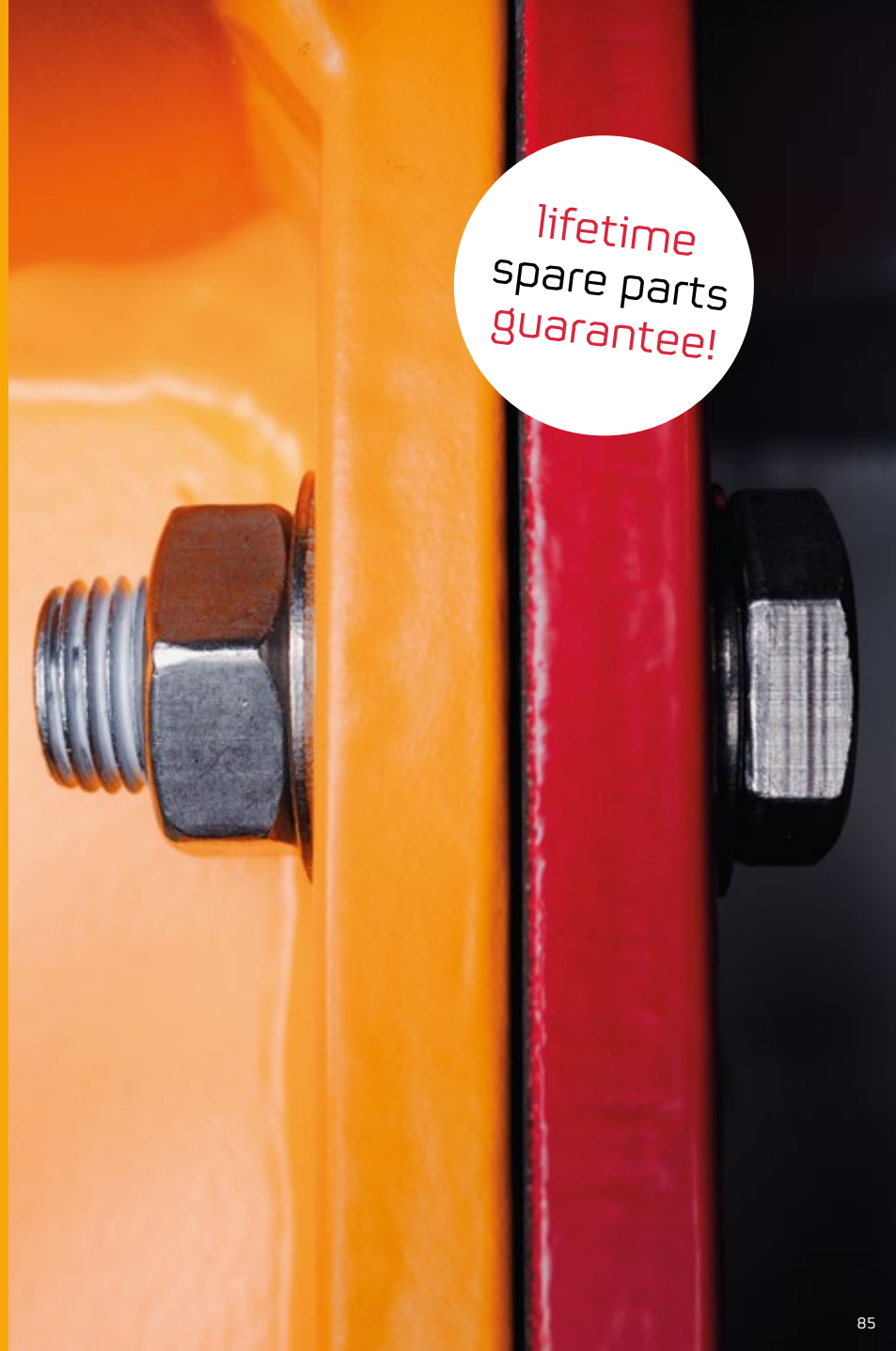
Commissioning / Maintenance

Worldwide on-site service

Even our low-maintenance combustion solutions need to be checked from time to time. Our team is at your service worldwide, optimizing the efficiency and availability of your plant and preventing downtime.

Maximum spare part availability

CS original spare parts offer the highest quality in terms of design and materials, provide optimum performance and extend the service life of your system.



Full service

We continuously inspect, maintain and optimize the efficiency of combustion systems and beyond. From the controls and safety devices to the refractory lining of the combustion chamber.

OPTIMIZATION AND RETROFIT

Plant optimization

The key to maximum efficiency is ensuring that a plant operates economically and in an environmentally friendly manner for as long as possible. We can help you to significantly extend the operating life of your plant.
With targeted retrofits, we significantly increase the efficiency of your plant while reducing running costs, for example through fuel savings. Thanks to the compact design of our solutions, they can be retrofitted easily and without major conversions.

Retrofit

We modernise your existing plant with decades of experience – from analysis to commissioning.
Whether you want higher efficiency, fewer breakdowns or lower emissions, Combustion Solutions delivers tailor-made solutions. From individual components to complete plants – our service team provides reliable support throughout the entire process.

Commissioning

To ensure that the spark really ignites, our technicians and engineers are happy to take care of commissioning. This involves optimally adjusting the system on site, checking and documenting the protective devices and the combustion system.

Our quality management system in accordance with DIN ISO and SCC-trained personnel make a significant contribution to safety.

Training

Our technicians can provide targeted training for your operating personnel on site, thereby sharing our know-how with you.

FIRING UP EFFICIENCY

If you're almost the most efficient - push further.

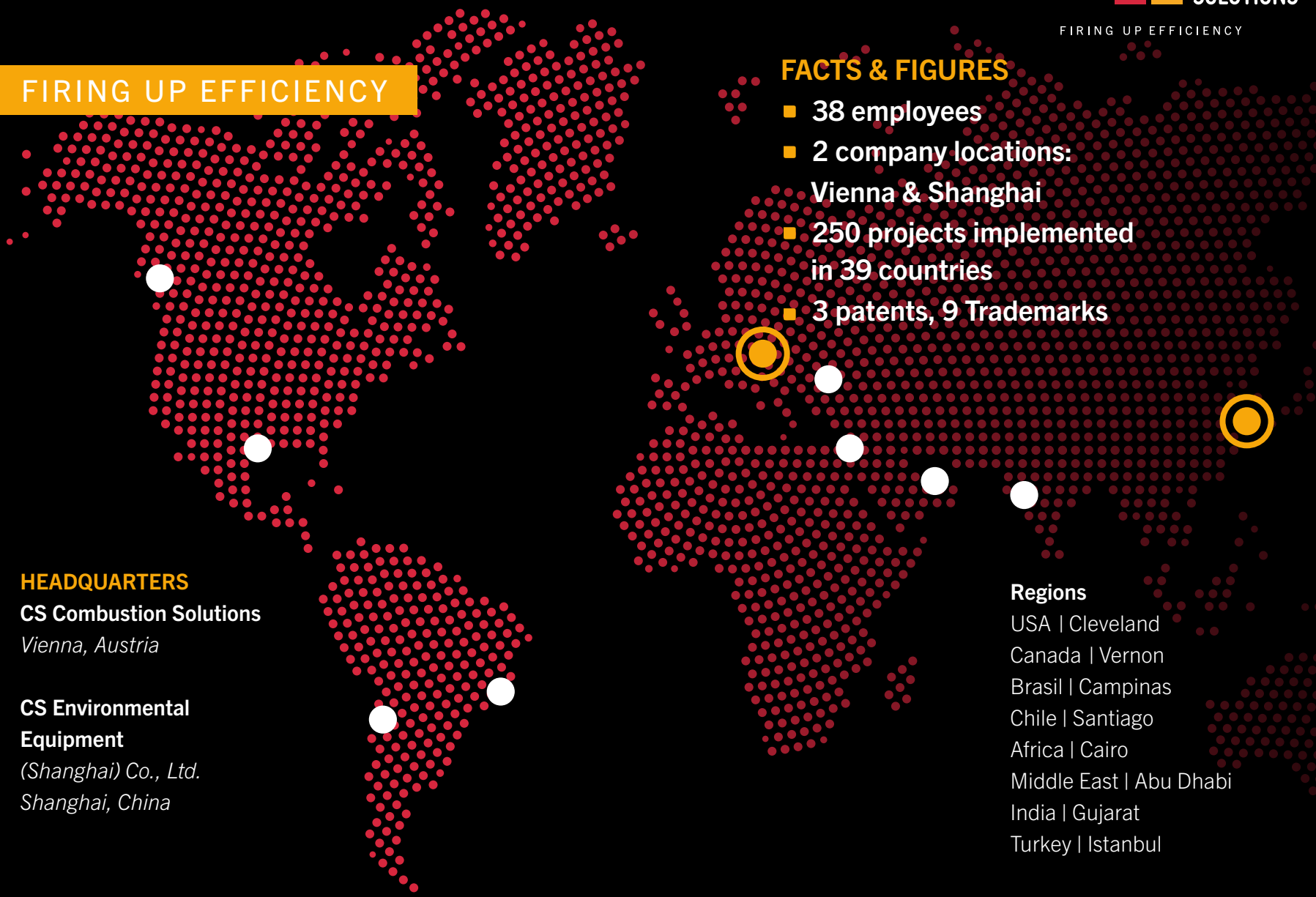
FIRING UP EFFICIENCY

Since our foundation in 2009 in Vienna, Austria, we have been pursuing a clear goal: to become the market leader for tailor-made combustion solutions. To this end, we work together with our customers to develop individual systems that combine maximum efficiency with maximum environmental compatibility.

Today, nearly 40 specialists at CS work on innovative technologies that are used worldwide – from Europe to Africa, America to Asia, from individual components to complete systems.

Efficiency isn't our goal – it's our ignition.

FIRING UP EFFICIENCY



FACTS & FIGURES

- 38 employees
- 2 company locations: Vienna & Shanghai
- 250 projects implemented in 39 countries
- 3 patents, 9 Trademarks

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Canada | Vernon
Brasil | Campinas
Chile | Santiago
Africa | Cairo
Middle East | Abu Dhabi
India | Gujarat
Turkey | Istanbul

The best time to boost efficiency is now.

Pick up the phone or send us an email.
We look forward to developing effective and
economically sustainable solutions for your processes too.

Get to know our team and how we work,
and benefit from a no-obligation analysis.

Phone: +43 (0) 1 907 44 16
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COMBUSTION SOLUTIONS

FIRING UP EFFICIENCY

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„The key to efficiency is doing better– again and again.“

Thomas Bartonek

Founder Combustion Solutions

COMBUSTION SOLUTIONS