

KILN
FLAME
SYSTEMS
COMBUSTION
BY
DESIGN

KFS

KILN FLAME SYSTEMS THE COMPANY

Kiln Flame Systems Ltd (KFS) was established nearly a decade ago by an experienced and enthusiastic team with over 100 years of collective experience and a proven track record in combustion system design. Today, KFS continues to actively pursue the most cost-effective solution to combustion issues through validated technology supported by flexible commercial arrangements. This is demonstrated by the expansion of our in-house CFD modelling and 3D design capability, and its direct impact on the KFS delivery process and future product development. More than ever this provides KFS customers with an outstanding opportunity to improve their plant operations.

In line with the changing requirements and regulations governing our stewardship of the environment, KFS is also committed to improving customer plant operations through the application of combustion technology that operates within specific national and regional emissions requirements. This can include modification of existing burners or installation of new equipment, both enhanced and improved through continuous development of technology. With the aid of new modelling techniques we will meet environmental needs through emissions reductions or introduction of alternative fuels.

KFS

THE KILN FLAME SYSTEMS OFFER

"To give commercial advantages to our customers."

reduce production costs

- lower fuel consumption
- improve product quality
- operate with lower cost fuels
- reduce emissions

long-term improved performance

- robust designs and long service life
- greater process up time
- reduced refractory damage
- reduced formation of rings or build-up
- increased process stability

active support when you need it

- high quality technical response
- frequent monitoring after start-up
- regular on-going contact with operations
- rapid provision of high quality spare parts



KILN FLAME SYSTEMS REFERENCES

Industries:

lime – Algoma, Carmeuse, Graymont, Hanson, Aggregates, Idwala, Linwood Mining, Mississippi Lime, O-N Minerals, PPC Lime, Rockwell Lime, Southern Lime, Steetley Dolomite, US Lime & Minerals

pulp and paper – AbitibiBowater, Alabama River Pulp, Boise Cascade, Burgo Ardenne, CanFor, Celgar, DomTar, Georgia-Pacific, Iggesund, Inland Paperboard, International Paper, Longview Fibre, Metsä-Botnia, Mondi, M-real, NewPage, Papeteries de Gascogne, Portucel, Potlatch, Pope & Talbot, Rayonier, Red Shield, Rock-Tenn, Smurfit-Stone, Thilmany Paper, Weyerhaeuser

alumina – Alcoa, Winalco, Alcan

cement - Australian Cement, Essroc, Lagan Cement, Považská Cementáreň, Siam City Cement, West Africa Cement

metal reduction – Fer Min Ore, Huntsman Trioxide, Queensland Nickel, Rotem

petrochemical – Conoco Phillips



Regions:

North America – Canada, US

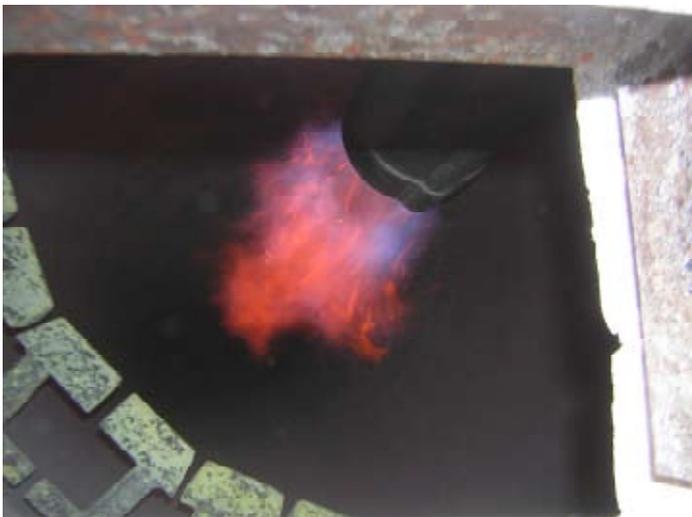
Europe – Belgium, Czech Republic, Estonia, Finland, France, Israel, Portugal, Republic of Ireland, Slovakia, Spain, Sweden, UK

Africa – South Africa, West Africa

Caribbean and South America – Brazil, Jamaica, Suriname

Asia and Australasia – Thailand, Australia

KILN FLAME SYSTEMS PRODUCTS AND SERVICES



OPTIMIX kiln burners – a range of rotary kiln burners, available for all fuel types with bespoke design for each individual kiln and process

DFN kiln burners and nozzles – specific technology for solid fuels via direct-fired systems and their variants, can include warm-up burners and alternative fuels

site surveys – combustion evaluations and process audits, equipment and systems assessment

world leading combustion modelling – aerodynamic and combustion modelling, using physical, mathematical and computational fluid dynamic (CFD) techniques

fuel delivery systems – gas and liquid valve trains, solid fuels conveying and delivery systems

ancillary equipment – primary air systems, ignitors and pilots, kiln burner supports and carriages

safety systems – operational safety systems including flame scanners and burner management systems

engineering – detailed engineering of combustion systems

feasibility studies – for process, equipment and fuel changes

spare parts and service – for all supplied systems and equipment

THE KILN FLAME SYSTEMS METHOD

Every single KFS project follows our tried and tested rigorous engineering approach minimising risk at each stage.

SITE SURVEY

evaluation of combustion systems & equipment
detailed combustion analysis

COMBUSTION MODELLING

current operating conditions
aerodynamic/combustion modelling
computational fluid dynamic modelling
basic burner system parameters
optimisation of system
fuel delivery system assessment

MANUFACTURE AND SUPPLY

fuel system design
combustion system PFD & P&ID
kiln burner detailed design
Burner Management System specification
I, O & M Manual

DETAILED DESIGN

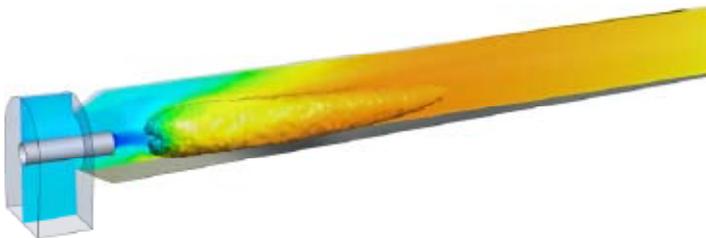
KFS or local manufacture
key part supply:
– burner nozzle
– air swirler
– oil gun/gas gun components
– gas pilot/ignitor components
– turpentine, methanol and solvent sprayers
inspection

INSTALLATION, COMMISSIONING AND TRAINING

supervision of installation
operator training
cold and hot commissioning
optimisation of burner operation

FOLLOW-UP, SPARE PARTS AND SERVICE

on-going follow-up of all installations
provision of spare parts
service of supplied equipment



KILN FLAME SYSTEMS MODELLING

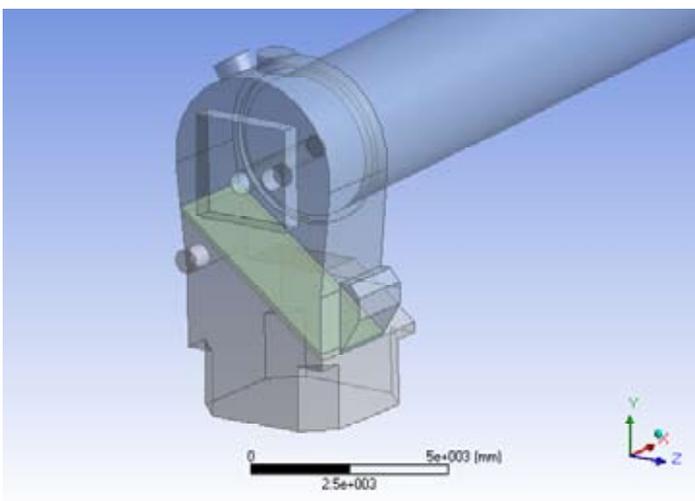
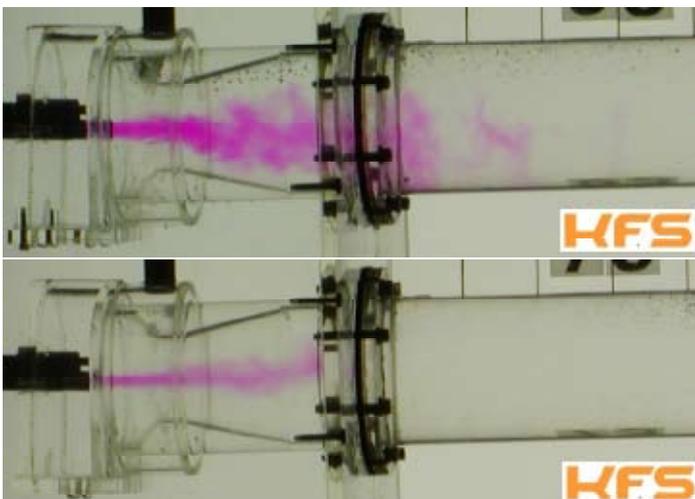
KFS provides their customers with the world's most experienced modelling team having worked on over 200 applications.

KFS physical modelling techniques include:
aerodynamic – provides visual interpretation of flow patterns in kiln hoods, coolers, calciner vessels and ducting
combustion – used to demonstrate the efficiency of fuel and air mixing together with its impact on the combustion performance in a wide variety of processes

Combustion and heat transfer are very complex subjects that cannot be easily analysed by conventional mathematics. Prediction of the performance of burners, combustion equipment and associated plant is therefore extremely difficult and is normally carried out by trial-and-error (straight-forward calculations combined with the extrapolation of experience) or modelling (physical and mathematical analysis of the system), the former being the industrial norm.

KFS has a long and successful history of in-house proprietary physical and mathematical modelling which is used for every single project as part of the burner design process. In recent years our traditional techniques have been expanded with the addition of CFD (computational fluid dynamic) modelling. KFS use a combination of commercial codes with specifically customised models for use in rotary kiln and calciner applications.

The use of CFD modelling now allows detailed examination of flame and temperature profiles, their impact on process conditions, and emissions. KFS experience combined with extensive validation with plant data and previous projects ensures a high degree of confidence in the CFD results. This in turn provides KFS customers with assurance of a successful project.



KILN FLAME SYSTEMS KILN BURNERS

GAS, LIQUID AND SOLID FUELS



OPTIMIX

A simple and elegant design that uses well established and proven changes in fuel/air mixing intensity to provide flame control. The KFS designs avoid the complex mechanical adjustment mechanisms which are essential in the standard burner one-size-fits-all approach and avoids potential for local operations or maintenance to adjust incorrectly. The primary air is split between axial air, for flame length and heat flux control, and swirl air for flame anchoring. Flame stability is provided by a highly efficient aerodynamic swirler to provide excellent flame stability. Each OPTIMIX burner is supplied with an integral pilot including the extremely reliable natural gas or propane Hegwein model.

The simplicity of the OPTIMIX ensures that consistent performance is available over the lifetime of the burner.

The OPTIMIX range is designed for firing all fuel types, either individually or in combination.

OPTIMIX G

for a wide range of gaseous fuels. Dual gas discharge locations ensure fine control on gas firing applications and turndown of over 20:1 ensuring the burner can be used in cold starts for refractory curing.

OPTIMIX L

for conventional liquid fuels, such as #2 to #6 oils and including waste and re-refined oils. Using the proprietary CM atomiser offers at least 8:1 turndown using either steam or air atomisation. The PJ atomiser is specific for pressure jet applications. For alternative liquid fuels KFS offer the WS Atomiser with air/steam-assist atomisation.

OPTIMIX S

for pulverised coal and petcoke, and already a world leader in the pulp and paper industry where KFS have burners firing natural gas, petcoke, methanol, and turpentine simultaneously. The KFS OPTIMIX S can also be designed to accommodate solid alternative fuels.

DFN

Focused particularly in the lime and cement industries, this advanced burner technology provides a straightforward retrofit to upgrade the performance of direct-fired systems or straight-pipe burners.



Developed using CFD modelling, the DFN (direct-fired nozzle) burner has been proven across many projects to provide outstanding improvements in areas such as production, fuel consumption, NOx emissions, and ash ring formation.

Each DFN burner is custom-designed for the kiln both in terms of process performance and mechanical installation. High levels of performance are provided by careful use of bluff-body and swirl techniques to enhance fuel/air mixing combined with far greater flexibility than traditional straight-pipe burners.

The DFN burner can be provided in a number of variants to suit specific customer requirements or applications.

DFN nozzle for simple retrofit for solid fuel firing, including alternative fuels

DFN with integrated warm-up burner for all types of gas and liquid fuels. Ignition systems can be provided using a gas pilot or high-energy igniter, and fully-automated ignition can be achieved through use of insertion and withdrawal mechanisms.

DFN with semi-direct firing for enhanced system flexibility and NOx reduction. KFS can provide full process design and equipment specification for conversion to semi-direct firing with a number of system variants available to suit each customer application.



ANCILLIARY EQUIPMENT



As part of system design, **KFS** offer a number of ancillary equipment items which enhance or complete the combustions system upgrade. Options are available for process and detailed design only, or full equipment supply:

fuel handling – valves trains for all gaseous and liquid fuels, and solid fuel storage and feed systems, all in accordance with customer and local specifications, and meeting appropriate regional standards

KFS NCG lances – custom-designed to handle single or multiple streams (SOG, HVLC, LVHC, etc) to minimise impact on main burner and kiln operation while also resolving issues such as ring formation

primary air systems – fans and associated equipment with FM/EN approved thermal mass flowmeters used to accurately and reliably monitor primary air flowrates essential in maintaining optimum combustion performance

flame scanners – use of state-of-the art FM/EN approved ultra-violet (UV) and infra-red (IR) systems sourced in North America or Europe

burner management systems – provision of PLC-based systems for single and multi-fuel applications in compliance with North American, European or other specific standards

ignitor systems – natural or propane gas pilots for continuous or intermittent use, high-energy ignitors with automatic retraction system

KRFS

THE KILN FLAME SYSTEMS COMMITMENT

KFS has worked hard to establish its position and reputation as a market leader in high technology, custom-designed combustion solutions. A significant part of our success is linked to an unerring desire to provide satisfaction to new and existing customers throughout every stage of every project.

In order to ensure your satisfaction and that we contribute to the success and growth of your business, we commit to you that we will:

act with openness and integrity in all our business dealings

provide the highest level of technical excellence in a solution to meet your specific objectives

commit to continuous technical innovation and product improvement

follow up throughout the equipment service life to ensure on-going performance and benefits

never rest until you are fully satisfied

Richard Manning
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