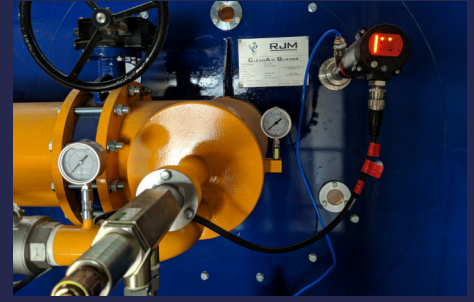
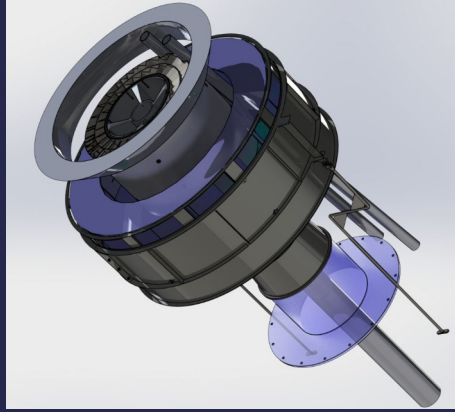
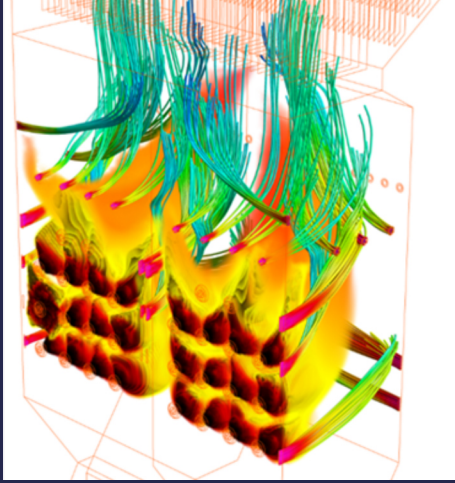
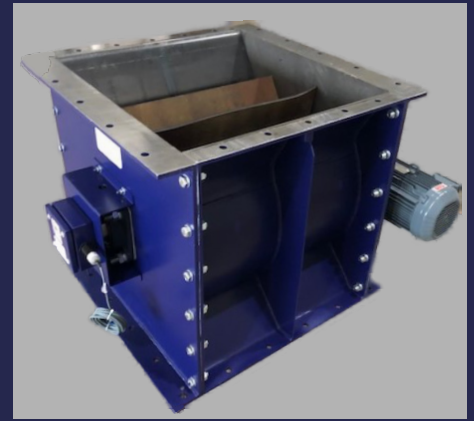
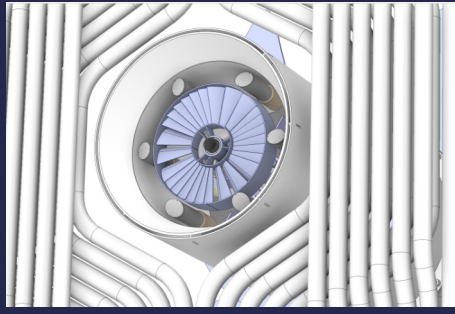
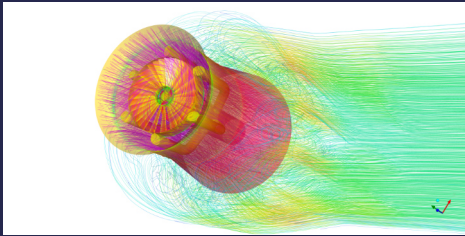


Corporate Overview



RJM International is an award-winning provider of technologies, products and services that enable power generators and other large combustion plants to operate cleanly, efficiently and reliably.

With offices in the UK, USA and Singapore, supported by a network of agents in Europe, the Middle East, Africa and across Asia-Pacific, RJM is able to effectively manage projects all over the world.



Diagnose

Design

Deliver

RJM International is an award-winning business that is helping to transform the power generation sector - and enabling it to deliver low emission, low carbon energy worldwide.

It does this by resolving the most complex materials handling, combustion, and emissions challenges for all types of thermal-fired power stations, no matter what the fuel, the firing configuration or the size of the plant.

Through its innovative technologies, products and services, RJM is not only enabling older plants to maintain more reliable and more flexible generation in a carbon-constrained world, but is increasingly working with newer plants that have not been fully-optimised and are struggling with a range of operational issues that they are unable to resolve without expert support.

These newer plants range from a 1,240MWe power station in Vietnam firing anthracite, to a 24MWe bubbling fluidised bed gasifier plant firing RDF and a rotary kiln firing hazardous waste in the UK.

Working with RJM



A proven approach built on solid foundations

For each project, RJM begins with a detailed analysis of every aspect of the plant's performance. This includes the Pre-Combustion stages where fuel handling is assessed, as well as the Post-Combustion stages where ash formation and ash handling are investigated. Accurate measurements are taken and specific problem areas are subjected to Root Cause Analysis. In addition, a range of modelling disciplines (physical modelling, CFD modelling and DEM modelling) are deployed to identify technical solutions that can be optimised off-site.



Consultancy to engineering design and manufacture

RJM's expert analysis provides plant owners and operators with a costed road-map for how best to move forward. But unlike many of its competitors, RJM can then deliver a full end-to-end solution. New or modified components are designed in-house and manufactured for RJM by approved, specialist fabricators.



Installation, commissioning and optimisation

RJM's engineers will supervise the installation to ensure that any new equipment is correctly integrated within the existing plant. They will then carry out the commissioning and optimisation stages themselves, to ensure that the project's objectives are met and are backed up by appropriate guarantees.



Post-project support

Following the completion of the upgrade or optimisation project, RJM will provide ongoing support to the plant operators. As well as supplying spare parts, this support is increasingly being delivered through Technical Services Agreements (TSAs), which bypass the need for additional contractual processes. This means that RJM can react quickly to any plant issues that may arise. Remote monitoring is also used to provide post-project support. RJM's engineers can analyse plant operations using live data and then make recommendations to deliver further performance improvements.



World-class expertise

Understanding the complex relationships between different fuel types, combustion and emissions and their impact on plant performance, requires multi-disciplinary expertise. RJM has assembled an outstanding team of materials handling experts, combustion engineers, fuels specialists, mathematical modellers, CAD designers, mechanical engineers and project managers to ensure that each project can be successfully completed.



Global reach

RJM has offices in the three hubs of Europe, USA and Asia-Pacific, plus a network of agents and non-compete partners in many of its key markets. It therefore has the capability to manage any upgrade project on all boiler types, from 1MWe to 1,000MWe.

Supporting current generation plant

No matter where they are in the world, heat producers and generators of power are facing similar challenges.

Demands are being placed on them to deliver more flexible and more reliable MWe or MWth outputs, with reduced emissions and with increased levels of combustion efficiency. At the same time, they are having to integrate new, low carbon fuels to reduce carbon emissions. In many instances, especially with older plants, investment budgets are extremely tight, but RJM specialises in developing cost-effective and innovative solutions to help plant operators achieve these technically-challenging objectives.



Utility Plants

From a dual fuel T-fired unit burning oil and pulverised coal, to a circulating fluidised bed grate firing lignite, RJM can optimise performance across every combustion technology and fuel type. RJM has over 60,000MW of global utility plant references and has also carried out over 12,650MW of coal-to-biomass conversion studies, including pre-FEED and FEED studies. RJM's engineers have also played key roles in pioneering the conversion of thermal plants to 100% biomass combustion. Today, RJM is enabling coal-fired generators to integrate new fuels and help them transition to lower carbon generation.



Industrial Burners

RJM has responded to growing demand for ultra-low emission burners by developing a new type of gas burner that can be sized to suit many different industrial applications, from refineries firing syngas to factories generating steam and electricity for use on site, or for district heating plants making hot water. Over 30 of RJM's ultra-low NOx CleanAir Burner™ units, designed specifically for the Chinese market, have now been installed at district heating plants across Beijing.



Biomass and Energy from Waste Plants

Through detailed site surveys and combustion performance investigations, RJM has learned that many of these plants are not operating as per design intention. For example, a failure to understand the fuel correctly can cause excess slagging, fouling and corrosion, leading to unplanned outages and loss of revenue. RJM's holistic approach, taking the time to understand the fuel, how it combusts and how each part of the plant interacts with the other parts, helps it to identify the optimal path for delivering a step change in performance and reliability. Today RJM is working at a number of biomass and EfW plants across the UK, delivering innovative solutions to improve reliability, flexibility and MW output.

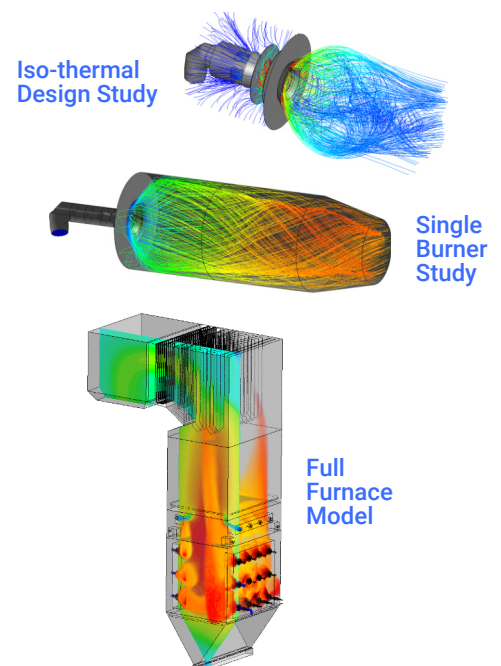
Industry-Leading CFD

RJM's highly-skilled combustion engineers apply CFD modelling to deliver accurate, robust and practical solutions that enable power plants to resolve a wide range of combustion, emissions and other operational issues.

As a pioneer in the development of CFD-driven solutions, RJM can provide the most effective and practical plant upgrades - at least cost.

Recent assignments include applying CFD to model baseline performance of lignite and bituminous coal-fired plants in Kosovo and Turkey; analysing various natural gas firing options to evaluate the viability of a coal-to-gas conversion in the USA; and using CFD to highlight how improvements can be made to the pyrolysis, gasification and oxidation zones of a unique thermal waste treatment plant.

RJM also applies its CFD expertise to improve auxiliary plant equipment, such as scrubbers (SOx removal), cyclone systems for ash removal and analysis of SNCR systems to further improve NOx reduction.



FlameSight™

RJM's FlameSight™ is the latest innovation in real-time flame performance monitoring. It can detect changes in fuel quality, calorific value, grind quality and moisture content. It can then automatically adjust burner geometry in response to these changes, thereby maintaining optimal performance levels.

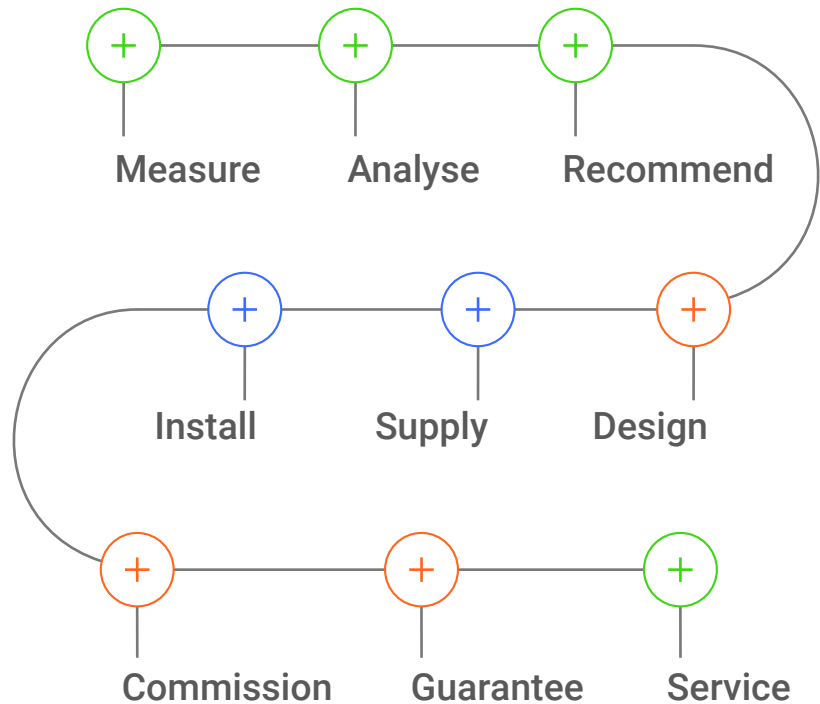


IMPULSE® Cleaning

The IMPULSE system uses supersonic shock waves to deliver dramatic improvements in the online cleaning of fouled surfaces, when compared to conventional cleaning systems. It is a cost-effective, non line-of-site system that removes deposits without damaging heat transfer surfaces.

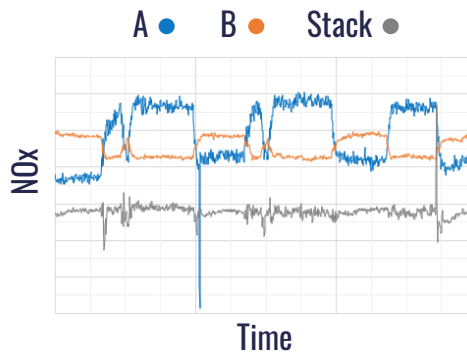
Our Approach Consistently Delivers Value

RJM provides a unique mix of consultancy, products and services, tailored to each customer's requirements. By following a logical, step-by-step approach in order to understand the operational challenges that each plant faces, RJM can then apply its know-how and proven expertise to resolve them. RJM's global customers benefit from this approach every day.



Remote Monitoring

RJM can monitor remotely any plant that has a suitable interface with its DCS (Distributed Control System). By analysing this data, RJM can propose incremental changes to settings to improve plant performance. This capability was fully utilised during the Covid lock-downs, when travelling to site was not possible.



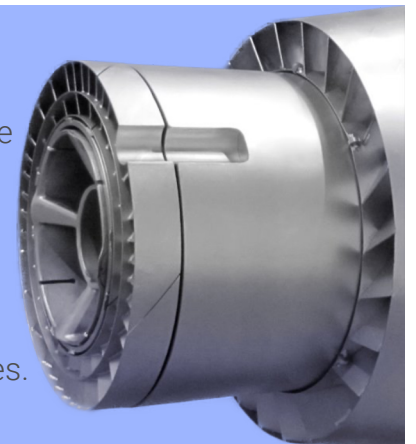
Technical Services Agreements

Following the successful completion of an upgrade project, RJM is increasingly using TSAs to establish and maintain an agreed relationship with the customer that offers operational certainty in the medium to longer term.

RJM's Ultra-Low NOx Burners

RJM has been refining its own ultra-low NOx burner technology since the company was founded in 1977. New variants have been developed to suit every firing configuration and all coal types, including lignite and high moisture coals, as well as gas and oil or multi-fuel versions.

No matter what the application, RJM has a proven burner solution that can meet the latest emissions limits without compromising reliability, flexibility or MW output. In many instances, desired performance levels can be achieved without the need for secondary NOx reduction measures.



Successful Projects Worldwide

Kilroot Northern Ireland



Plant Challenge

The primary challenge was to reduce NOx emissions to 250mg/Nm³ at this T-fired, 560MW power station. This was technically complex because 60 different nozzles deliver air and fuel to the boiler, with each one being controlled by an individual damper.

RJM Solution

Using highly advanced CFD modelling, RJM was able to capture the complexity of the plant's nozzle and damper geometry and exploit it to develop and patent an entirely new Ultra-Low NOx solution. This featured a Separated Under Fire Air (SUFA) system which enabled air to be introduced into the centre of the fireball from below, reducing the amount of air injected through conventional means.

Results

The plant is now meeting its emissions targets and operating reliably, without having needed additional secondary NOx reduction measures.



AES Maritza Bulgaria



Plant Challenge

This new lignite-fired 345MWe plant was unable to operate stably and efficiently across the full load range and meet the 200mg/Nm³ or below LCPD limit for new plants.

RJM Solution

RJM created a full furnace CFD model combined with baseline test data to understand the combustion dynamics of the boiler, plus a physical modelling study of the mill and burner systems. To create strong and stable furnace circulation, RJM designed a number of nozzle inserts for various air ports and modified the injection angles. It also installed strategically-placed baffles into the PF ductwork to improve and control PF distribution to the vapour burners and the main burners.

Results

These modifications allowed the boiler to be operated at design conditions with minimal build-up of material on the grate. It also restored compliance with the latest NOx emission limits, whilst maintaining boiler efficiency.



“ This was a very challenging project technically and in terms of schedule but the results have exceeded expectations, with emissions well below the required limits. We will definitely use RJM in future projects. ”

Lyle Woodard
Director of Global Engineering and Construction

ICORSA Spain



Plant Challenge

A paper mill in Spain needed to upgrade its gas-fired power plant to achieve new emissions limits of NOx <100 mg/Nm³; CO <40 mg/Nm³; and particulates <5 mg/Nm³. An additional challenge was to achieve these emission limits, firing either natural gas or biogas - or a combination of the two fuels.

RJM Solution

RJM's detailed CFD analysis of the existing firing equipment confirmed the presence of an unusually large recirculation zone. This was having a major impact on both furnace dynamics and flame shape, causing localised areas of high NOx, flame damage to the side walls and high levels of CO. In order to meet the new emissions limits and deliver a reliable unit, RJM carried out 25 different CFD iterations to arrive at an optimum burner design.

Results

RJM adapted its own Ultra-Low Nox CleanAir Burner and designed four 17.5MW units that meet these new emissions limits.



Solving Multiple Operational Challenges

Tradebe England



Plant Challenge

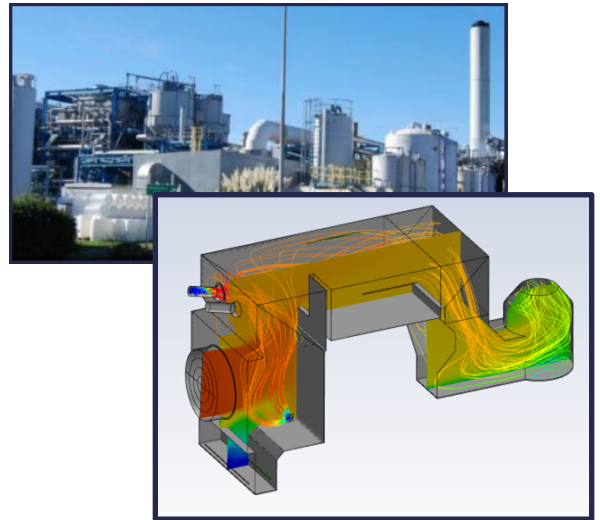
This rotary kiln incinerating 45,000tpa of hazardous and medical waste streams needed to know what its options were to reduce NOx emissions.

RJM Solution

RJM carried out a site survey and a cost-benefit analysis for the available options for improved NOx control. Due to the plant's unusual configuration, a CFD study was carried out to ensure that the proposed SNCR system would be installed in the optimum location to meet the performance requirements.

Results

The findings from these various tests and modelling suggested that an SNCR system, injecting the correct type and amount of reagent into the secondary chamber would be the most appropriate way forward to control NOx.



VCM Mong Duong II Vietnam



Plant Challenge

This newly-built, 1,200MW plant firing a local anthracite coal, was suffering from sever slag build-up, resulting in frequent and large slag falls, unstable combustion causing loss of flame and unit trips.

RJM Solution

RJM carried out a Combustion Audit followed by a comprehensive evaluation phase including coal characterisation, isothermal CFD modelling, physical modelling, and a fully-validated combustion CFD modelling study. Following confirmation of the root causes, RJM designed and installed a number of innovative and cost-effective firing system modifications. The plant was also remote-monitored by RJM for two years to deliver further performance improvements that could be made during normal operation.

Results

The boilers now are operating reliably, with improved efficiency and reduced NOx emissions.



“RJM brought great experience, data analytics and modelling to help us solve our challenging combustion issues at our plant. It was a pleasure working with a team which was as determined and dedicated as we were to find the solutions.”

Kevin Pierce
Plant Manager

Energy Works Hull England



Plant Challenge

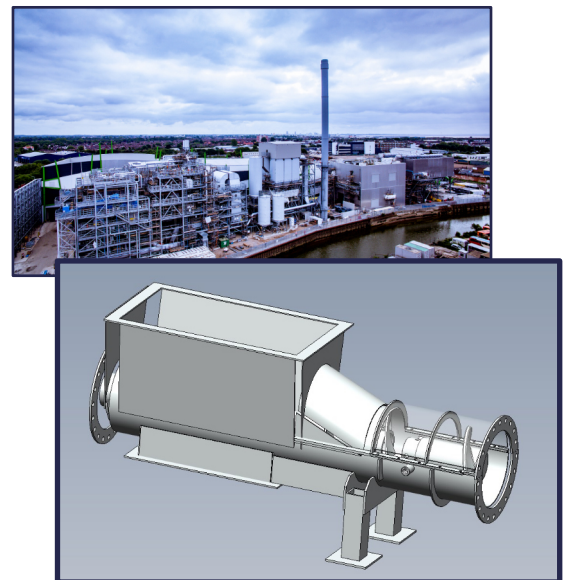
This 28MWe fluidised bed plant, firing Refuse Derived Fuels, was experiencing a range of operational problems, meaning unplanned outages and poor performance.

RJM Solution

RJM modelled the fuel feed system, then redesigned and manufactured the fuel metering system, including new hoppers and screw feeders. RJM also undertook a full system review of the gasifier using CFD modelling to understand how the Over-Fire Air (OFA) nozzles were affecting gasification and syngas combustion. A new Flue Gas Recirculation (FGR) system was then designed and installed to help reduce temperatures within the gasifier, significantly reducing the formation of slagging and fouling material.

Results

RJM's modifications have enabled the plant to operate much more reliably and a Technical Services Agreement is now in place to ensure ongoing engineering support. A new holistic programme of further upgrades is also being prepared.



Meet our Industry-Leading Experts



John Goldring
Managing Director

Highly-skilled energy sector professional. Over 35 years' of technical and management experience. Track record of success in the development and commercialisation of innovative, ultra-low emissions technologies.



Dr. Anura Perera
Head of CFD

World-class CFD modeller with expertise in innovative concept development, problem-solving, troubleshooting and solutions delivery. Unrivalled understanding of FLUENT CFD software applied to combustion and emissions analysis.



Larry Berg
Vice President, RJM USA

Over 40 years' power and process industry experience. Designer and engineer of many new combustion products and systems. Developer of unique analysis methodologies and complex CFD models.



Steve Billett
Head of Projects

Over 15 years' experience in the power sector. Responsible for the management of all RJM's projects outside Asia-Pacific. Lead developer of RJM's SUFA system for T-fired boilers and the latest version of RJM's Ultra-Low NOx burner.



Dr. Gerry Riley
Head of Business Development

Over 35 years' experience in the power sector. RJM's fuels expert with expertise in the engineering, design, and combustion performance of all types of boilers. Combustion Division chair of the Fuel and Energy Research Forum.



Steve Cornwell
Head of Process Engineering

Combustion engineer with over 30 years' in the power sector. Experience spanning equipment design, consultancy and operations. Technical expertise also includes oil, gas and biomass combustion system design and all aspects of plant safety.



Roger Surry
Head of Mechanical Engineering

RJM's materials handling engineer. Over 45' years experience in the design, manufacture, construction, installation and commissioning of bulk materials equipment for coal, biomass and W2E plants.

Broad Experience with Global Customers

RJM's customers include many of the world's leading power generators, oil & gas multi-nationals, large combustion plants across a range of industrial sectors, as well as biomass and Energy from Waste sites.



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