

RJM resolves the most complex combustion and emissions challenges for all fuels including biomass and Energy from Waste through the application of cost-effective, innovative solutions

IMPULSE® Cleaning System

Licensed to RJM International by
PowerPlus Cleaning Systems Inc.



“ The IMPULSE Cleaning System has enabled our plant to operate longer campaigns with reduced downtimes between outages ”

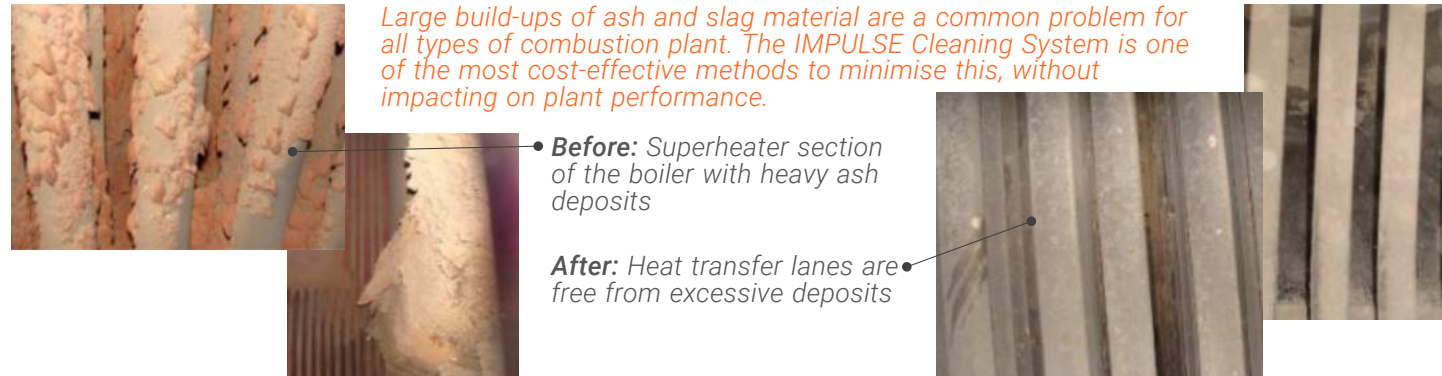
RJM International is an award-winning provider of technologies, products and services that enable power generators and other large combustion plants to operate cleanly, efficiently and reliably.

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.

IMPULSE Cleaning is Revolutionising On-line Plant Cleaning

The IMPULSE boiler cleaning system is a development of the pulse detonation propulsion technology pioneered by GE at its Global Research Center. The cleaning technology is based around a supersonic shock wave that is created by the detonation of a mixture of fuel and air.

IMPULSE cleaning technology delivers dramatic improvements in the online cleaning of fouled surfaces, when compared to conventional cleaning systems. The pulse waves work effectively as a non line-of-site cleaning system removing deposits without erosive damage to heat transfer surfaces - unlike conventional cleaning methods. The IMPULSE system is also self-contained and has no need to tap into expensive plant steam.



A Proven Technology for Every Fuel and Combustion System

Waste to Energy

- BWSC 8MW unit (Elk River, Minnesota)
- Firing RDF, unit could only run for 5 to 8 weeks before air heaters were fully blocked
- Post-IMPULSE installation, unit runs for 10 to 12 weeks, with offline time reduced from 5 - 7 days to 2 - 3 days



Biomass

- Small package boiler / hot oil heater (El Dorado, Arizona)
- Firing waste wood
- Customer data confidential but post-IMPULSE installation, significant improvements to performance across multiple parameters

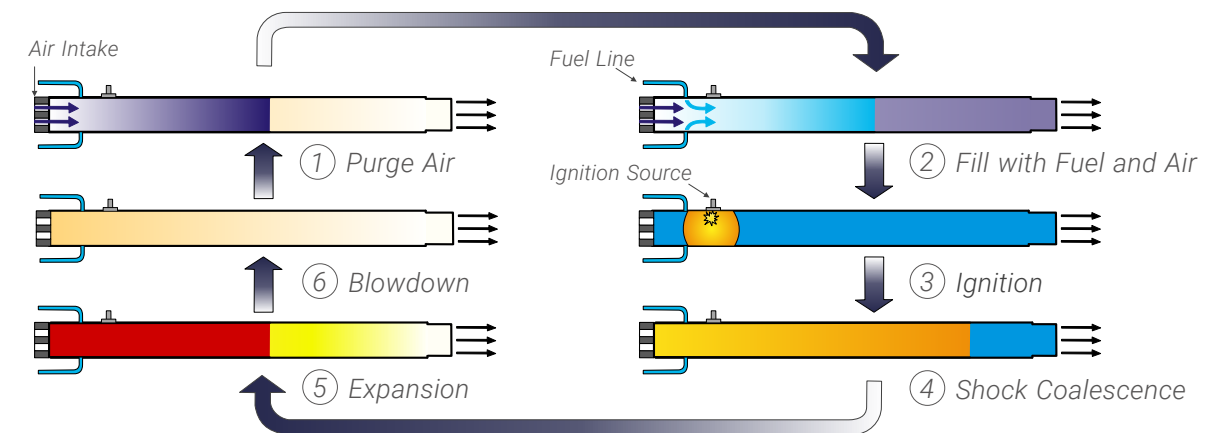
Coal

- 261MW unit (Riley Power, Nearman Creek, Kansas)
- Firing sub-bituminous coal
- Two IMPULSE cleaning systems installed on opposing walls of reheat section of boiler. Operational running times increased from 12 months to 18 months.
- Two steam soot blowers no longer required

Key Advantages of IMPULSE Cleaning

- Effective and efficient on-line cleaning system
- No erosion or damage to heat transfer surfaces
- Low Opex and maintenance; innovative design avoids moving parts
- Minimal intrusion into boiler means small installation footprint and low installation cost
- Does not scavenge plant steam, therefore no reduction in exported power
- Negligible recoil from proprietary detonation technology
- Non line-of-site cleaning; better coverage than sootblowers
- Significantly less expensive capital cost and lower operational costs than its competitors
- Suitable for all boilers, all sizes, all combustion technologies and all fuels
- Proven technology with over 260 installations in the USA

Harnessing Supersonic Shockwaves to Deliver Optimal Cleaning



Pulse detonation cleaning technology employs a rapid series of supersonic shock waves. Each high velocity shock wave is characterised by a high-density front, followed by an ultra-low pressure behind the shock that generates a vacuum, which in turn creates a substantial trailing edge vortex or eddy current.

The repeated combination of ultra-high and ultra-low pressures causes trailing eddy currents to form which effectively dislodge and sweep away stubborn deposits on the front and opposing faces of the heat transfer tube surfaces. In addition, wherever shock waves are reflected off hard surfaces, this further improves the effectiveness of the cleaning.

“The results were dramatic. The plant personnel had never seen the boiler looking so clean after a year of operation. The IMPULSE system has maximised production and allowed us to operate both boilers for the entire nine month processing season without the need for a forced outage.”

Jeff Kava, Western Sugar

Some of Our Key Customers in the USA



Wide Range of Multi-Fuel Applications across the USA

Facility	Fuel	Plants	IMPULSE Units
Utility	Coal/ Peat Coke	45	176
EfW	MSW Mass Burn	5	51
EfW	Refuse Derived Fuel	1	6
Co-Gen	Biomass	4	11
Industrial	Waste Heat Recovery	10	52
Total		65	296*

* As at August 2022

- Large municipal utility in northern Florida
- 2 x 297.5MW Circulating Fluidised Bed Units
- Firing Coal, Petcoke and Refuse Derived Fuels
- Post IMPULSE installation, Unit 1 now delivering over \$ 2,24 million annual reduction in Opex and Unit 2 an Opex reduction of over \$ 2,28 million (300 days at full load). Unit 2 also with an improved heat rate of 2.5%.
- Following the impressive results of the first IMPULSE installation in autumn 2020, an additional 14 units were installed on Unit 1 in April 2022.

Why IMPULSE Cleaning from RJM?

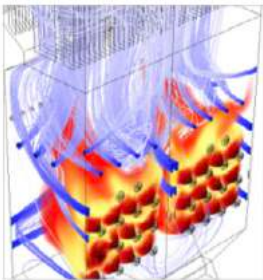
Customers confirm that the IMPULSE Cleaning System delivers significant operational advantages, including increased plant run times, reduced cleaning time, greater reliability and raised outputs



A full service offer from RJM

Utility power generators, biomass and Energy from Waste plants the world over seek out RJM for its expertise in resolving the most complex operational, combustion and emissions challenges.

- Completed **60,000MW** of successful combustion solutions to leading generators world wide
- Extensive experience across a **wide range of biomass and waste fuels**
- Industry-leading **fuel and combustion experts** working in-house
- Expertise across **all aspects of material handling**, combustion systems and ancillary equipment
- Advanced **flame diagnostics** to aid combustion tuning
- Wide range of **products and services** adapted to suit each individual customer
- State-of-the-art **CFD modelling capabilities**
- End-to-end offer from **consultancy and engineering** to implementation



Mike Bell

IMPULSE Sales Manager

Mike has over 40 years' experience in the energy sector, across a wide range of fuels and combustion technologies. Mike is responsible for developing the 'Package Equipment Market' segment, including sales of the IMPULSE Cleaning System.



Tom Ball

IMPULSE Lead Engineer

Tom has a First Class Masters in Chemical Engineering and plays a key role on RJM's larger biomass and EfW projects. His work includes installation, commissioning, technical support and monitoring, with a special focus on the IMPULSE Cleaning System.

RJM is the exclusive licensed distributor in Europe, Turkey and the UK (Asia-Pacific: Non-exclusive) for IMPULSE® Cleaning System technology, designed and developed by PowerPlus Cleaning Systems Inc. of Missouri, USA

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