



WorleyParsons

resources & energy

EcoNomics™

WorleyParsons Gas Cleaning





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“There is no task so important or so urgent in our business, or our customers’ businesses, that it overrides the need to work safely...”

John Grill, WorleyParsons CEO

Zero Harm is our corporate vision for health, safety & the environment (HSE).

We are committed to our vision; it applies to all of our operations, at all times, in all locations, and at all levels of responsibility. We will actively work to align our expectations and behaviors with those required to achieve our vision through a dedication to continuous improvement.

The launch of our HSE framework, OneWay™, enables us to further align and consolidate our global systems and procedures and continue to work with our personnel to reinforce a culture that underpins our drive to achieve our corporate differentiator of industry leadership in HSE performance.

OneWay™
to zero harm

Corporate Overview

WorleyParsons is a leading global provider of professional services to the resources & energy sectors and the complex process industries.

We cover the full asset spectrum, both in size and lifecycle, from the creation of new assets, to services that sustain and improve operating assets.

Our business has been built by working closely with our customers through long term relationships, anticipating their needs and delivering inventive solutions through streamlined, proprietary project delivery systems. Strong growth continues to characterize our performance both through organic development and through strategic acquisition as we strive to provide tailored services wherever our customers need us.

- Mineral & Metals
- Hydrocarbons
- Power
- Infrastructure & Environment

37
countries

120
offices

28,800
personnel

EcoNomics™ Delivering profitable sustainability

EcoNomics™ is our range of services and technologies that profitably embed environmental, social and financial sustainability into project delivery, across the asset lifecycle. It is a seamless extension of our established project delivery capability in the key areas of Assessment, Efficiency and Treatment & Mitigation. We are committed to working with our customers to turn their sustainability objectives into good business practice.

WorleyParsons Gas Cleaning

WorleyParsons Gas Cleaning has built a reputation as a responsive, solutions-driven organization with strong technical qualifications and a proven record of accomplishment by delivering high quality, niche process engineering services at cost competitive prices. WorleyParsons Gas Cleaning provides specialized process engineering and multi-disciplinary capabilities to the minerals and metals, hydrocarbons (downstream), and power industries.

Areas of specialization include:

- Process engineering
- Process gas handling and cleaning system design
- Process troubleshooting and optimization
- Process plant fugitive emissions control
- Process modeling
- Heat recovery and energy optimization
- Field testing and monitoring
- Evaluation of new processes
- Process operations training

Scope of services includes feasibility / conceptual studies, basic and detailed engineering, and plant commissioning support.

WorleyParsons Gas Cleaning's goal is to exceed customer expectations by always focusing on a strong commitment to employee health and safety, as well as improving the environment and addressing compliance requirements through sustainability projects. Engineering solutions are developed with these factors in mind coupled with a solid understanding of process operations.

WorleyParsons Gas Cleaning successfully executes strong schedule performance and effective cost control, and delivers innovative, high quality products and services. The end results of our engineering efforts are improved plant operating performance, employee safety, and a cleaner environment.

80

Process Plants

46

Major Clients





Process Gas Handling and Cleaning System Design

WorleyParsons Gas Cleaning has extensive experience in gas handling system design for both ferrous and non-ferrous metallurgical furnaces, including drying, calcining / roasting, smelting / melting, heating, and refining. Specific capabilities surrounding process gas handling system design include:

- Process gas characterization
- Process gas heat recovery, including waste heat boilers and heat exchangers
- Process gas conditioning, including combustion chambers, water-cooled ducts, and evaporative coolers
- Flue gas desulfurization (FGD)
- Process NOx control
- Gas cleaning system equipment selection, including baghouses, scrubbers, electrostatic precipitators (ESPs), and fans



Energy Optimization & Greenhouse Gas (GHG) Emissions

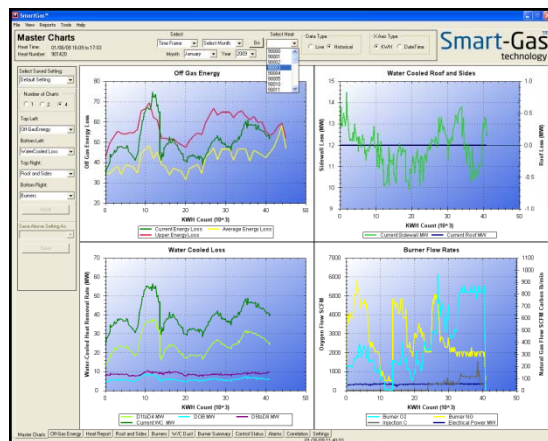
WorleyParsons Gas Cleaning has extensive expertise in heat recovery and energy optimization, including process plant energy intensity assessments, and process unit energy optimization, which directly impact GHG emissions. WorleyParsons Gas Cleaning regularly performs energy assessments for process equipment and off-gas systems. Potentially up to 50% of energy input into a pyrometallurgical process could be lost through the off-gas. WorleyParsons Gas Cleaning identifies practical approaches to recover heat from the off-gas in the form of steam, preheated air, or direct recycle that can be used in other processes to reduce fuel consumption. WorleyParsons Gas Cleaning assesses energy usage in all areas of a process plant. These energy intensity evaluations provide an understanding of total energy consumption by each process unit and identify opportunities for efficiency gains, energy savings, and reduction in GHG emissions. Specific capabilities include:

- Audit and assessment of existing process operations with respect to productivity, efficiency, and environmental considerations
- Benchmarking of energy consumption in process operations
- Determination of GHG emissions associated with process operations, and development of process strategies aimed at reduction of GHG's
- Evaluation of material inputs, equipment capabilities and operating practices aimed at improved operating efficiency and reduction of GHG generation



Smart-Gas[®] Technology

Smart-Gas[®] is a proven low maintenance, user-friendly, and modular tool using proprietary software which enables meltshops to optimize their EAF's total energy usage in real-time, while providing guaranteed minimum overall net savings of at least US\$1.00/ton plus safety and environmental benefits without the need to measure off-gas chemistry. Validated over thousands of heats in multiple installations around the world, Smart-Gas[®] also provides a continuously updated energy balance for every heat, historical tracking of furnace energy performance, assessment of injection carbon recovery, and comprehensive hands-on operator training for enhanced learning, in both open and closed-loop control conditions. In addition, Smart-Gas[®] can be readily customized to provide similar benefits to other energy intensive industries including non-ferrous, power generation, cement, and petrochemicals.



Process Plant Fugitive Emissions Control

WorleyParsons Gas Cleaning staff has extensive experience in reducing fugitive emissions from plants in order to achieve environmental compliance requirements. WorleyParsons Gas Cleaning also has expertise in the engineering and design of industrial ventilation systems. Specific WorleyParsons Gas Cleaning capabilities in the areas of fugitive emissions prevention and industrial ventilation include:

- Protecting employees and equipment from heat stress and dust exposure
- Field measurements and emissions quantification
- Secondary emissions control
- Molten metal transfer emissions control
- Process vessels secondary hooding
- Meet environmental compliance for visible emissions through building roof line
- Materials handling dust control



Process Evaluation and Optimization

WorleyParsons Gas Cleaning performs a wide range of process evaluation studies for existing plant operations for both ferrous and non-ferrous metallurgical applications. Typical studies involve process audits, energy audits and determination of requirements for adjustment of operating practices and evaluation of upgrades required for process equipment. Specific tasks may include:

- Evaluation of process flowsheets for existing processes
- Development of process flowsheets for new processes
- Techno-economic evaluation of new process technologies
- Pilot scale testing for new process technologies
- Process vessel design/re-design
- Development of process sensors to provide enhanced process control
- Development of modified operating practices
- Benchmarking of raw material consumption in process operations
- Debottlenecking and process optimization for ferrous, non-ferrous industries

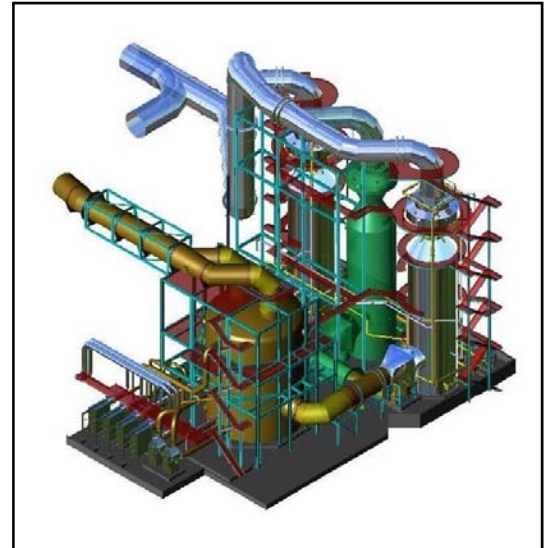




Process Operations Training and Start-up Assistance

WorleyParsons Gas Cleaning staff has experience in the start-up of process equipment, such as electric arc furnaces and ladle furnaces. Services span the fields of equipment selection, classroom training, as well as hands-on training and development of operating practices. Specific capabilities include:

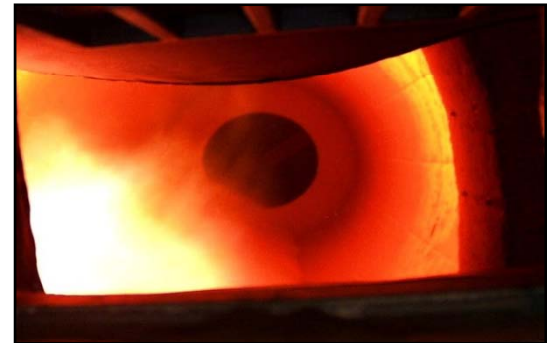
- Development of customized process training programs
- Development of operating practices
- Assistance with selection of raw materials
- Hands-on training in the plant
- Training the Trainers – programs are developed to assist supervisors in developing plant training programs for their specific areas of responsibility
- Coordination of benchmarking activities at similar process operations
- Assistance with obtaining government grants for training
- List of specific process training modules are available upon request



Engineering Design of Kilns and Furnaces

WorleyParsons Gas Cleaning staff has experience in the engineering design of kilns and furnaces. Our kiln and furnace design applications offer:

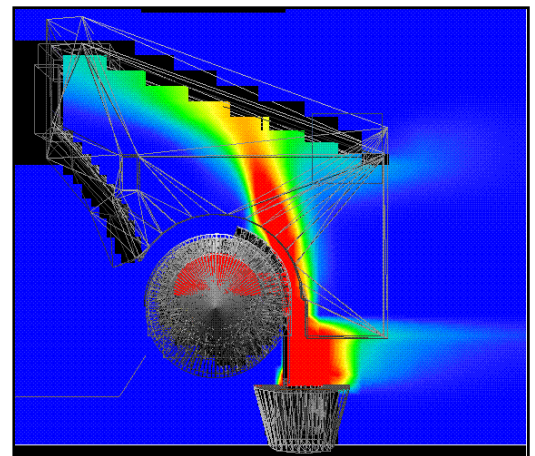
- Process design and metallurgical expertise
- Unique design application and expertise in copper cooling technologies and refractories
- Design of high power, high productivity units
- Design of various furnace types (electric furnace, blast furnace, cupola, fluid bed, and solid/gas reaction)
- Long campaign life, operating time, and less maintenance
- Specialized applications to obtain high processing rates
- Numerous proven retrofit improvements and greenfield installations
- Commissioning, ramp-up, and debottlenecking/optimization expertise



Process Modeling

WorleyParsons Gas Cleaning utilizes proprietary and in-house mathematical models for process simulation to optimize system design of gas handling systems and secondary fume control systems in process plants. We use Computational Fluid Dynamic (CFD) models as an effective design tool to predict the performance of gas handling systems for process plants. CFD provides the means to compare the relative performance of several design scenarios. Specific benefits of our CFD modeling techniques include:

- Predicting heat and contaminant exposure levels
- Evaluating performance of ventilation systems in process plants
- Predicting airflow patterns and contaminant migration paths
- Optimizing primary and secondary capture hood performance
- Predicting and optimizing process gas mixing and combustion systems
- Evaluating burner configuration and selection





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Our Vision

WorleyParsons will be the preferred global provider of technical, project and operational support services to our customers, using the distinctive WorleyParsons culture to create value for them and prosperity for our people.

Leadership

- Committed, empowered and rewarded people
- EcoNomics™ - Delivering profitable sustainability
- Integrity in all aspects of business
- Energy and excitement
- Minimum bureaucracy

Relationships

- Rapport with all stakeholders
- Open and respectful
- Collaborative approach to business

Agility

- Smallest assignment to world scale developments
- Local capability with global leverage
- Responsive to customer preferences
- Optimum solutions customized to needs

Performance

- Zero harm
- Results for our customers and other stakeholders
- World-class resources, capability and experience

EcoNomics™



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EcoNomics™

For further information about our global capability email:
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www.worleyparsons.com

