ABOUT TETRONICS

TETRONICS - SOLVING THE WASTE MANAGEMENT CHALLENGE

We are the global leader in the supply of Direct Current (DC) plasma arc systems for a wide range of applications including Hazardous Waste Treatment, Metal Recovery and Production Processes. Our capabilities encompass everything from initial modelling/feasibility assessment, pilot testing of the process material, through to design, supply, onsite installation/commissioning and on-going support of full commercial plants.

UNDERSTANDING WASTE

Waste management needn’t be a problem. Our technology is used to transform hazardous waste into a safe inert product (recovering value if present) not to ‘dispose’ of it. We see everything as having an opportunity for a closed loop lifecycle. Societies discard items at a particular stage, yet that isn’t the end of the material. Most have the potential to be reused, recovered or recycled in some form in order to generate further value; so allowing the resource to effectively become an ‘urban mine’. With waste being the only global resource not in decline, it makes sense that we change our behaviour to extend the lifecycles of our resources and maximise their value – a more sustainable and future friendly approach.

OUR EXPERIENCE

Tetronics’ track record in advanced environmental waste treatment and material recovery processes for a range of toxic, hazardous/industrial waste, as well as other resource rich streams, has resulted in more than 90 installations across a wide and varied range of applications. Tetronics continues to work in association with many of these customers in developing upgrade/optimisation improvements, providing specialist advice, spares and service.

“Tetronics’ experience in the application of plasma technology has resulted in an enviable international reputation, not only for the quality of plasma systems but also for the depth of technical expertise.”

FICHTNER
WHAT IS PLASMA?

Plasma; a controllable, clean, high temperature and versatile heat source.

Plasma is simply an ionised or electrically charged gas, and is often described as the fourth state of matter, i.e. when energy is added to a solid (first state) it becomes a liquid (second state); with more added energy it becomes a gas (third state) and when further energy is added it eventually disassociates to become a plasma. Examples of plasma are lightning, sparks coming from static electricity, fluorescent lights, arc welding and the aurora borealis (northern and southern (polar) lights). 99.9 percent of the Universe is made up of plasma.

WHY PLASMA?

Across the world regulations are tightening and the importance of Corporate Social Responsibility obligations growing, leading to:

- More material being classified as hazardous
- An increase in the number of hazardous waste producers
- A reduction in the availability of landfill
- Reduced freedom to transport and ‘export’ hazardous waste
- Increasing and unpredictable cost burden associated with waste treatment
- Pressure for recycling and recovery as opposed to disposal
- A decline in primary material sources – critical in manufacturing processes

Plasma overcomes these challenges with a unique portfolio of attributes that make it ideal for treating hazardous and industrial wastes as well as material recovery from waste. One of the key advantages of DC plasma arc technology is its broad versatility and wide range of applications. It can be used purely as a ‘clean’, controllable heat source, where other alternatives such as oxy-fuel heating lead to process chemistry changes or contamination of the product. It can be operated utilising inert or reactive gases at a range of pressures. The absence of combustion means that temperature control and process chemistry are independent of one another and also that the quantity of the off-gas and associated abatement equipment is greatly reduced. These attributes allow close process and environmental control whilst minimising plant operating costs.

The superb operating performance of plasma technology combined with its unmatched environmental compliance characteristics provides the secure business option for the treatment of and recovery from waste streams.

Tetronics: solving waste management for good, in both senses of the word
Solving the long term challenge of waste management
Provides a ‘future proof’ solution for managing business risk
Versatile with multiple industrial applications
Small physical footprint with no unusual building requirements
Readily retrofittable to existing plants
Wide feedstock flexibility
Robust and simple operation
Can generate value from waste
Clean functional heat source with strong environmental benefits
Heat input independent of process chemistry

WE PRIDE OURSELVES ON
- Credibility and spread of our reference plants and experience
- Superior technical performance of our technology
- Breadth and scope of our Intellectual Property – global patents combined with a deep technical competence
- On-going technical support to our customers
- Market, operational and compliance knowledge of our staff

COMMERCIAL ADVANTAGES
- Solving the long term challenge of waste management
- Provides a ‘future proof’ solution for managing business risk
- Versatile with multiple industrial applications
- Small physical footprint with no unusual building requirements
- Readily retrofittable to existing plants
- Wide feedstock flexibility
- Robust and simple operation
- Can generate value from waste
- Clean functional heat source with strong environmental benefits
- Heat input independent of process chemistry

Due to Tetronics success with their plasma technology in treating hazardous wastes such as SPL, we see Tetronics as a natural technology partner
ABOUT OUR TECHNOLOGY

PLASMA: AN ESSENTIAL WASTE MANAGEMENT SOLUTION

As plasma arc formation does not involve the direct combustion of a fuel to generate heat, it is considered a ‘clean’ heat source that does not introduce contamination. As well as intense heat, the plasma arc also emits high levels of light especially Ultra Violet, which aids the rapid destruction of organic compounds. Hence, harmful Persistent Organic Pollutants such as dioxins, PCBs, furans etc are all safely destroyed as part of the waste recovery process.

Due to their compact and controllable nature, Tetronics’ plasma systems provide unique opportunities for industrial processing. In fact, plasma is one of the cleanest thermal processing technologies available and allows Tetronics systems to treat an extensive range of wastes including both organic and inorganic hazardous wastes, transforming them into substances that are benign to the environment and producing valuable by-products for use elsewhere in industry so closing the recycling loop. Plasma technology is at its most beneficial in metal recovery processes, generating a higher recovery rate than alternative technologies and also in a range of production processes, where it can be used to improve the quality of materials and the efficiency of how they are produced.

PLASMA: THE ESSENCE OF TETRONICS

Tetronics has plasma at its very essence: TETRONICS = Tetra(Four) + Ionics(Ionised Gas). Our customers can be confident that through our expertise and experience in treating wastes with plasma, we can effectively support them with their waste management challenges.

"We selected Tetronics as they are considered the world leader in the supply of plasma systems"

FURUYA METAL
VALUABLE OUTPUTS:

Tetronics always looks at waste to identify the constituents of value that can be extracted. **Example recovered products include:**

- Spent catalysts, recovered as a ‘bullion’ containing Platinum Group Metals (PGM)
- E-waste and Waste Electrical and Electronic Equipment (WEEE), recovered as copper, gold, silver and PGM
- Hydrochloric acid as a pickling agent from Air Pollution Control (APC) residue treatment
- Stainless steel dust, recovered as an iron-nickel-chromium alloy for the steel industry
- Ilmenite ore tailings, recovered as an enriched slag for the titanium industry
- Basalt tailings, recovered for use in mineral wool production
- Carbon steel dust, recovered as zinc oxide for zinc smelting
- Chromite ore fines, recovered as ferrochrome for the steel industry
- Energy from high levels of organic hazardous wastes, such as oily sludges

In addition to the recovery of valuable metals, minerals, acids and energy, our plasma arc technology also produces an inert, environment friendly Environment Agency approved by-product (Plasmarok®), which can be sold as a material for a wide range of construction applications.

Intense heat and ultraviolet light transforms material eradicating any hazards elements
**Tightly controlled chemistry**

**Easy power adjustment**

**Robust, flexible and proven**

**Environmentally clean**

Transforms waste into a non-leaching and stable vitrified solid product (EWC 190401) which can be utilised as a construction material (e.g. building aggregate)

**High Destruction & Removal Efficiency (DRE) of hazardous organics e.g. dioxins and furans**

**Easy to retrofit to existing plants**

**Single plant capable of treating a wide range of wastes**

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**PLASMAROK®**

- From Waste to Product – certified as a product as it leaves the plasma furnace
- Plasmarok® - an Environment Agency certified product so no longer viewed as a ‘waste’
- Use - can be utilised for a range of construction applications (e.g. aggregate)
- Suitability - mechanically stronger than natural alternatives such as basalt and granite
- Safety - inert and extremely resistant to leaching – lower leaching profile than granite

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**PLASMA TECHNICAL BENEFITS**

- Tightly controlled chemistry
- Easy power adjustment
- Robust, flexible and proven
- Environmentally clean
- Transforms waste into a non-leaching and stable vitrified solid product (EWC 190401) which can be utilised as a construction material (e.g. building aggregate)
- High Destruction & Removal Efficiency (DRE) of hazardous organics e.g. dioxins and furans
- Easy to retrofit to existing plants
- Single plant capable of treating a wide range of wastes
Tetronics’ technology has been tried and tested over five decades with more than 90 installations globally across a wide and varied range of applications. Our customers can rest assured that Tetronics offers the versatility and experience to deal with their industry’s specific waste challenges.

Applications include, but are not limited to:

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EXPERIENCE TREATING WASTE IN YOUR SECTOR

Through our years of experience delivering plasma systems, Tetronics provides hazardous waste treatment, metal recovery and production process solutions to support our customers across a wide range of industries and applications.

“Our customers can rest assured that Tetronics has decades of experience across many industries around the globe in processing problematic wastes in a stable and cost-effective way.”
HEAR OUR CUSTOMERS:

GREEN ENERGY PARK (REFERENCING ENERGY PARK PETERBOROUGH)
“Tetronics’ plasma-enhanced waste treatment technology has been the final piece to the puzzle ensuring the absolute minimum of residues from the treatment process need to be landfilled. Tetronics’ contribution has been vital in guaranteeing a practically zero waste facility is achieved.”

HARSCO METALS
“The Tetronics technology will enable our customers to recover valuable resources from waste that they can reuse in their manufacturing processes in a sustainable “closed loop model”

FURUYA METAL
“We selected Tetronics as they are considered the world leader in the supply of plasma systems and have extensive experience in the delivery of metal recovery solutions specifically designed for the recovery of PGMs from catalyst wastes.

MITSUBISHI CORPORATION
“We see the treatment of Spent Potliner as a natural progression to the current services we offer to the aluminium industry and given the experience of Tetronics and the success of their plasma technology in treating hazardous wastes such as SPL, we see Tetronics as a natural technology partner.”

“Refining technology is of course important to us, and we are confident that Tetronics’ plasma solution provides higher levels of technical recovery than any competing technology”

SOLAR APPLIED MATERIALS TECHNOLOGY CORP., TAIWAN
HAZARDOUS WASTE

Tetronics uses its patented plasma arc technology at the core of our waste treatment plants, offering in many cases a near zero waste outcome and recovery of usable materials, even when looking to treat hazardous wastes. **Example industries supported:**

**CASE STUDY - Fly Ash & APC Residues**
APC residues are a mixture of fly ash, organic pollutants (including dioxins and furans), carbon and alkaline salts in powder form. They are generated from processes associated with the operation of solid waste combustion (approximately 80% generated by this route) or other thermal waste management processes. APC residues are classified as hazardous waste as they contain high levels of dangerous substances. APC residues typically account for approximately 3.5-5% by weight of waste input of thermal treatment technologies such as incineration.

**CASE STUDY - Organics e.g. PCBs**
PCBs in particular have been used in many different products, including electrical equipment, surface coatings, inks, adhesives, paints, flame retardants, pesticides, and other applications that required products with high heat resistance, elasticity and durability. They are some of the most Persistent Organic Pollutants (POPs) in the environment and have posed an environmental problem, with instances of improper disposal resulting in an almost ubiquitous contamination of the environment. They are considered to have carcinogenic effects in mammals and can cause severe poisoning when introduced into the food chain.

**CASE STUDY - Spent Potliner**
Spent Potliner (SPL) is a contaminated graphite/ceramics cell waste generated in the primary production of aluminium and worldwide is estimated to arise at a rate of over 500,000 tonnes per year. This waste has been identified as an extremely problematic hazardous waste because it contains concentrations of cyanide and fluoride and gives off noxious and flammable gases when in contact with moisture. These contaminants readily "leach" into the surrounding soils and groundwater during both short term and long term storage and can cause potential contamination of drinking water reserves. Because of this concern, SPL must be managed and disposed of in an appropriate manner.

**CASE STUDY - Asbestos**
Asbestos Containing Materials (ACM) and Refractory Ceramic Fibres (RCFs) are toxic and when inhaled can cause serious illnesses, including lung cancer and asbestosis (a type of pneumoconiosis). Since the mid-1980s, use of Asbestos has been banned and in most territories its use is strictly prohibited and the subject of specific regulation. Unfortunately, due to its use in manufacturing and construction as a preferred material up to well into the 20th century, asbestos is now a widespread problem. The resistance to heat and chemical damage in raw and cemented product form make this type of toxic material waste disposal very challenging.
CASE STUDY - Petrochemical Wastes

Heterogeneous soil contamination is caused by the presence of man-made chemicals or other alteration in the natural soil environment and includes Persistent, Bio-accumulative, and Toxic (PBT) pollutants organics such as PCBs, inorganic contaminates like asbestos containing materials and metallic pollutants like hexavalent chromium. This type of contamination typically arises from industrial or municipal activities and events such as the rupture of underground storage tanks, application of pesticides, percolation of contaminated surface water, oil and fuel dumping, leaching of wastes from landfills or direct discharge of industrial wastes to the soil.

Spent zeolite catalyst materials used in Residue Fluidised Catalytic Cracking (RFCC) units

General oil waste including oily sludge/cakes from oil tank cleaning operations

Hazardous streams with heavy metal contamination and POPs e.g. PCBs and HCBs.
HOW TETRONICS CAN HELP UNLOCK VALUE FROM THESE WASTES

Tetronics’ plasma waste recovery plants offer a near zero waste outcome and commercial advantages over existing waste management solutions across a growing number of hazardous waste applications. The decontamination process in Tetronics’ plasma enhanced waste recovery technology is designed to separate and destroy the hazardous components leaving a non hazardous material with a valuable secondary use. The intense temperature and ultra-violet light applied in the plasma process results in an extremely high Destruction and Removal Efficiency (DREs) with levels of 99.9999% typically achieved.

The remaining material is an inert product called Plasmarok® that can be employed in a range of applications, such as a simple construction aggregate - reducing landfill liabilities. Where practical, Tetronics always aims to extract additional value from a waste stream, for example, when treating APC residue it is likely that Tetronics will be able to extract the hydrochloric acid or when treating petrochemical wastes there is the potential for energy recovery, enabling our customers to extract the maximum value from their waste. The robust level of construction and minimal number of moving components delivers outstanding plant availability and operational longevity. The process also has exceptional environmental and commercial credentials and can be considered as a future proof solution, removing the business risk associated with unknown future landfill availability, disposal costs and tightening regulations.

“Tetronics typically achieves Destruction and Reduction Efficiency (DREs) levels of 99.9999%”
METAL RECOVERY

Example industries supported:

**Electrical Wastes**

CASE STUDY - PM Recovery from e-Waste

Waste Electrical and Electronic Equipment (WEEE) consists of discarded electrical or electronic devices from domestic, commercial and industrial sources. In the past the disposal of electronics waste was largely unregulated. Not only did this permit a rather informal attitude to the processing of electronic waste, which can lead to serious health and pollution problems, but it also allowed society to discard a major source of scarce and valuable metals. Following the introduction of the WEEE Directive in Europe, the focus of WEEE treatment has shifted towards the recovery of valuable Precious Metals including copper, gold, silver and palladium. As awareness grows of the strategic nature of Precious Metals, so electronics waste will be seen increasingly as a valuable source of these metals, and ‘urban mining’ will become an ever more attractive option for material supply.

**Catalyst Wastes**

CASE STUDY - PGM Recovery from Catalysts

Catalyst wastes, including automotive catalytic converters and industrial catalysts, for example from the chemical and petrochemical industries, contain Precious Metals and specifically the Platinum Group Metals (PGMs) that are valuable as a result of their low natural abundance, unique properties and the complex processes that are required for their extraction and refining from primary sources. Whilst PGMs are found as naturally occurring ores, these metals may also be obtained by recycling PGM bearing wastes. When recycled, these waste streams are typically orders of magnitude richer in PGMs than their naturally occurring ore equivalents, helping to conserve natural resources and balance supply and demand. Therefore, it is both financially beneficial and environmentally responsible to recycle spent catalysts.
CASE STUDY - Base Metal Recovery from EAF Dust

During the manufacturing of steel, a significant amount of hazardous baghouse dust is produced that contains zinc and other metals as well as minerals generated from the steel smelting process. This dust is typically extracted by the air pollution control system on an EAF. The traditional means of disposing of EAF dust is in hazardous waste landfill sites where the tonnage cost varies from country to country; but commonly the costs continue to rise. Steel plant waste is difficult to recycle back through the primary steel plant facility because of environmental compliance issues and/or their physical form as particulates/dusts. The challenge is finding a solution capable of separating the valuable recyclable metals for either resale or reuse, from the hazardous waste.
Tetronics has extensive experience in the delivery of metal recovery plants specifically designed for the recovery of Precious and Base Metals. The process chemistry in Tetronics’ plasma enhanced recovery technology is designed to preferentially separate and recover the valuable material whilst destroying any hazardous components. The remaining non-valuable material is vitrified into an inert, safe disposable non-hazardous material in a single processing step.

The high specific values of these types of waste streams provide a compelling justification for investment in a plasma based metal recovery plant and a typical payback period (dependent on scale and material) of two to five years or less can often be achieved by installing a Tetronics plant. We are confident that Tetronics technology offers the best technical recovery rates available for these process applications at a scale appropriate for the industry. The robust level of construction and minimal number of moving components delivers outstanding plant availability and operational longevity. The recovery process also has exceptional environmental and commercial credentials and can be considered as a future proof solution for metal recovery challenges.
PRODUCTION PROCESSES
For more than 25 years, we have supplied Tundish Plasma Heating (TPH) equipment to some of the most important steel companies in the world where the technology has delivered many proven quality and productivity benefits for our customers. This technology has been used to control the temperature of carbon, alloy and stainless steels and has been fitted to all major types of casting machine. Controlling the temperature of the steel entering the continuous casting mould is a central feature of all steelmaking practices. Great efforts are made throughout the steelmaking and casting process to ensure that the steel has the correct superheat at each stage of its journey. However, significant variations in casting temperature still occur and these variations lead to a range of problems in steel quality and caster operation. Tetronics’ TPH technology enables the steelmaker to keep the superheat within the optimum range at the last point before it enters the mould.

By using plasma as a clean and controllable heat source, the product has a high degree of integrity, as the absence of any natural gas flame means the resulting product is free from bubbles, contamination and other defects. **Example industries supported:**

**Steel Production**

**CASE STUDY - Steel Tundish Heating**

Tetronics’ twin torch system has been used continuously for the commercial production of high quality silica glass for optical applications since 1992. Tetronics’ unique twin torch technology allows a Plasma Arc to be stabilised in space, which enables a falling stream of high quality silica powder to be melted at the junction of the two arcs to form an ingot of high optical quality silica glass. By using plasma as a clean and controllable heat source, the product has a high degree of integrity, as the absence of any natural gas flame means the resulting product is free from bubbles, contamination and other defects.

**Silica Glass Production**

**CASE STUDY - Silica Glass Production**
CASE STUDY - Titanium Smelting

Tetronics’ innovative anode torch design has resulted in compact transferred arc torches, which can be constructed without the need for tungsten or other heavy metals that are highly undesirable in the melting of titanium alloys. This has enabled Tetronics to provide plasma torches for the welding and melting of titanium sponge to the titanium industry for over 25 years. The clean controllable heat source, combined with a highly compact torch design, easy torch maintenance, long component life and low argon flow rates have continued to be a winning combination in what remains one of the most demanding plasma torch applications.

CASE STUDY - Gas Heating

Tetronics gas heating torches are based on Tetronics’ highly successful Direct Current (DC) system, operating in a non-transferred arc mode. They have a typical operating power of between 50 and 300 kW and can accept almost any gas as the working gas to be heated. Their design makes them ideal for providing a clean, controllable source of heated gas (without contamination by combustion gases) at up to 2000 °C. Gas heating torches are typically supplied as a packaged heater with all necessary controls, water cooling, gas delivery system and plasma power supply, with options for flange mounting onto the outside of a furnace or in a water cooled tube which projects into a furnace. Our gas heaters are currently being used in a range of industries including: steel making, advanced materials and nanopowder production, organic waste treatment and high temperature materials testing.
For decades, Tetronics have been supplying production process equipment to some of the most important companies in the world.
Tetronics’ plasma trials facility, the most comprehensive of its type in Europe, has a unique suite of highly flexible pilot scale furnaces for conducting plasma trials across a wide range of material processes including:

- Hazardous waste treatment
- Metal recovery
- Production processing

Tetronics has a unique suite of highly flexible furnaces for conducting plasma trials across a wide range of processes, including: hazardous waste treatment, metal recovery and production processes. These furnaces are supported by all the necessary services and utilities, under the appropriate regulatory approvals from the UK Environment Agency and backed up by comprehensive data acquisition and external chemical analysis services. This enviable combination of facilities continues to enable Tetronics to investigate the plasma treatment of an enormous number of wastes and other materials in support of client and government-sponsored programmes, often as a prelude to the supply of major capital equipment.

Tetronics’ trials facilities are built around its highly flexible plasma furnaces. Four plasma furnace stations can be configured in a variety of ways to cover different mass throughputs and operating conditions. Depending on the specific requirements of the plasma trial, containment for the molten material can be provided by refractory lining, graphite crucible or water-cooled copper hearth, while plasma heating can be provided by single or twin graphite electrodes or plasma torches. At the end of a plasma trial the molten contents can be allowed to solidify in-situ for later removal by mechanical means or tapped, by oxygen lancing or tilt pouring. In some configurations it is also possible to tap separate molten layers, e.g. metal and Plasmarok®, as individual streams. Feeding as required.
The operation of the plasma furnaces is supported by all the necessary services and utilities. The Direct Current (DC) plasma power supply and associated bus bars are capable of delivering up to 5,000 Amps at up to 600 Volts, while power output is only limited by the 1 MW thermal load management of the water cooling system. Deionised and raw water systems are available for cooling the equipment and a wide variety of gases can also be provided to the process, including for bubbling through the melt if required. Solids feeding systems are provided for all furnace stations, with a typical feed rate of up to 100 kg per hour; liquids feeding systems are also available for all stations, either alone or in conjunction with solids feeding as required.

“The Tetronics technology will enable our customers to recover valuable resources from waste that they can reuse in their manufacturing processes in a sustainable ‘closed loop model’.

We have first-hand experience and trust in Tetronics and the effectiveness of their DC plasma arc technology.

HARSCO CORPORATION
DATA ACQUISITION & CONTROL

The plasma furnaces and all supporting services are linked to a central Supervisory Control and Data Acquisition (SCADA) system and a plant safety system. These provide the necessary interlocks and alarms to protect operating personnel and equipment and ensure the operating conditions used during the plasma trials are recorded for later diagnosis and analysis. In conjunction with chemical analysis that is provided by independent accredited organisations on the raw materials and solid, liquid and gaseous products from the trials, a comprehensive data suite are recorded, enabling Tetronics to provide a complete picture of the process being investigated. Such knowledge often forms the basis of process and business models for larger commercial plants, which in turn provide our customers with a high level of confidence in Tetronics’ plasma technologies as the solution for their materials processing requirements.

ENVIRONMENTAL

The Tetronics plasma trials facilities are operated under the terms of the latest UK Environmental Permitting regime and the receipt and dispatch of all materials are handled by qualified personnel. Regular monitoring of gaseous emissions to atmosphere ensures that customers and public alike can have the confidence that all trials fulfil our clients’ duty of care by being conducted in compliance with the terms of our licence to operate.

“\nWe always consider the client’s commercial and environmental position in offering capital plasma equipment and associated technology licensing agreements.”
COMMERCIAL & TECHNICAL

COMMERCIAL

Tetronics experience and technical expertise ensures all of our clients benefit from industry leading levels of support and advice throughout their journey from order placement to installation and commissioning. We offer a simple yet comprehensive step-by-step process that is flexible enough to be tailored to a client's specific need.

We provide a wide range of supporting technical services at all stages of project development to ensure that the plasma system is efficiently integrated with the balance of the plant. The value of many years of collective know-how and experience can be put at our customers' disposal on a number of fronts including initial testing of the process material, through design and procurement to onsite installation/commissioning and on-going technical support, servicing of full commercial plants. In particular, we can advise a customer on how best to incorporate a Plasma Arc system into their process, either through the supply of a new stand-alone plant or as a retro-fit to an existing process, and the type of plasma device that would be the most appropriate. Furthermore, our expertise extends far beyond capital equipment supply.

COMMERCIAL PROCESS

ASSESSMENT OF CLIENT REQUIREMENTS → FEEDSTOCK ANALYSIS → FEASIBILITY STUDY → ENVIRONMENTAL COMPLIANCE → SITE VISIT → INSTALLATION → COMMISSIONING → ON-GOING SERVICE & SUPPORT
FEASIBILITY STUDIES

Tetronics are able to offer comprehensive feasibility studies from desktop modelling through to onsite surveys and processing of our clients’ feedstocks at our Swindon plant. Customers can utilise our experience in process design, engineering and manufacturing complimented by project management, commercial and environmental regulatory expertise.

BUSINESS MODELLING

Our expertise is used to engineer plasma solutions on a bespoke basis to meet specific client and territory needs. We always consider the client’s commercial and environmental position in offering capital plasma equipment and associated technology licensing agreements. As a result, Tetronics’ technology is scaled and configured for prevailing local conditions and we work with clients to determine an optimal configuration for their circumstances.

We understand that plant requirements change and therefore Tetronics offers technical/ process auditing and optimisation expertise during the lifecycle of a plant to ensure on-going value for the client. In support of project development, Tetronics is able to thermochemically model plasma processes, which result in accurate operational and capital cost assessments. These assessments, when combined with customer specific financial assumptions can be combined with peripheral requirements, e.g. civil and permitting activities, to give a complete project based profit and loss profile as well as cash flow.

PROCESS MODELLING

Through our many commercial and research projects covering a very wide range of materials and processes, we have the experience and the tools to provide a process modelling facility for your melting, smelting, waste treatment or waste recovery problem. Tetronics has developed close relationships with a number of accredited external laboratories who can carry out chemical analysis of raw materials and products, leachate testing and a variety of microstructural and materials characterisation tests. Heat and mass balances can be generated for each process step, whilst thermal modelling of reactors and vessels provides heat loss data for the models.

Our extensive library of previous plasma applications enables us to predict appropriate voltage and current characteristics for the plasma process itself and allows us to generate operating plans and process flow diagrams as desired. Tetronics can provide additional support to these process models through live testing of a client’s materials in our comprehensive plasma trial facilities and by developing commercial models of operating cost, capital cost, IRR, etc. to the client’s own requirements.
PERMITTING & REGULATION
Our team of engineers includes Technically Competent Environmental Managers and have full lifecycle experience of plasma technology in commercial application. Tetronics can provide assistance and guidance with waste characterisation and classification activities in line with regulatory frameworks. Process modelling, equipment specifications and operational experiences are used in support of permit applications and determination processes.

Tetronics' technology is licensed in some of the most stringent territories in the world, providing for strong case references. Tetronics process technology is specified and configured to assist clients in fulfilling their duty-of-care responsibilities. We understand the importance of compliance during operation and have worked with competent authorities to support their understanding of plasma technology and the environmental impacts surrounding it.

Downstream of the plasma step there are requirements to support product qualification activities. Here Tetronics has successfully engaged with competent authorities, after comprehensive testing, to ensure Plasmarok® is regarded as fully recovered, and therefore a product, at the point it exits the plasma furnace. This underpins the technology's credentials as a recovery solution intermediate within the waste management hierarchy.

FIELD SERVICES
Tetronics maintains a highly skilled Field Service Team for the purpose of installation, commissioning, operation, maintenance and technical support. Our multi-faceted, highly qualified field team has vast experience applying the technology to an unrivalled range of applications. Field services include:

- Electrical, Automation and Mechanical Service Engineers
- Systems Integration Engineers
- Process Engineers
- Project Manager and Engineering Managers

SPARES
Our waste treatment facilities and recovery plants are built with a robust level of construction and minimal number of moving components in order to deliver outstanding plant longevity. When new or replacement parts are required, Tetronics is available to its customers to fulfil any requests as quickly and efficiently as possible.

“Our Tetronics technology functions very well - we need few spare parts”

GEKA
Why Plasma

`Solves the long term challenge of waste management`

`Plasma technology is a commercially proven robust solution for hazardous wastes and metal recovery`

`The technology provides an ideal solution to the world's growing waste problems and is commercially attractive for most industrial scales of waste generation/treatment`

`The technology's environmental and sustainability credentials are ‘best in class’`

`The technology provides a ‘future-proof’ solution to industries ever changing waste challenges`