

# Tetronics: Treatment of Waste Electrical and Electronic Equipment

## Tetronics Benefits:

Complete gasification of the plastic and other organic components, which greatly reduces the mass and volume of the waste stream, and avoidance of the reformation of Persistent Organic Pollutants (POPs)

Recovery of metals including Precious Metals e.g. Au, Ag, Pd

Robust technology that is tolerant of a challenging chemical environment, e.g. Chlorine

Encapsulation of any hazardous metallic species within the Plasmarok® phase

Higher technical recovery rates than competing technologies: >99% for Cu, Au and Ag, typically ≥98% for Pt and Pd

Lower capital and operating costs than competing technologies

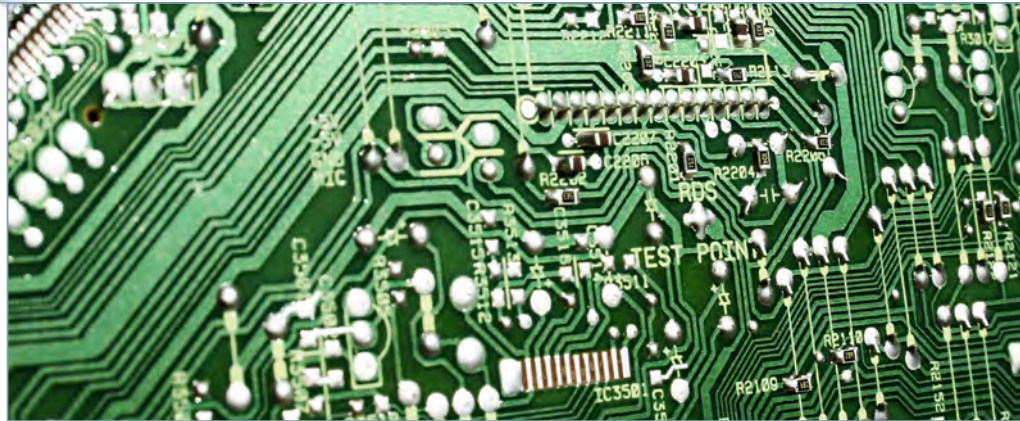
An intensive, compact process plant package that can be readily retrofitted adjacent to existing installations

Control of power input independently of process chemistry

Rapid Precious Metal returns

Process applicable to a range of different Precious Metal waste streams

Environmentally compliant closed loop recycling (extremely low air-borne emissions)



Treatment of Electrical and Electronics waste using Tetronics' patented technology offers commercial advantage over alternatives while conserving natural resources.

### About Tetronics:

Tetronics Ltd is a global leader in the supply of Waste Recovery Plants. We have the capability to manage the complete deployment lifecycle of a Waste Recovery Plant from initial testing of the waste material at Tetronics' test facility, the most comprehensive in Europe, through to the physical onsite installation of a full commercial plant, and subsequent support and maintenance.

Tetronics' patented Direct Current (DC) Plasma Arc plant technology provides the closest solution to Zero Waste currently available. This "green" sustainable alternative for waste management uses ultra-high temperatures to melt, gasify or vaporize any waste material, in order to treat, recover or generate useful commercial products.

As a pioneer in using plasma technology for waste treatment, our multi-faceted, highly qualified research and engineering team have applied the technology to an unrivalled range of waste challenges.

Our technology has been tried and tested over five decades and has been used globally in more than 80 plants across a wide and varied range of applications.

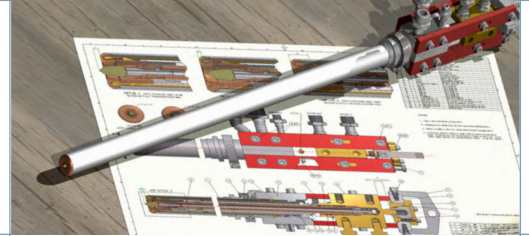
These applications include, but are not limited to: transforming hazardous waste into environmentally safe building aggregate, recovering precious metals from spent catalysts, recovering energy from waste oil, reducing the volume of radioactive materials and improving the quality and efficiency of steel production.

Our principal aim is to provide sustainable and future proof solutions to support organizations in recovering value from their waste materials while meeting their waste disposal carbon footprint challenges.

### What is WEEE:

Waste Electrical and Electronic Equipment (WEEE) describes loosely discarded, surplus, obsolete or broken electrical or electronic devices. Research shows that informal processing of electronic waste can cause serious health and pollution problems. The Waste Electrical and Electronic Equipment Directive (WEEE Directive) was introduced in January 2007. The WEEE Directive aims to reduce the amount of electrical and electronic equipment being produced and to encourage everyone to reuse, recycle and recover it.

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## WEEE Challenges:

Some WEEE have parts that contain hazardous substances, e.g. mercury in some switches, lead in solder and cadmium in batteries. However since 1st July 2006, these materials are being progressively phased out. Most electrical and electronic products' lifetimes are around 10 years, therefore, after 2016 the treatment of WEEE will focus on Precious Metal (PM) recovery, with less emphasis on material hazard.

As time progresses, WEEE will increasingly be seen as a valuable source of PM, and 'town mining' will become a more attractive option for material supply, due to the increasing scarcity of natural resources and difficulties in working with them. Furthermore, the market for electrical components is growing in line with consumer demand and the UK now throws away 1.2 million tonnes of WEEE every year, equivalent to 20kg per British inhabitant per year. In the EU only 33% WEEE is reported as collected and treated. Examples of high value PM streams are:

- ✓ Integrated Circuit (IC) Sweeps (Au 200-3500 ppm, Ag 0.2-3%)
- ✓ Multilayer Ceramic Capacitors (MLCC) (Ag: 1-15%, some contain Palladium 0-17,000ppm)
- ✓ Recovered IC Copper Powder (contains Au 50-500 ppm)

Subject to waste availability, the high specific values (7k–100k \$/tonne) of these waste streams provides a compelling justification for investment in a plasma based PM recovery plant; as capital payback is achieved within 1–2 years at waste throughputs of 1,500–2,000 tonnes per year.

## How Tetronics can Help:

Using Tetronics' plasma-enhanced smelting technology, pre-segregated and crushed WEEE is fed into a sealed furnace, and heated in a controlled environment using the plasma arc created by single or multiple plasma electrodes. The process chemistry is designed to preferentially separate the valuable metals from the less valuable material. This less valuable material is transformed into a disposable vitrified product in a single processing step. The plastics can be converted to synthesis gas for direct utilisation; however the calorific value of these species is more usually utilised as a fuel supplement to minimise primary power requirements. Tetronics' patented technology is mature and has been successfully employed in a wide range of environmental applications. For some WEEE with a high organic content, a two stage pre-incineration stage is used to prepare the material for a furnace smelting operation.

Contact Tetronics to find out how we can assist with your WEEE Challenge.

*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:

a leading engineering, project management and technical advisor to the waste management, process and renewable energy sectors.

\*Plasmarok® is a dense, mechanically strong and environmentally benign product that can generate value as it may be readily employed in a range of building applications.

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