



## CHARACTERISATION LABORATORIES FOR ENVIRONMENTAL ENGINEERING RESEARCH

The CLEER facility has a wide range of analytical equipment for the identification and quantification of organic and inorganic components in solutions, gases and solids

- o **Perkin Elmer Optima 2100 DV ICP-OES** for elemental analyses
- o **Dionex ICS-2000 Ion Chromatograph** for quantification of dissolved species
- o **Hitachi U-1900 Spectrophotometer and portable spectrophotometers**
- o **Perkin Elmer CLARUS 500 Gas Chromatograph and Mass Spectrometer** for identification and quantification of organic compounds. Fitted with a Automated Turbomatrix Headspace Sampler and Thermal Desorber.
- o **Varian CP-4900 Micro Gas Chromatograph** for analysis of light gases
- o **Dionex ASE 100 Accelerated Solvent Extraction System**
- o **Malvern MasterSizer** for particle sizing
- o **Malvern ALV/CGS-3 Compact Goniometer System** for sizing sub-micron particulates
- o **Malvern Zetasizer Nano** for measuring zeta potentials
- o **Anton Parr Multiwave 3000** for the microwave assisted digestion of solids for subsequent ICP-OES analyses
- o **XRD (Philips PW1710 diffractometer)** for identification of crystalline solids
- o **XRF** for elemental quantification
- o **Shimadzu Total Organic Carbon and Nitrogen analyser** for analysis of Total organic and inorganic carbon and nitrogen in solids and liquid samples.
- o **Optical Microscopy**
- o **Facilities for rock crushing, milling, materials shredding and Materials screening**
- o **Flotation cells, Pressure & vacuum filters, Centrifuges, Drying and roasting ovens**
- o **Heavy media separation equipment and Multi-gravity separator**

### ACCESS TO:

- o **Scanning Electron Microscopy (SEM) with EDX analytical tool**
- o **Transmission Electron Microscopy (TEM)**



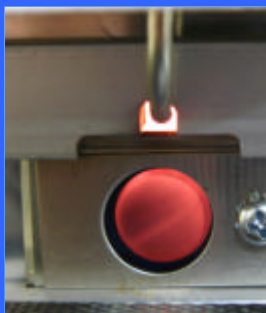
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## CHARACTERISATION LABORATORIES FOR ENVIRONMENTAL ENGINEERING RESEARCH

### Expertise

- Acid Mine Drainage · Bespoke Leach testing · Chemical Analyses
- Characterisation of solids, liquids and gases · Composting · CO<sub>2</sub> Capture · Effluent Characterisation · Energy Management · Environmental Engineering · Kinetic Testwork for Mining Wastes · Landfill Leachate Studies · Leachability Studies · Mine Water Treatment · Minerals Engineering · Mine Waste Characterisation · Noise Surveys · Particulate Sampling and Characterisation · Resource recovery from solid and liquid wastes · Thermal processes: pyrolysis and gasification of wastes and biomass · Underground Coal Gasification · Waste Management · Waste Gasification · Wastewater Treatment · Water Treatment





## BUSINESSES ASSISTED - CASE STUDY

Welsh Water / Imtech Process had a problem at one of their treatment works. An unknown mineral scale was found to be developing in the pipes and pumps leading from the anaerobic digesters. This scaling was causing severe operational difficulties, resulting in pipe blockage and breakdown of pumps within weeks of operation. The Cardiff School of Engineering was approached and tasked with identification of the scale, identification of the cause of its formation and to suggest remedial options. CLEER staff used the facility's equipment to identify the scale, and used expertise in geochemical modelling to model the system and discover the root cause of the scale formation. Once this scale formation mechanism was established, remedial options were trialled in the computer model until a selection of the best three options was produced. The subsequent written report to Imtech Process / Welsh Water allowed this expert advice to be implemented and scale formation prevented. This combination of analyses allied with specialist theoretical knowledge and modelling is a typical example of the unique strengths of the CLEER facility.

## OTHER EXAMPLES

o**Sony** A review of process water usage was conducted for Sony at their former Bridgend site and recommendations made to where costs could be potentially reduced. In conjunction with Aquatreat and General Waters pilot plant trials on water recycling were then conducted to fully identify the financial and environmental benefits of recycling the waste water.

o**L'Oreal** Analyses of rainwater from the rainwater collection systems and advice on what treatment is required to make the water suitable for re-use in the boiler systems.

o**Barrick Gold Corporation** Formation of a collaborative relationship with Barrick and a Russian Research Institute to facilitate the formation of a joint commercial and research program.

o**BioSystems Europe** Advice on use of CLEER for treatability studies for bioremediation.

o**Chevron** Chemical analyses of process waters.

o**Coal Authority** Contract Research on mine water treatment systems.

o**Corus** Ongoing process studies and production of environmental data.

o**Environmental Pollution Abatement** Technical review of a carbon dioxide scrubbing system.

o**Environment Agency** Analyses related to nutrient availability.

o**G24i Innovations Ltd** Imaging and analyses of photovoltaic cells using electron microscopy.

o**LAS waste** Numerous analyses during collaborative research.

o**Mael Gwyn** Mineral processing and Knowledge Transfer Partnership.

o**Mouchel Parkman Ltd** Collaborative research relationship developed for mine water treatment.

o**Panasonic UK Ltd** Expert advice on dust analyses using electron microscopy.

o**Renishaw Plc** Bespoke analysis to identify problematic deposits occurring within laser systems.

o**SRK Consulting (UK) Ltd** Various and numerous large commercial and contract research concerning the environmental impact of mining wastes and waste processing technologies.

o**Unipure Europe Ltd** Inorganic and organic contaminant analyses; expert advice on geochemical modelling of water treatment processes.

o**Zenith Media** Advice and water analyses.