



## Welcome to the September 2024 edition of LPD Lab Services Newsletter.

LPD Lab Services are the experts in materials, chemicals, technical engineering and scientific problem solving for products and manufacturing processes across all sectors within Quality Assessment, Facilities, Manufacturing, Engineering, Product and Process, Development and Research. LPD Lab Services develop innovative and practical analytical solutions, as well as bespoke testing methods for in-process manufacturing, finished products and field failure, plus help develop new production processes, products and materials. Staff pride themselves resolving some fascinating and complex technical problems from across diverse product ranges and sectors of industry. The laboratory offers scientific and engineering solutions, with timely response times and clear communications, which are all core to the company's business model.

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Meet our Technical Director Dr Wyndham Johnstone

### Metallurgy Failure Analysis and Consulting

Metallurgy is a term that includes a wide range of practices related to the extraction of metals from their ores, refining the metals, producing alloys, and shaping and manipulation of their properties in real world applications. Metallography is a branch of metallurgy that is concerned with the examination and characterisation of the structure of metals and alloys to access the material and associated mechanical properties created.

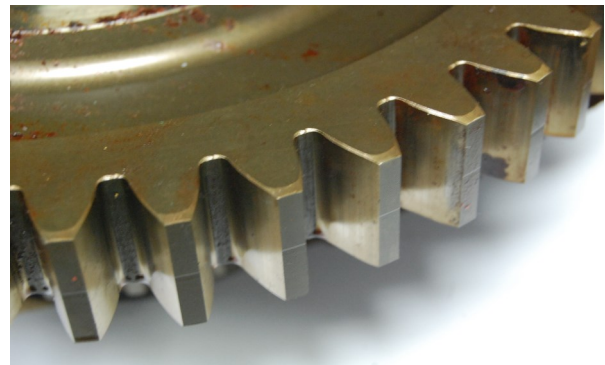
At LPD Lab Services analysis, interpretation, and consultancy of components made of different metals and alloys are carried out, or overseen, by the laboratory Senior Metallurgist.

### Typical metallurgical support work conducted at the laboratory includes:

- Engine component failure analysis and internal corrosion.
- Bearing failure investigation.
- Tool failure and cutting metallurgical failure investigation.
- Weld assessment and failure investigation, weld inclusions and determination of size of heat affected zone (HAZ).
- Checking grades of steel, cast iron, brasses, bronzes and aluminium alloys.
- Cleaning and degreasing of metals.
- Microstructure and grain size assessment.
- Corrosion and high temperature oxidation of metals.
- Assessing heat treatment and surface treatment of metal components.
- Powder metallurgy and failure investigation including sintering and green cracking problems.
- Surface preparation, chemical etching, electrochemical and pickling processes.
- Anodising of aluminum alloys and castings for painting or adhesive bonding.
- Hardness measurement and assessment of friction and wear.
- Alloy and metal component analysis: Conformation of raw material structure and composition.
- Landfill gas engine and power generation system failure investigations.
- Plating blistering and uniformity using cross-sectional analysis.
- Parts comparison for engine production and alternative supplier evaluation.
- Root-cause for overload failure in cast metal components.
- Galvanised coating assessment and thickness measurements.

### Inorganic Chemical Analysis Capability

#### Anion and Cation Chromatography



Ion Chromatography (IC) is a specific form of chromatography that separates ions or ionisable polar molecules based on their affinity to an ion exchange column. There are two types of ion chromatography; anion-exchange when the analytes of interest are negatively charged and cation-exchange when the analytes of interest are positively charged.

LPD Lab Services can test for a wide variety of analytes; both anions and cations, and tailor analysis and methods used to suit a client's needs. Anion and cation ion chromatography can be applied to a wide range of customer samples and the lab regularly tests samples for clients that include water quality and waste water from various different industrial processes as well as suspect contaminated chemicals and material surfaces such as pipework and PCBs.

Often clients are also interested in any anions that may indicate the presence of weak organic acids such as acetate and formate, particularly in conjunction with other analytical techniques as part of corrosion investigations. The presence or absence of certain ions can often aid a client in determining how their product or process failed and whether or not this was due to unwanted contamination or from a failure within the process itself.



## ICP-MS

Inductively Coupled Plasma Mass Spectrometry (ICP-MS) is a technique routinely used to analyse trace levels (ppb) for a wide range of inorganic elements ranging from amu 7 (lithium) to amu 250 (uranium). Analysis can be carried out on a variety of sample matrices to allow for accurate reliable results. Full quantification methods can be used to measure known elements within a calibration range. Total quantification method can be used to measure unknown elements not included within the calibration range. Detection and quantification limits can be at ppm and ppb levels for elements of interest.

Kinetic Energy Discrimination (KED) is a technique used to reduce polyatomic ion interferences derived from plasma interferences in a collision cell, to allow for more accurate results for problematic elements like silicon, calcium and iron.

ICP-MS analysis can also differentiate between different isotopes within the same element to determine isotope enrichment within samples.

## AAS

Atomic Absorption Spectroscopy (AAS) is an analytical technique that uses the principle that atoms absorb light at specific wavelengths allowing element concentrations to be calculated in a solution. Light of a specific wavelength appropriate to the element being analysed is shone through the flame, resulting in an absorption which is proportional to the concentration of the element. The solution can be aqueous, organic liquid, or solid, if it can be dissolved.

LPD Lab Services has a Varian SpectrAA 55b AAS instrument, capable of measuring a large range of concentrations, from percentage to parts per million (ppm). This means it has a wide range of uses, including:

- Quantification of the amount of lead in a paint sample (a test which LPD Lab Services is UKAS accredited for).
- Detecting low level contaminants.
- Quantitative measurements of metal concentrations in solutions.
- Analysis of additives and purity in steels and other metal alloys.
- Measuring trace elements in industrial effluent streams.
- Detection of heavy metals.

## Problem-Solvers & Technical Thinkers - Our Team Behind The Lab



### Interview with our Technical Director Dr Wyndham Johnstone

#### Q: What interested you in science?

I have always been inquisitive about the way things work and like to understand why things are the way they are. I am passionate about finding solutions and have an intellectual curiosity about the world; Science has unlimited potential and I find that fascinating.

#### Q: Why did you choose the specialty you did?

My father was an engineer and had his own business and he would have liked me to be an engineer. However, I was attracted to physics as it gave a greater scope for understanding the world around us, because we have the ability to study everything in existence and that intrigues me. I have always been a hands-on person, for example, I like to set up equipment and fix any problems along the way. I get a great deal of satisfaction if something has been broken and I can fix it and get it working properly again; I am passionate about finding solutions.

#### Q: What is your favourite part of the work you do?

There are two facets to this: I enjoy getting exposure to a wide range of technologies, processes, and products that our customers need help with. Understanding the many issues they face, talking with them, and really understanding the problem and breaking it down. Then, once I have the information, coming up with an analytical solution to solve, improve, or fix the issue gives me a great deal of satisfaction. There is nothing else I would rather do.



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