CASE STUDY

DYNE TESTING
an intertronics company

SITA CleanoSpector
Handheld Metal Cleanliness Test Instrument



Our customer

Powdertech Surface Science

Customer benefits

- Validation of process quality by meeting OEM-specified RFU cleanliness thresholds
- Improved quality by identifying parts that need additional cleaning
- Easy to use, non-destructive testing of large, complex parts

How we ensure clean is clean

Oxfordshire-based **Powdertech Surface Science** proclaim that they are the UK's most technically advanced aluminium powder coating and surface treatment provider. Its largest market is automotive, but it also serves the medical device manufacturing, aerospace, robotics, space and satellite, and lighting industries. Understanding substrate cleanliness is fundamental to the quality of their work. Powdertech approached **Dyne Testing**, an Intertronics brand, for help with an enhanced cleanliness QC process.

The challenge
Casting and machining processes often leave lubricants, release agents, and other organic contamination behind on aluminium parts. If reliable adhesion is important, then assessing surface energy and cleanliness is an important QC step before the next process, whether that's powder coating, painting, bonding or welding. And with their top-notch reputation, reliable adhesion is very important to Powdertech.

Good wetting is a prerequisite for adhesion, and ensuring that the surface energy of the aluminium parts is high enough for good adhesion is a simple process using Dyne inks. Ink is applied to the surface (Powdertech use 56 Dyne ink); if the ink spreads or wets evenly, then the part has the expected high surface energy. If the ink fails to spread, does not wet, and forms beads on the surface, then the potential for good adhesion is low. The likely reason for poor wetting is that the parts are not clean enough. Better understanding of the surface cleanliness was a goal.

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Measuring cleanliness

To bolster its cleanliness QC capabilities, Powdertech had previously explored other testing options, including a contact angle meter, but it preferred something that is easy to use and is able to test over large surface areas. In 2020, the company explored methods using the **CleanoSpector handheld non-destructive metal cleanliness test instrument** from Dyne Testing.

The timing proved awkward, as the height of the COVID-19 pandemic brought about lockdowns.

Alison Fox, Dyne Testing Sales Manager, said:

> *"Lockdown meant Powdertech sent us parts for testing, and we fed the results back to them rather than the in-person demonstrations we do routinely. Powdertech's submitted parts underwent a day of laboratory testing at Dyne; they provided sample parts that they had already screened for low and high levels of surface energy, and levels in between.*
>
> *"Results from the use of Dyne inks, Dyne pens, and the CleanoSpector showed a clear distinction between parts that had been cleaned and those that hadn't. Furthermore, there was a clear correlation between the quantitative results from the CleanoSpector and the varied surface energy levels on the samples."*

The CleanoSpector measures organic contamination such as oil, grease, coolants, release agents and cleaning fluid on metal parts. It detects contamination by emitting focused UV light onto the surface and measuring the fluorescence from any organic compounds; metal surfaces do not fluoresce. The fluorescence intensity depends on the amount of contamination found on the surface at the measuring point, i.e. the higher the fluorescence the more contamination on the surface. The CleanoSpector reports a number in RFUs – relative fluorescence units.

Powdertech use a CleanoSpector both during and after their internal QC process. They receive parts from vendors which can measure 200-700 RFUs. After cleaning in Powdertech's process, measurements with the CleanoSpector show 14-15 RFUs, a range that they know is optimal for their subsequent coating and bonding processes.

QC testing

Levels of contamination or residues on incoming parts vary, both from part to part, and on the parts themselves. The QC team uses the CleanoSpector to quickly test on different locations across the aluminium surface, even quite large castings. It is a simple, non-destructive test at the push of a button, which outputs a RFU quantity each time. Multi location testing gives a better picture of the overall cleanliness.

Automotive parts

The CleanoSpector has been a device that has helped Powdertech react to the evolving automotive market with the increasing popularity of electric vehicles (EVs). Manufacturers are looking for ways of reducing weight from the vehicle to improve the range between charges, resulting in the removal of rivets and other heavy nuts and bolts, and replacing them with adhesive bonding.

Dr Nick Welton, Technical Manager at Powdertech Surface Science, said:

> *"Clean surfaces are essential when it comes to painting and gluing, and it's even more important with EVs as OEMs become more reliant on bonding metals, rather than using nuts and bolts to fasten parts together."*

The company works to specifications outlined by an OEM to prepare the parts for the next process, whether that's powder coating or adhesive bonding. The quality requirement is an RFU number set by the customer and CleanoSpector can be used to check incoming parts to establish if the RFU level is too high for its conventional cleaning methods, and which need more attention. This helps Powdertech understand if any parts need additional cleaning steps before the selected process. It is a strong validation of the CleanoSpector that a major automotive OEM quotes the instrument's RFU measurement on drawings.

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Jimmy Phillips, Marketing & Sales Manager, said:

> *"We position ourselves as a very technical, quality focused business. It gives people the reassurance that we understand the challenges they're facing and can deliver solutions that work. We're a technically focused business where QC is integral to what we do. The Dyne inks and CleanoSpector have become a core part of our day-to-day business, as* ***this video*** *demonstrates. That's how we ensure clean is clean. As we look to move in more markets where technical proficiency is key, we are likely to keep investing in this area."*



SITA CleanoSpector Handheld Metal Cleanliness Test Instrument

- Improved product quality by monitoring cleanliness at critical process points
- Documentation of slightest contamination on various shaped surfaces
- Process optimisation for productivity
- Mobile and robust measuring instrument for flexible use at the process and in the laboratory
- Intuitive operation: simple & fast measurement
- Automatic calibration on reference surface

Applications include: Cleanliness inspection of metal parts after machining, inspection of functional surfaces after selective cleaning, monitoring the cleanliness of metal parts before laser welding, automotive crank shafts, pistons, cam shafts and con-rods after cleaning, pistons for hydraulic pumps before hardening, stainless steel pipes before coating (e.g. in vehicle construction), detecting residual agents and encapsulation material on pcb bond pads before wire bonding in electronics.

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