

## AvCount - Frequently Asked Questions

### **AvCount Test Methods & Fuel Specifications**

IP 565; ASTM D7619 Test methods for sizing and counting particles in light and middle distillate fuels by automatic particle counter

DEF STAN 91-91, Issue 6, includes IP 565.

The Joint Inspection Group (JIG) has included IP 565 in version 23 of the Joint Fuels Checklist.

### **What formal precision exist for the AvCount?**

IP 565 is the published method with full precision for JET A/A-1. AvCount has also full published precision for a range of other road/marine fuels including BioFuels. ASTM is developing a new test method for Particle Counting in road transport and other fuels, AvCount will be fully compliant with this method.

### **Why is it important to my refinery/terminal and customers?**

This data will be used to determine a pass/fail criteria. Participation in this data collection exercise will allow each refinery to be party to the decision making process, it will be able to assess the cleanliness of its fuel and also be able to implement robust local procedures in good time for the full implementation.

### **How does it differ from current testing?**

Refinery or QC lab based testing typically uses filtration tests in accordance with IP 423 or ASTM D 5452 to determine particulate contamination at point of manufacture. Field based testing is based around the traditional 'Clear & Bright' or the 'line sampling method' (IP 216 or ASTM D 2276). Clear & Bright is a simple visual test but can be time consuming and very subjective, it is limited by the ability of the human eye to only detect particles greater than 40 microns. However, these 'traditional tests' suffer from poor resolution and cannot provide information regarding particle size or distribution and are not portable.

### **Why should we purchase a particle counter rather than send samples to the lab?**

Local analysis provides a more cost effective method of measuring your sample. Users can quickly identify contaminated samples without the down time of waiting for results from the lab. It also ensures seeing a more representative sample before settling takes place which allows immediate decisions to be taken regarding action - for example; filter changing, tank cleaning, sample/batch embargo if required.

### **How long does it take to carry out a test?**

4 minutes

### **How much sample is required?**

100ml – the test actually only uses 80ml comprising 50ml flush and 30ml analysis.

### **What particle sizes does the instrument measure?**

At each measurement the instrument records 4, 6, 14, 21, 25, 30, 38 & 70 micron sizes. Data is presented in accordance with the test method selected. All particle channels can be viewed via the optional PC software.

### **What type of fuels can the AvCount test?**

Aviation Turbine Fuels (JET A/A-1 & AVGAS), Gas Oil, Diesel – Automotive & marine, Biofuels & Biofuels blends, Gasolines, Kerosine, Heating Oil and refinery feedstocks prior to blending.

### **What is the maximum fuel temperature that the AvCount can test?**

The AvCount is capable of measuring fuels up to a temperature of 70°C.

### **What is the maximum viscosity of fuels I can run through the AvCount**

Viscosity's up to 200 centistokes can be easily accommodated, although the pump can work with viscosities of up to 800 centistokes.

**Can AvCount identify water particles or air bubbles?**

The AvCount does not distinguish between dirt, water or air bubbles it counts all this as particulate contamination. Sample preparation is a key part of the testing process, SetaAnalytics supply a special bottle or IATA can tumbling system to ensure that air bubbles are minimised during the agitation process.

**What is the difference between on-line and bottle sampling?**

On-line sampling is field based and usually involves a direct connection to pipelines. When used Inline the AvCount takes sample from the stream at user defined intervals and carries out a particle count automatically storing the results. The AvCount can be programmed to flag 'out of specification' samples which allows users to quickly identify any potential problems at source. Bottle sampling involves taking a small amount of fuel from the tank or line and running a test in a laboratory. The AvCount is capable of both online and bottle sampling with no additional accessories needed.

**What is the maximum pressure for on-line sampling?**

As supplied the instrument can be used with a 10bar connection. An optional pressure reducing system (available from SetaAnalytics) allows connection to high pressure distribution systems and use up to 320Bar.

**What connectors do I need to use the AvCount?**

For bottle sampling the AvCount comes complete with all the connectors required and a sampling probe for a 250ml bottle. This is all you need to commence testing. For inline measurements braided hoses can be supplied with standard Swagelock fittings for rapid and easy connections.

**Do I need an external pump for bottle sampling?**

The AvCount requires no additional external pumps for bottle sampling. The instrument comes complete with an internal metering pump that guarantees the correct flow rate and volume through the cell.

**Is there any special treatment of the sample?**

The Energy Institute Round Robin proved that sample preparation and conditioning is the single most important factor in gaining good precision. Lab procedures will need to be developed to suit the local working practices. In general the sampling containers must be clean and rinsed with a solvent such as Heptane. Each container must be tumbled in accordance with the method and the test must be conducted as soon as the tumbling process has completed. Samples must not be left to stand following tumbling and bottles must be opened as few times as possible to avoid moisture and dust ingress.

**Should an IATA can be sub-sampled?**

We do not recommend sub sampling and this can lead to a non-representative or size-fractionated sample. SetaAnalytics supply sampling probes suitable for use with IATA cans as well as small 250ml bottles

**Is there a Health and Safety issue when tumbling IATA 5 litre containers?**

There are a number of issues with tumbling large containers – weight, size, frequency of tumbling and the possibility of a spill. For this reason SetaAnalytics have developed two 'universal' tumblers. One is for small bottle samples, the other is for the IATA 5 litre cans. These tumblers are easy to use and ensure maximum safety with a consistent approach to sample preparation.

**How accurate is the sample data?**

The precision data is published in IP 565. The Energy Institute Round Robin showed that the AvCount method had significantly better precision in the 4 and 6 micron bands.

**Is the cell affected by very dirty samples?**

The cell is capable of measuring very high particle counts. Where a highly contaminated fuel is suspected an inline filter system (supplied) can be used to protect against cell blocking. The Energy Institute Round Robin also showed that all instruments were subject to carry-over if a highly contaminated sample was run. The cell can easily be flushed with Heptane to flush out any residual particulate matter.

**Oxidation/Corrosion of laser cell**

The instrument design means that it will not be affected by fuel samples. An integral detection system automatically flags any malfunction of the cell calibration which is reported by the analyser.

**Cleaning of cell**

No flushing of the cell is required and the components used are not affected by fuel samples. The flush sequence is built into the instrument e.g. it performs 5 x 10ml flushes before the 3 x 10ml measurements. If there is concern that a corrosive material has been sampled through the instrument, then a flush with HPLC grade heptane is the best way of cleansing the cell.

**Does the sample colour matter?**

The infra-red laser is not affected by sample colour, however the sample must be transparent and the system is not suitable for heavy black oils.

**Does the optical measuring cell require maintenance?**

Other than routine verification and calibration the cell requires no specialist servicing. The optical system and cell is a self contained modular unit that can be swapped by local service personnel. Each replacement cell is supplied with full calibration data traceable to ISO11171.

The AvCount checks the laser intensity during start-up, and cell performance can be checked using the verification materials available from SetaAnalytics.

**Does the pump require maintenance?**

Each pump has an estimated life of 40,000 tests, the pump is also a modular unit that can be replaced by local service personnel.

**Can users compare the results from IP 216 (ASTM D 2276) with IP 565?**

There is no proven correlation between Gravimetric and Particle Counting.

**Is the AvCount calibrated in accordance with ISO 11171?**

Yes, calibration is traceable to ISO 11171 and is in accordance with section 6. The process uses materials prepared in accordance with ISO 11171 Annex F. The calibration materials are traceable to a Gold Standard Primary Calibration instrument.

**How is AvCount calibrated?**

Calibration of the flow rate and particle counting is required every 12 months according to the method. Seta has a unique calibration solution prepared in accordance with ISO 11171 Annex F. Calibration can be performed locally by authorised SetaAnalytics service personnel. Re-calibration is an automated process and can be verified using the SetaAnalytics verification fluids.

**How can I verify the performance of the AvCount?**

SetaAnalytics can supply a verification material that will enable the performance of the instruments to be verified. Each verification material is supplied with a certificate showing the expected ISO codes and the results should be within one number of the certified value.

**How many tests can be stored in the memory?**

AvCount has a memory of 1200 measurements in 100 data sets.

**Can the instrument be connected to a PC?**

The AvCount has sophisticated log & show software that allows a detailed analysis of the results, including % volume distribution calculations and also trend analysis. The software also allows additional size channels (38 & 70 micron) to be displayed. The instrument can be controlled remotely via the PC if required.

**Can the instrument be connected to LIMS?**

The data can be exported from the AvCount PC software to Excel format, this can be fed into LIMS. Alternatively the AvCount can be controlled via a scripting language and details can be obtained from Seta Analytics if customers wish to write their own interface.

**Does the AvCount support High/Low outputs?**

The AvCount can be used to control external sub-systems (i.e. safety shut-off valves) based on particle counts. The customer can set trigger values.