POWER CONTINUITY

# FIRST AID FOR FUELS™

Your essential guide to fuel cleanliness

**Diagnosis & Prevention**

**Treatment**

**Cure**

**Health**

## QUICK REFERENCE FUEL CLEANLINESS GUIDE



## FUEL CLEANLINESS EXPERTS

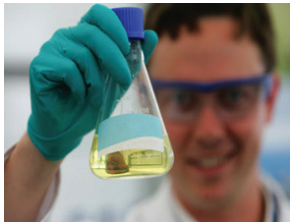
PowerContinuity Systems is a manufacturer and supplier of high quality filtration solutions for oils, fuels, biofuels and process fluids. We have over 20 years experience supplying filtration solutions to the UK and overseas markets for fuel, lubrication and hydraulic oil applications.

Our in-house design and build team can supply solutions to meet the most challenging cleanup or polishing tasks, regardless of the volume that needs to be cleaned.

PowerContinuity Systems can provide next day fuel condition analysis from our onsite laboratory with an easy to read report providing a clear diagnosis of your diesel fuel.

Whether it is filtration solutions for back-up diesel generators or mobile fuel analysis for your stored fuel, we have the right solution for you.

All of our filtration units are designed, commissioned and built on site in Nottingham at our centre of excellence.



## WE'RE THE FIRST CHOICE FOR COMPLETE FUEL SOLUTIONS

### FIRST FOR DIAGNOSIS & PREVENTION

Our advanced diagnosis and prevention products, test kits, FS9001 laser particle counter and sophisticated laboratory service, will help you identify potential problems before it's too late.

### FIRST FOR TREATMENT

We understand fuel health. PowerContinuity Systems's family of ready-to-go filtration and polishing products enable you to effectively remove water and solid contaminants to keep your fuel source clean, and your equipment performing at

### FIRST FOR INDIVIDUAL CURES

As expert designers and builders of customised filtration systems, we ensure exactly the right response whatever your specific fuel health issue or challenge.

### FIRST FOR HEALTH

We have been constantly innovating for over 20 years, making us the proven and qualified experts in fuel health. If you need advice, consultancy, site-servicing, training or emergency product rental, trust PowerContinuity Systems.

## WHY DOES THE HEALTH OF YOUR FUEL MATTER?

Engines rely on having a clean and pure source of fuel in order to perform at their best and ensure reliability and longevity.

- Modern performance engines incorporating high-pressure fuel injectors have ultrafine tolerances, meaning the quality of your fuel has never been more important.

- At the same time, environmental legislation has led to the adoption of ultra low sulphur diesel, with the sulphur content replaced by up to 7% biofuel.

These two developments have created a significant problem. By introducing the biodiesel blends, the rate of degradation has accelerated. Biodiesel suffers from more aggressive water and microbial contamination because the natural ingredients contain water which facilitates bacterial growth.

If fuel is not properly treated and managed the biodiesel can block filters and injectors, jeopardise the reliability of your engines and cause expensive equipment failure.

**Biofuel suspected in probe into diesel breakdowns**

BBC

**West Bank pump station's generators failed in test due to bad fuel**

The Times-Picayure

**Motorists warned over bad diesel**

Telegraph

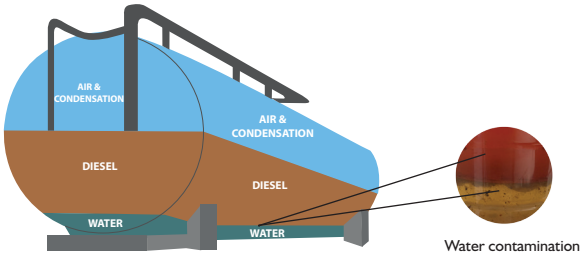
## TOP TIPS FOR FUEL MANAGEMENT

### 1 Sample Your Fuel

Understand your fuel stored on site and always check:

a. Type and size of the tank (tank construction, steel/plastic)
b. Positioning (aboveground/underground)
c. Age of the facility - this will determine how often the fuel needs to be checked and if pressure testing may be required
d. Check for areas where water ingress is possible, air vents, loose manholes covers or fittings etc.
e. Check how often the fuel is replenished

You will now have a good idea of possible problems and the best solutions. Remember though, even the best facilities can also end up with contaminated fuel.



Tank contamination

Water contamination

### 2 Fuel Sampling

a. Consider any access complications - a sample vacuum pump or fuel sampler can be used.
b. Ensure the equipment and sample container are clean and dry for each sample taken.
c. Take a bottom sample to provide the worst case in terms of the fuel condition. If the sample is not clean and bright then;
d. A middle and top sample can be taken to determine the extent of the contamination.

### 3 Sample Analysis & Interpretation


Effective fuel sampling

Visual clarity does not always mean that the fuel is within specification. It is strongly recommended that further testing is undertaken.

a. Standard on site fuel testing includes water content ppm, particulate (18/16/13/ ISO 4406) and microbial growth.
b. Further testing by a laboratory includes FAME content, sulphur content, water, particulate and microbial growth.
c. A laboratory report will give you a full understanding of the condition of the fuel and often the laboratory will advise next steps.

## FUEL ANALYSIS REPORT

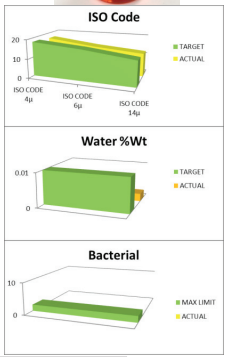
B
A - Normal
B - Monitor
C - Action Required
X - Immediate Action

Customer Name
Address

Post Code
Report Date 21/05/2014
Interpreted By

Serial No 50395
Unit No 170395
Sample Date
Location
Make
Model
Component
Lubricant
Received Date

| Sample Detail | Test Method | Units | Current Result |
|---|---|---|---|
| Lab No | | | 141419101 |
| Sample Date | | | 15/05/2014 |
| Meter Hrs | | | 0 |
| Fluid Hrs | | | 0 |
| Oil Added | | | 0 |
| Fluid Changed | | | N |
| Filter Changed | | | N |
| Lubricant | | | Diesel Fuel |
| Physical | | | |
| Water | ASTM | %Wt | 0.0022 |
| Microbes | ASTM | | Negative |
| Fungal | ASTM | | Negative |
| Fungal Rating | | | 0/10 |
| Colour – Fuel | ASTM | | Red / Orange |
| Colour Shade | ASTM | | Normal |
| Appearance | ASTM | | Clear |
| Particulates | | | |
| Particles (Y/N) | ASTM | (Y/N) | Yes |
| Particulate Amount | ASTM | | Trace |
| Particulate Description | ASTM | | Sludge |
| ISO | ASTM | | 17/14/12 |
| 4 | ASTM | µ | 778 |
| 5 | ASTM | µ | 285 |
| 6 | ASTM | µ | 146 |
| 10 | ASTM | µ | 50 |
| 14 | ASTM | µ | 25 |
| 22 | ASTM | µ | 9 |
| 42 | ASTM | µ | 6 |
| 68 | ASTM | µ | 4 |




Diagnosis:

THE PARTICLE COUNT HAS IMPROVED SIGNIFICANTLY THIS TIME AND IS NOW WELL WITHIN TARGET (ISO 18/16/13). WE NOTE SOME DEBRIS IN THE SAMPLE BUT FROM THE TESTS CARRIED OUT; THE FUEL APPEARS TO BE IN ACCEPTABLE CONDITION AND IS FIT FOR USE.

B
A - Normal
B - Monitor
C - Action Required
X - Immediate Action

## 4 Fuel Cleanup

If analysis shows that your fuel does not meet specification, remedial action will be required.

a. Establish the source of the contamination if possible, e.g. free water could indicate water ingress - was the filler cap left off? Could groundwater be entering the fuel tank?
b. Repair and ensure the fuel storage facility is secure.
c. Clean the fuel - depending on the condition of the fuel, this may include removing the fuel, tank cleaning and offsite fuel cleaning.
d. If the fuel is not too far off specification, it can be cleaned in insitu.
e. Decide if you can afford to be offline while the fuel is being cleaned.

Onsite fuel polishing allows your fuel to be available at all times, without the need for standby fuel facilities.

## 5 Fuel Management

Once you have ensured both the fuel and facility are clean, it is critical to put a plan in place for regular checks.

a. Sampling should be conducted at least once a month and on each new delivery of fuel.
b. Consider fitting a fixed fuel polishing system, designed to recirculate the fuel at predetermined times to ensure it remains clean and dry.

As leaders in the field we are always available to assist with all of the above to ensure you adopt the most appropriate and cost effective solution for your business.

## FUEL SPECIFICATIONS

The current UK Diesel and gas oil specifications are as follows:

**BSEN 590:2009** - Road Diesel (Derv) with up to 7% bio-content

**BS 2869:2010 Class A2 -** gas oil with red excise marker for non-road mobile machinery with up to 7% bio-content

**BS ISO 8217 -** Marine gas oil for sea going vessels with no biodiesel content

## WORLD WIDE FUEL CHARTER

For engines designed to achieve Euro 2, 3, 4, 5 and 6 emissions standards the WWFC specifies a maximum dissolved water content of **200ppm** and a cleanliness level in terms of particulate matter of **18/16/13** as defined by **ISO 4406:1999.**

## DIESEL - BS EN 590 - AUTOMOTIVE DIESEL FUEL - SULPHUR-FREE (DERV)

| TYPICAL |
|---|
| Density @ 15° C (kg/m$^3$) 820.0 - 845.0 |
| Appearance Clear and Bright ---- Clear and Bright |
| Flash Point (°C) 56 |
| Sulphur (mg/kg) 10 |
| Cetane Index 51 |
| Viscosity @ 40°C (mm$^2$/s) 2.3 4.5 2.0 4.5 |
| Ash (% m/m) 0.010 |
| Water (mg/kg) 200 |
| Contamination (mg/kg) 24 < 1 |
| FAME (biodiesel) (% Vol) 7.0 |

## GAS OIL - SULPHUR - FREE BS 2869:2010 - CLASS A2 #

| | |
|---|---|
| Density @ 15° C kg/m³ | 820.0 - 875.0 |
| Appearance Visual Clear & Bright, Dyed red | |
| Viscosity @ 40°C mm²/s 2.0 | - 5.0 |
| Distillation BS EN ISO 3405 | |
| Rec. @ 250°C % Vol 65 | |
| Rec. @ 350°C % Vol 85 | |
| Flash Point °C 56 | |
| Sulphur mg/kg 10 | |
| Copper Corrosion rating 1 | |
| Cetane Number 45 | |
| Ash % m/m 0.010 | |
| Water mg/kg 200 | |
| Particulates mg/kg 24 | |
| Carbon Residue: (10%) % m/m 0.30 | |
| FAME % V/V 7.0 | |

## MARINE GAS OIL - BS ISO 8217 - CLASS DMA

| |
|---|
| Density @ 15°C kg/m³ 890.0 |
| Appearance visual Clear and bright |
| Flash Point (P.M.) °C 60 |
| Sulphur % 1000 mg/kg |
| Oxidation Stability g/m3 25 |
| Pour Point °C 0 (summer) - 6 (winter) |
| Cetane Index 45 |
| Kinematic Viscosity @ 40°C mm²/s 2.0 - 6.0 |
| Ash % m/m 0.010 |
| Water mg/kg 200 |
| Acid No. mg/KOH/g 0.5 <500 mg/kg) |
| Lubricity (for Sulphur = $\mu$m 520 |

* This product will always contain less than the ISO 8217, the minimum level of 0.1% V/V of FAME (Fatty Acid Methyl Ester)

## UNDERSTANDING ISO CLEANLINESS CODES

**ISO 4406:1999** is an internationally recognised method of measuring particulate in a given fuel or lubricant sample. The code is made up of three numbers. Each number represents a range and size of particle present in a given sample. For diesel fuel or gas oil the ISO code internationally accepted is 18/16/13.

**18 -** represents a range or count of particulate from 1300 – 2500 at 4 micron in size
**16 -** represents a range or count of particulate from 320 – 640 at 6 micron in size
**13 -** represents a range or count of particulate from 40 – 80 at 14 micron in size

**Filter element media recommendations**

| Desired Cleanliness Level (ISO Code) at 4μ (c)/6 μ(c)/14 μ(c) | PowerContinuity Systems Synthetic Media Type |
|---|---|
| 20/18/15 - 19/17/14 | Z25 |
| 19/17/14-18/16/13 | Z10 |
| 18/16/13 - 15/13/10 | Z3/Z5 |

**Important note:**

The desired cleanliness level in order to achieve industry standard for fuels is highlighted in red above. In order to achieve effective filtration, it is paramount that the correct filter inserts are used. Filter inserts can have varying quality ratings. These are known as 'nominal' or 'absolute' efficiencies. Absolute rated filter inserts will guarantee greater overall efficiency. For advice on the best configuration for your application please contact our technical team.

## ISO 4406:1999 CODES

| | Particles per millilitre | |
|---|---|---|
| Range Code | More than | Up to / including |
| 17 | 640 | 1300 |
| 16 | 320 | 640 |
| 15 | 160 | 320 |
| 14 | 80 | 160 |
| 13 | 40 | 80 |
| 12 | 20 | 40 |
| 11 | 10 | 20 |
| 10 | 5 | 10 |
| 9 | 2.5 | 5 |
| 8 | 1.3 | 2.5 |
| 7 | 0.64 | 1.3 |
| 6 | 0.32 | 0.64 |

| | Particles per millilitre | |
|---|---|---|
| Range Code | More than | Up to / including |
| >29 | 2500000 | - |
| 28 | 1300000 | 2500000 |
| 27 | 640,000 | 1300000 |
| 26 | 320,000 | 640,000 |
| 25 | 160000 | 320,000 |
| 24 | 80000 | 160000 |
| 23 | 40000 | 80000 |
| 22 | 20000 | 40000 |
| 21 | 10000 | 20000 |
| 20 | 5000 | 1000 |
| 19 | 2500 | 5000 |
| 18 | 1300 | 2500 |

It is important to note each time the range code increases by a single code, the number of particles doubles and each time a code decreases by a single number, the contamination level is halved.

## TYPES OF FUEL CONTAMINATION

Diesel fuel can contain many types of contamination, all of which are harmful to engine systems at varying degrees.

**Solid Contamination** - these include rust, silicon, metals and other harmful, abrasive debris which cause damage to injection systems and engine components.

Particulate under microscope

A diverse source of particulates exist such as road dust, grit, soot, fuel tank rust and engine wear particles. Particulates are a major cause of fuel injection system failures and fuel system wear. Particulates found in fuel systems are introduced from a variety of sources, from deliveries to air born dust entering tank vents, to internal corrosion of tanks to name a few.

**Water**

Water is probably the most concerning fuel contaminant and can be found in fuels as free water, suspended or in a dissolved state.

**Free water** develops when droplets of emulsified water combine to become larger and heavier, falling out of suspension and gathering at the bottom of the tank.

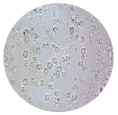
**Suspended or emulsified water,** water that is in suspension that will eventually fall out of the fuel and form free water when allowed to settle. The fuel often has a milky appearance.

**Dissolved or entrained water** that has chemically dissolved or is absorbed into the fuel.

Water is heavier than diesel and tends to fall to the bottom of a fuel tank. Where water gathers a water layer is formed between the tank bottom and the fuel tank. The water layer or water phase is the substrate for microbial growth. Water will cause engine and fuel system failures and damage and promotes microbial growth in fuel systems.

Water contamination

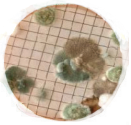
**Microbial Growth (diesel bug)** refers to bacteria, mould and yeasts found in stored fuel, fuel filters and fuel systems. There are more than a hundred different strains, which can exist in the fuel in a planktonic form or in a biofilm.



Bacteria under microscope

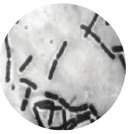
**Bacteria** single cells typically 1-10 micron in size - bacteria will degrade the fuel over time.

**Mould** is a type of fungi with long multi-cellular filaments, little indication that fungi will degrade fuel however mass is formed which will result in filter blocking and subsequent fuel starvation in fuel systems.



Mould under microscope

**Yeasts** are typically 3-4 micron, slow growing and also form biomass over time.



Yeast under microscope

Most microbes can exist anywhere within the fuel tank, however they thrive where there is an interface between fuel and water, living in the water substrate and drawing nutrients from the fuel in the form of hydrocarbons. Often a visible layer of microbial growth forms between water at the bottom of a tank and the fuel, this is often referred to as the "rag layer". The level of microbial contamination is often hard to determine as every system is different and offers a unique environment.

**Biofilms** are complex structures of microbes in which cells adhere to the wall of the fuel tank and to each other, or form floating colonies when they break off and form new colonies

**Asphaltines** are present in fuels at varying levels and tend to increase with changes to fuel temperature and fuel oxidation. They are hard, brittle particles of carbon less than 2 micron in size. The particles can agglomerate into larger particles that can result in engine filter blocking in severe cases. These particles will accumulate at the bottom of a tank and form an oily sludge.

**Gums & Organic contaminants** with the addition of FAME to petro-diesel the fuel has become unstable, and subject to oxidation. When the fuel comes into contact with oxygen the fuel breaks down into peroxide, organic acids and gummy sediments are formed. These substances can stick to fuel filters and fuel system components and over time will cause acid erosion.

**Sludge** is formed as a result of a combination of many of the above contaminants.

## STEPS TO TACKLE FUEL CONTAMINATION

**Preventing and dealing with Fuel Contamination**

From the onset of ultra low sulphur diesel we have seen a steady increase in fuel contamination over the years. The new ULSD with FAME content has a shelf life of 6 to 12 months and if it is not maintained, will result in equipment downtime and equipment failure. Simple steps can be taken in order to rectify fuel issues and maintain your fuel going forward.

## FUEL TESTING

**Sampling**

Best practice for fuel testing is to take a bottom, middle and top sample. This will provide the worst and best case in terms of the fuel quality in the fuel storage facility.

**Sampling equipment available from PowerContinuity Systems**

- Sample Thief
- Bacon Bomb
- Sampling bottles

Our sample kits are used for fuel sampling

## FUEL SAMPLING SERVICES

**Laboratory Testing**

We offer a comprehensive, low cost fuel analysis service. We are dedicated to providing a competent laboratory service using up to date technology combined with professional excellence. Our laboratory analysis service allows you to take your own fuel samples using bottles pre-cleaned to ISO 3722 standards, and post them off direct to the laboratory (pre-labelled bottle and box provided). The reports give valuable information on the condition of the fuel e.g. water contamination, particulate, microbial etc.

**Analysis**

Check your fuel in storage on a regular basis. If the fuel does not meet specification and is contaminated, take steps to rectify and clean the fuel and the fuel facility.

A visual test will be your first port of call, is the fuel clear and bright? If the sample has visible particulate, free water, microbial growth or is cloudy in appearance further testing will be required.

Onsite analysis can be performed with our FS9001 laser particle counter. This will provide us with the level of contamination in terms of particulate (ISO4406) and we can also determine the level of water ppm in a said sample.

Once we have established the level of contamination, we will be in a position to take corrective action.

This may be to remove the water, and clean the diesel through filtration, or we may need to remove the fuel from the facility, clean the facility and the fuel, then re-instate the fuel to the facility. This will all depend on the level of contamination we find.

**Fuel Testing Equipment and Services available from PowerContinuity Systems:**

- FS9001 (testing to ISO4406, water content in PPM, viscosity)
- Karl Fischer test kits
- Patch test kits
- Internal laboratory for problem solving
- Independent laboratory services and tests to UKAS standard

## FUEL CLEANING

Once we have established the level of contamination of the fuel we can then determine the corrective action. This may mean that the fuel needs to be filtered which can be done insitu, or depending on the level of contamination, the fuel may have to be removed and entry may be required to clean the tank. It is recommended at this point to contact us in order to follow the most appropriate solution and to work out the most cost effective way of dealing with the problem. We will conduct onsite assessments free of charge within the UK.

PowerContinuity Systems fuel

## OUR DFU RANGE - DIESEL FUEL UNITS

DFU-1

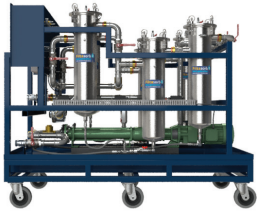
- Powerful pump with flow rates up to **80 L/min**
- High volume dirt holding capacity to deliver ISO cleanliness codes of 18/16/13 or better
- High performance Filtasorb2 inserts to achieve 100ppm or better
- Rugged frame with integral drip tray
- Pressure gauge indication of system performance
- Extensive selection of filter cell inserts to suit every clean-up application
- Suitable for most diesel & biodiesel (B100)

DFU-2

- Powerful pump with flow rates up to **90 L/min**
- High volume dirt holding capacity to deliver ISO cleanliness codes of 18/16/13 or better
- High performance Filtasorb2 inserts to achieve 100ppm or better
- Rugged frame with integral drip tray
- Pressure gauge indication of system performance
- Extensive selection of filter cell inserts to suit every clean-up application
- Suitable for most diesel & biodiesel (B100)

DFU-3

- Powerful pump with high flow rates up to **140-200 L/min**
- High volume dirt holding capacity to deliver ISO cleanliness codes of 18/16/13 or better
- High performance Filtasorb2 inserts to achieve 100ppm or better
- Rugged frame with integral drip tray
- Pressure gauge indication of system performance
- Extensive selection of filter cell inserts to suit every clean-up application
- Dual stage filtration efficiency
- Suitable for most diesel & biodiesel (B100)

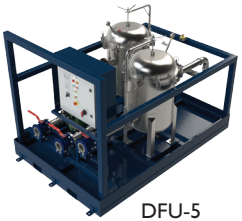


DFU-4

- Powerful pump with high flow rates up to **500 L/min**
- High volume dirt holding capacity to deliver ISO cleanliness codes of 18/16/13 or better
- High performance Filtasorb2 inserts to achieve 100ppm or better
- Rugged frame with integral drip tray
- Plug in and play set up
- Multi stage filtration efficiency
- Extensive selection of filter cell inserts to suit every clean-up application
- Suitable for most diesel & biodiesel (B100)

DFU-4MU

- Powerful pump with high flow rates up to **500 L/min**
- High volume dirt holding capacity to deliver ISO cleanliness codes of 18/16/13 or better
- High performance Filtasorb2 inserts to achieve 100ppm or better
- Rugged frame with integral drip tray
- Plug in and play set up
- Built in generator
- Suitable for most diesel & biodiesel (B100)



DFU-5

- Powerful pump with high flow rates up to **1,000 L/min**
- High volume dirt holding capacity to deliver ISO cleanliness codes of 18/16/13 or better
- High performance Filtasorb2 inserts to achieve 100ppm or better
- Rugged frame with integral drip tray

## FUEL MAINTENANCE

Once the fuel in the facility has been cleaned and meets specification, we will need to maintain the fuel. As we have already made mention of, ULSD has a shelf life, and is hygroscopic. Each facility is different and each with their unique challenges. At PowerContinuity Systems, we pride ourselves in providing the right solution for the application, which means in most cases an off the shelf solution does not provide a complete solution. We will design and manage the process to ensure the fuel in storage is maintained and kept within specification going forward.

## ON TANK UNITS - POLISHING STORED FUEL

OTU-1 Day Tanks

- Powerful pump with high flow rates up to **90 L/min**
- High volume dirt holding capacity to deliver ISO cleanliness codes of 18/16/13 or better
- High performance filter housing
- Stainless Steel enclosure
- Plug in and play set up
- Extensive selection of filter cell inserts to suit every clean-up application
- Seven day programmable timer
- BMS outputs


OTU-2

- Powerful pump with high flow rates up to **90 L/min**
- High volume dirt holding capacity to deliver ISO cleanliness codes of 18/16/13 or better
- High performance Filtasorb2 inserts to achieve 100ppm or better
- GRP enclosure for IP55 protection
- Plug in and play set up
- Seven day programmable timer
- BMS outputs
- Suitable for 2000-10,000 litre tank capacities

OTU-3

- Powerful pump with high flow rates up to **90 L/min**
- High volume dirt holding capacity to deliver ISO cleanliness codes of 18/16/13 or better
- High performance Filtasorb2 inserts to achieve 100ppm or better
- Rugged frame with integral drip tray
- Plug in and play set up
- Seven day programmable timer
- Two stage filtration
- Suitable for 5000-20,000 litre tank capacities

## ON TANK UNITS

OTU-4

- Powerful pump with high flow rates up to **200 L/min**
- High volume dirt holding capacity to deliver ISO cleanliness codes of 18/16/13 or better
- High performance Filtasorb2 inserts to achieve 100ppm or better
- Multiple staged filtration
- GRP enclosure providing IP55 protection
- Plug in and play set up
- Ideal for remote facilities with the ability to connect to BMS
- Suitable for tanks with 20,000 litres - 50,000 litre capacities

OTU-5

- Powerful pump with high flow rates up to **250 L/min**
- High volume dirt holding capacity to deliver ISO cleanliness codes of 18/16/13 or better
- High performance Filtasorb2 inserts to achieve 100ppm or better
- Multiple staged filtration
- Plug in and play set up
- Ideal for remote facilities with the ability to connect to BMS
- Higher flow options (1,000 L/min) available for systems exceeding tanks with a 50,000 litre capacity

## SERVICES & SUPPORT

### Tank Cleaning and Confined Space Entry

We will come on site and remove all contamination built up in the tank. This includes confined entry and manual tank cleaning services.

### Pipework Installation

Our team of technical engineers will provide tank and pipework installation to ensure the filtration system is fully functional.

### Site Surveys

We provide a comprehensive survey on site to ensure that we specify the correct filtration solutions taking into consideration the type and size of the tank, positioning and age of the facility.

### Tank Decommissioning

Tank decommissioning needs to be done safely and correctly.
There are generally two options to choose from. The first option is to leave the fuel tank in-situ and fill it with foam, cement or slurry. This form of fuel tank decommissioning involves an initial cleaning process to ensure all fuel, contaminants and slurry, which could otherwise harm the surrounding environment if a leak occurred, are removed safely before the fill is carried out.

Once this tank cleaning process is complete, our technicians will insert foam, cement or slurry, and then safely cap and seal the tank to ensure it is safely and permanently decommissioned.

### Tank Removal

Fuel tank removal involves the same cleaning process to ensure all contaminants are fully removed. Our fuel technicians can excavate the area, and safely remove the tank ready for safe disposal.

For above ground tanks, the removal process is as per above and will be carried out in accordance with DEFRA.

### Tank Lining

Old tanks can be re-lined to extend service life. This is often a cost effective solution to expensive tank replacement and costly engineering work.

## FAQ'S

**How long can I store diesel fuel for?**

Pre ULSD, fuel with higher sulphur content could be stored indefinitely. Problems of contamination, both particulate and water, still occurred however the fuel remained stable. With the onset of ULSD that contains FAME we now have a shelf life of 6 to 12 months without significant degradation, provided the fuel is kept clean and dry. Longer-term storage of diesel fuel can be achieved through the use of fuel polishing systems and the addition of fuel additives.

**What is the maximum water content permissible in diesel fuel?**

For the UK we work to the EN590 specification, and this is the same for the Worldwide Fuel Charter recommendation of 200ppm.

- Filtasorb2 is the revolutionary water removal solution for oils and fuels, removing water to under 100ppm across an impressive range of flow rates.
- Universal fittings for all of our filter housings
- In 30 minutes Filtasorb2 cleaned 700 litres of diesel from 835ppm down to 100ppm

**What is the standard for clean fuel?**

Again we refer to the recommendation of the World Wide Fuel Charter who recommend ISO4406 for measuring fuel cleanliness. The accepted cleanliness level for diesel is 18/16/13.

**What is FAME content?**

(Fatty acid methyl ester) Fatty acid methyl esters are a type of fatty acid ester that is derived by transesterification of fats with methanol. The molecules in biodiesel are primarily FAME, usually obtained from vegetable oils by transesterification. In the UK up to 7% FAME can be added to diesel fuel per the EN590 specification. With the drive to reduce greenhouse gasses the FAME content may increase to 20% by 2020, B20.

**What is fuel polishing?**

Fuel polishing is the process of removing water and particulates from fuel using filtration in order to bring the fuel back in line with fuel specifications, and maintaining the fuel to stay within specification.

**Will fuel polishing remove all tank contamination?**

Fuel polishing will remove free and emulsified water as well as solid particles from fuel. This is dependent on how contaminated the fuel is, and the condition of the holding tank. Where the contamination is severe tank entry and cleaning may be required. The construction of the fuel holding tank will also effect how efficient fuel polishing will be, if there are baffle plates inside the tank this could cause sediment to backup in areas of the tank, blocking tank cleaning through the tank entry.

**How often should fuel be tested?**

With modern diesel fuel it is recommended to carry out fuel testing once every six months, or when a fuel delivery is received. There is no specific rule as to how often fuel testing should be carried out and this will vary from operation to operation.

**Is fuel in standby operations all we should be concerned with?**

Fuel in standby operations, such as hospitals and data centres, all have stored fuel and over time will degrade. However there is always ullage (product left in the bottom of a tank which is not used). Ullage will more likely develop with frequent deliveries.

**Does the fuel colour affect the performance of the diesel?**

Slight fuel colour variations are no indication of the fuel properties. This is down to natural refining and feedstock variations. At times fuel can appear very dark in colour that can be a result of oxidation. If unsure have the fuel tested if it is not bright and clear.

**Is it sufficient to use additives only to maintain fuel?**

There are many different additives available in the market today, cetane boosters, biocides, fuel stability additives etc. Fuel suppliers will supply fuel with additives as standard, for example anti-foaming additives. Applying additives will not remove particulate contamination and water contamination. There are additives that force water to become soluble with the fuel however this can have damaging affects on engines. Whichever way you look at it, ultimately additives alone cannot be used to maintain fuel and filtration is an essential part of the solution.

## HFAM1000 FUEL BIOCIDE

PowerContinuity Systems HFAM1000 fuel biocide is the undisputed industry leader for eradicating the microbes (including diesel bug) living in water and feeding off hydrocarbons in your fuel. It also prevents acetic acid build-up that can lead to tank and fuel system corrosion. Use a dose rate of 1 litre of HFAM1000 to 20,000 litres of fuel for light cases and increase dosage for severe cases.


## GLOSSARY OF TERMS

**Ash Content** - A test carried out (EN ISO 12937) to determine metals within a fuel sample.

**BS EN590** - Fuel standard for the UK and Europe

**Cetane Index** - Is a measure of the ignition quality of a diesel fuel. It is often mistaken as a measure of fuel quality. Cetane number is actually a measure of a fuel's ignition delay.

**CFPP** - The lowest temperature fuel will pass through a specified filter element.

**Cloud Point** - The temperature at which fuel will wax.

**DERV** - Also known as 'road diesel'. Standard, full excise duty diesel fuel without red excise marker.

**DFU** - Diesel Filtration Unit - PowerContinuity Systems have a family of diesel fuel polishing units ranging from 80 L/min - 1,000 L/min.

**FAME** - (Fatty acid methyl ester) Fatty acid methyl esters are a type of fatty acid ester that is derived by transesterification of fats with methanol. The molecules in biodiesel are primarily FAMEs, usually obtained from vegetable oils by transesterification.

**Flashpoint** - Lowest point at which vapors from a fluid will ignite

**FS9001** - Part code for a portable laser particle counter

**Hygroscopic** - Ability of a substance to attract and hold water molecules from the surrounding environment

**ISO** - International Organisation of Standardisation

**NRMM** - Non Road Mobile Machinery

**OTU** - On Tank Unit, a fixed filtration fuel polishing system fitted to fuel facility for maintaining the stored fuel

**Rag Layer** - This is a layer of bacteria or fungi that forms between the fuel and water interface

**ULSD** - Ultra Low Sulphur Diesel

**Worldwide Fuel Charter** - a document jointly released and updated by the European Automobile Manufacturers Association (ACEA), the Alliance of Automobile Manufacturers, the Engine Manufacturers Association (AMA) and Japan Automobile Manufacturers Association (JAMA). This document seeks to match fuel specification to the needs and capabilities of engine and vehicle technologies.

## APPENDIX

### EN590

https://www.dieselnet.com/standards/eu/fuel_automotive.php

### Worldwide Fuel Charter

https://www.acea.be/uploads/publications/Worldwide_Fuel_Charter_5ed_2013.pdf

### PowerContinuity Systems

http://www.Power Continuity Ltd.co.uk

### UKAS Standard

http://www.ukas.com

## CASE STUDIES

### RAIL

Our mobile filtration carts have been extensively deployed within the rail sector. In this case a company required analysis and treatment of their fuel to ensure fuel related breakdowns stopped. Power-Continuity Systems provided the analysis with our FS9001 & treatment with the DFU-1. Overall costs savings were made due the complete removal of fuel related breakdowns.

### DATA CENTRES

Our OTU-4 polishing units have been extensively deployed in data centres across Europe. With its powerful flow rate and fuel polishing capabilities, the OTU-4 is the ideal filtration unit for protecting UPS applications and the integrity of data centres globally.

## NOTES

## NOTES

## NOTES

# POWER CONTINUITY

**PowerContinuity Systems**
Power Continuity House
81 Spinney Hill
Melbourne
Derby
DE73 8LX

Tel: 0845 055 8455
Email: sales@powercontinuity.co.uk

www.powercontinuity.co.uk/