



Diesel

RAPID, ON-SITE TEST KIT BOX

Item code: FMD8

The FUELSTAT® resinae PLUS DIESEL test measures the amount of different types of contamination: H Res, bacteria and fungi actively growing in the sample and reports that as the weight of material in the sample. This is a newer, more accurate measurement system than the old Colony Forming Unit (CFU) count.

The test provides results based on a traffic light scenario:

- Negligible (green) – negligible contamination.
- Low Positive (amber) – moderate contamination.
- High Positive (red) – heavy contamination.

WHY USE FUELSTAT® DIESEL?

- FUELSTAT® DIESEL is an IATA approved, on site diesel bug test.
- In just 10 minutes, without any special skills or equipment, the pregnancy style fuel testing technology allows quick and easy detection of fuel contamination.
- Detect both high and low levels of fuel contamination within minutes.
- Accurately identify the type of contaminants that may be present in your fuel.
- Discover fuel contamination at an early stage before it becomes problematic.
- Easily determine the right course of action to treat the problem.
- Keep a simple log of test results using the easy to read test paddles.
- No special equipment needed – everything is provided.
- All components of the FUELSTAT® DIESEL on site fuel test are completely disposable.

TEST KIT CONTENTS:

- Each heat sealed foil pouch contains a Paddle with desiccant sachet and pipette in one section and Sample Extraction Bottle with flat cap, dropper cap and instructions for use in the other section.
- Paddle: Plastic base with 6 lateral flow devices affixed.
- Preparation Bottles: 175ml plastic bottle with flat cap and “dropper” cap containing 3.0ml of Sample Extraction Liquid.
- Disposable, single use, plastic pipette.
- Instruction leaflet.





FUEL HUSBANDRY:

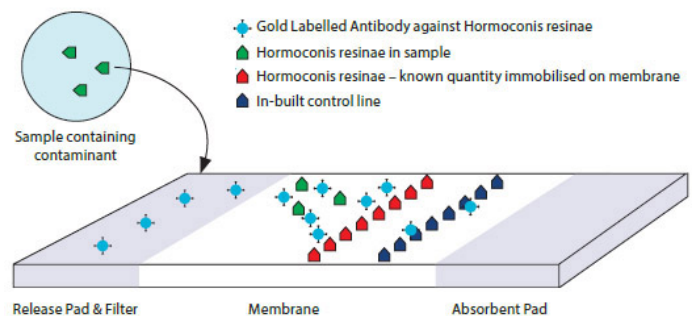
Rather than treat contamination when significant operational or fuel quality problems arise it is better to prevent microbial growth occurring. Much can be done to ameliorate problems associated with microbial contamination in fuels, these include;

- Allowing fuel deliveries to settle in the tank for 24 hours before putting the tank back into service.
- Drain any accumulated water from the bottom of the tank weekly.
- Routinely test bottom samples for microbial contamination.
- Treat fuel if required, according to test results.



HOW FUELSTAT® WORKS:

- The FUELSTAT® resinae PLUS DIESEL test utilises lateral flow technology and antibodies to H Res, bacteria and fungi which grow in diesel fuel.
- The gold-labelled antibody is immobilised in the Release Pad under the sample well.
- The sample containing an unknown amount of contamination is added to the sample well and this re-hydrates, allowing the reagents to flow up (wicking) the membrane towards the absorbent pad.
- Any large particles in the sample, which may block the reaction, are blocked by the filtering action of the pad.
- During the wicking, the contamination in the sample will bind to the specific antibodies.
- As the liquid reaches the Test Line (T) any free gold-labelled antibodies will bind to the test line.
- This means if more contamination is in the sample than the threshold engineered, there will be no antibodies to bind to the Test Line, no red line will appear, and this is a POSITIVE result.
- If the amount of contamination in the sample is lower than the threshold, there will be free antibodies to bind to the Test Line, a red line will appear, and this is a NEGLIGIBLE result.
- The quantities of materials immobilised in the device are engineered to provide results at the different thresholds of H Res, bacteria and fungi in each of the test devices on the Test Paddle.





SAMPLE PREPARATION:

- Take a sample from the fuel tank into a clean container.
- Allow the sample to “settle” and any water to accumulate at the bottom of the sampling container.
- Ideally, the sample should be drawn from the tank sump or lowest point from a water drain point.
- Alternatively, draw a tank bottom sample using a dipped sample tube from the tank fill aperture.
- For vehicle tank testing, if it is impossible to harvest a tank bottom sample then the contents of the primary fuel filter is the next best place.
- This sample however may not represent the tank bottom.
- Any sample taken should be tested as soon as possible after collecting and, in any event within 6 hours to maintain the integrity of the sample.
- **NOTE:** When possible, test the water phase of the sample taken from the fuel tank. Testing the water phase will provide more accurate results than testing the fuel phase.

HOW HAS FUEL CHANGED?

- The combined effects of adding FAME (Fatty Acid Methyl Esters) and reducing sulphur have changed the characteristics of diesel fuel.
- The fuel supply chain is adapting to deal with the consequences in storage, from distribution to storage and right through to vehicles.
- Avoiding water is much more difficult now as FAME, being hygroscopic, attracts it.
- With more water comes increased incidence of injector problems, corrosion and lubricity issues.
- Then there is, of course, microbial contamination aka ‘diesel bug’.

WHAT IS THE DIESEL BUG?

- The Diesel Bug is a consortium of organisms which live at the fuel water interface.
- They live in the water phase whilst feeding on the fuel.
- Of all the organisms in this consortium, H res is the most recognisable and also damaging component of ‘sludge’.
- This fungus is the main culprit in instances of filter blockage & tank corrosion when left unchecked.
- The rest of the consortium includes bacteria and other types of fungi, particularly some yeasts which can also cause fuel system problems.

WARNINGS AND PRECAUTIONS:

- Caution should be exercised in the handling of fuel or other hazardous materials in accordance with Health and Safety procedures.
- Optimum results will be obtained by strict adherence to this protocol.
- Each paddle is disposable. Use only once.
- The paddle in the foil pack should be kept sealed until ready for use. Once the foil pack is opened the shelf-life of the device is not guaranteed. It should be used as soon as possible.
- The viewing window of the test device should not be touched.
- The paddle should be kept dry at ALL times. DO NOT USE if the device becomes wet.
- If the paddle appears damaged, scratched or marked in any way please contact PETRO Industrial.

PETRO INDUSTRIAL



petroind.com



THE SCIENCE:

- Micro organisms can grow in certain fuels by using the alkanes in the fuel as a foodstuff.
- In some cases, they may be able to utilise some of the additives in the fuel.
- Mid to light distillate fuels are particularly susceptible to contamination by micro-organisms, although more recently there are increasing reports of gasoline being affected, particularly some of the more “environmentally friendly” products.
- The type of organisms and the damage inflicted depend upon on the fuel and the additives.
- All contamination is important when considering the quality of a fuel, particularly when monitoring stored products and reserves.
- A wide range of micro-organisms can be found in fuels in aircraft tanks and, if left unchecked, can cause damage to the tanks, the most serious organism is the filamentous fungus *H. res.*
- This is for a number of reasons:
 - Firstly, its size and bulk. When compared to single cell yeasts and moulds, *H. res.* produces far more biomass and is thus more likely to cause blockage problems.
 - Secondly, it is by far the most common cause of microbial corrosion in aircraft tanks. Other organisms are more important in other circumstances, for example, in some ship fuels and in long-term storage. Other important corrosive organisms are the anaerobic bacteria, collectively known as Sulphate Reducing Bacteria (SRB) or, more accurately, Sulphide Generating Bacteria (SGB). These are not common in aircraft wing tanks because of the high level of aeration produced during flight and refuelling. Other filamentous fungi may be emerging as important, but these tend not to occur without *H. res.* being present and, in any case, are not currently very common.
- Thirdly, because of the way *H. res.* grows between fuel and water, it usually starts on small water droplets. It then covers the droplet, holding it in place, and continues its growth, actually generating more water under the mat due to its metabolism. In the process, it firmly attaches itself to the tank. Bacteria and yeasts require free water and are found, mainly, floating in the water phase. This means that they are less likely to adhere to surfaces and will, therefore, be significantly reduced at each water drain. *H. res.*, once established, continues to multiply in situ.
- In aircraft, high levels of bacteria and yeasts tend to indicate that you have picked up poor quality fuel and, as such, are useful indicators. However, this does not necessarily mean that they are causing any problem in the tank, and they will probably be significantly reduced at the next drain. High levels of *H. res.*, however, indicate that there is, potentially, a serious problem.

Ident #	Tank #	Result	Operator	Date	Lot #	Sta/site	Time

CONIDIA BIOSCIENCE

IATA Strategic Partner



TESTING PROCEDURE:

- Unscrew and remove the top from the Fuelstat® Sample Extraction bottle.**
 - For the Fuelstat® resinae Plus test kit: If there is 15ml of water in the sample, then add the water to the bottle up to the "Water Phase" line. If there is less than 15ml of water in the sample, then add all the water and the fuel from the sample to the bottle, up to the "Fuel Phase" line.
 - For the Fuelstat® resinae test kit: If there is 5ml of water in the sample, then add the water to the bottle up to the "Water Phase" line. If there is less than 5ml of water in the sample, then add all the water and the fuel from the sample to the bottle, up to the "Fuel Phase" line.
 - (Identical procedure for remaining part of the test)
- Replace the top and shake the bottle for 5 seconds.**
- Invert the bottle and allow the blue solution to settle completely into the dropper.**
- Remove the Test Paddle from the foil pouch.**
 - NOTE: Do not touch the viewing windows on the test paddle. Touching the viewing windows can contaminate the test paddle. Inspect both viewing windows. There should be a faint blue line opposite the Control Line mark (C). This is used in the production process to line up the device correctly. It has no actual function in the test and will disappear when the sample moves up the wick. If any other visible lines show in a viewing window, then the paddle is contaminated.
- Write the aircraft number, tank number aircraft cycles and hours onto the test paddle.**
- Remove the cap from the top of the Fuelstat® Sample Extraction Buffer bottle.**
 - Discard the first two drops from the bottle.
 - Place 4 drops of the blue extraction liquid in each sample well. (The sample well will turn blue).
 - NOTE: The blue extraction liquid, NOT the fuel or water sample, must be placed in the sample well.
- Keep the test paddle flat for at least 30 seconds.**
- Wait for 10 minutes.**
 - Make sure the Control Lines show after 10 minutes.
 - If any Control Lines do not show, then the test is not valid. Read within 30 minutes

ACTIONS FOLLOWING TESTING:

- Based on the IATA Guidelines, but we advise that each user should define their own policy on test frequency and actions following a positive test result. For specific aircraft type actions users should refer to the AMM.
- If the detection test shows contamination from either H Res, bacteria or fungi then do the scheduled inspection test more often.
- If the detection test shows microbial growth, then do the scheduled inspection test more often.
- After a treatment with biocide, don't test again until you fly at least 5 flights. This is to make sure that fuel treatment with biocide is fully removed from the fuel tanks before the next test.
- If the biocide treatment is not effective using 1/3 fuel load, use a biocide treatment with a full fuel load and use the maximum soak time. The contamination may be towards the top of the tank.



DETECT
The Diesel Bug
Stay in control
with FUELSTAT®





TEST RESULT GUIDE:



FAILED TEST RESULT



NEGATIVE RESULT



LOW POSITIVE RESULT



HIGH POSITIVE RESULT