

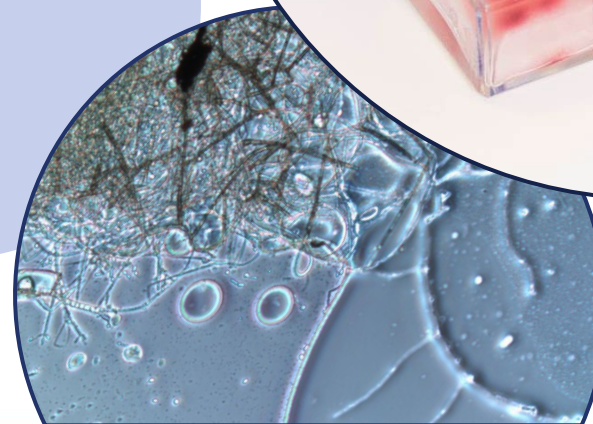
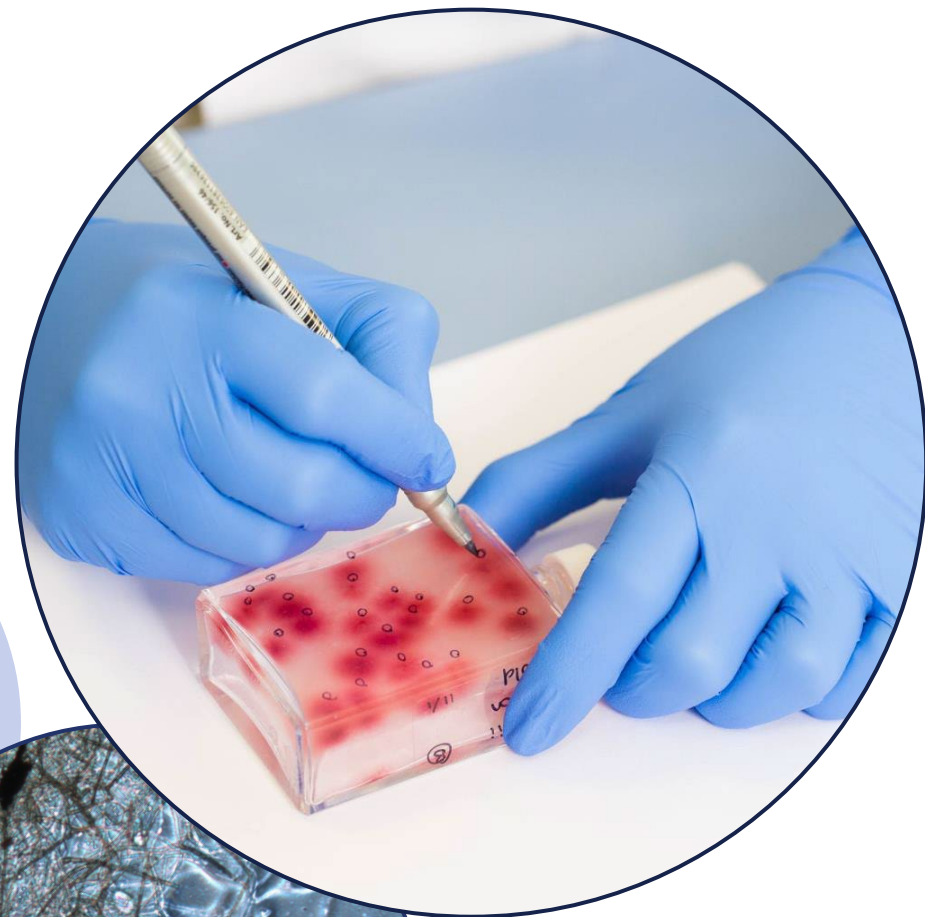
MICROBMONITOR[®]2

Dr Gareth Williams

ECHA Microbiology Ltd., Cardiff, UK



JIG Members' Technical Forum, Rome, June 8-9th, 2026



Who Are We And What Do We Do?

- ECHA MICROBIOLOGY have globally recognised expertise in the investigation, treatment and prevention of microbiological spoilage and corrosion
- Serve the Energy, Aviation, Marine & Engineering Industries
- Founded in 1983 as a spin off from Cardiff University
- Headquartered in Cardiff, Wales, UK
- Supply over 100 Countries
- Active involvement in developing industry best practice (IATA, ASTM, EI, JIG)



ANALYSIS &
RESEARCH



CONSULTANCY
SERVICES



MICROBIOLOGICAL
TEST KITS



TRAINING COURSES



SITE SURVEYS

What is MICROBMONITOR[®]2?

- A simple, quantitative test kit to detect living aerobic microbes that can be present in fuel tanks and systems.
- An industry standard method
 - ASTM D7978 / IP613.
- Measures the extent of microbial contamination in fuel, oil or associated water by measuring colony forming units (CFU).



MICROBMONITOR[®]2 Referenced in



Bombardier

BAE SYSTEMS



Gulfstream[®]

Industry standards / Method history

- CFU Methods are considered reference methods for microbial contamination (bioburden) in many industries.
- CFU Methods are the reference method in IATA Guidance Material on Microbiological Contamination in Aircraft Fuel Tanks.
- JIG defines CFU contamination limits for the MicrobMonitor®2 test.*
- MicrobMonitor2 shows good correlation with Industry Standard Reference Laboratory Method IP 385 (ASTM D6974).**
- MicrobMonitor2 provides accurate, reliable quantitative results for fuel samples with or without water.
- MicrobMonitor2's accuracy has been independently validated by Energy Institute Inter Laboratory Study (ILS)*** and by CRC-AV-31-22 Microbial Test Kit Evaluation.****
- CFU Methods are not rapid – routine monitoring at facilities is generally not time critical.

* JIG Technical Information Document *Microbial Growth in Fuel and Monitoring Strategies* TID #1 2nd Ed. 2023

** ECHA report "Comparison of IP 385 and MM2_CR1.05.pdf"

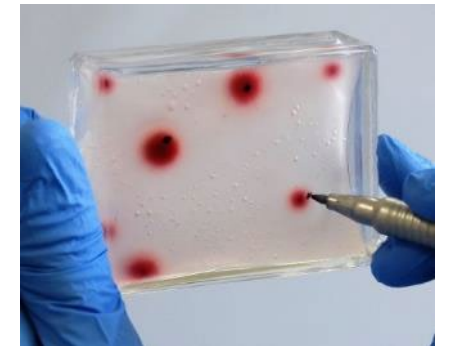
*** Energy Institute Research Report RR IP613-2013

**** CRC Research Report CRC-AV31-22 Microbial Test Kit Evaluation. Coordinating Research Council, Atlanta, January 2026
(<https://crcao.org/crc-project-no-av-31-22/>)



How does **MICROBMONITOR[®]2** work?

- The test consists of a pre sealed glass bottle that contains a sterile thixotropic nutrient gel.
- Fuel or water sample is added directly to the bottle and shaken.
- The test bottle is incubated for up to 4 days and viable (live) culturable microbes present will grow, utilising the nutrients in the gel and sample added (e.g. fuel).
- As each microbe grows it forms a visible red / purple spot (colony).
- Each spot represents a Colony Forming Unit (CFU).
- The number of spots is counted and converted to CFU per litre (for fuel) or per ml (for water).
- Follow this [link](#) for a video showing the test procedure.



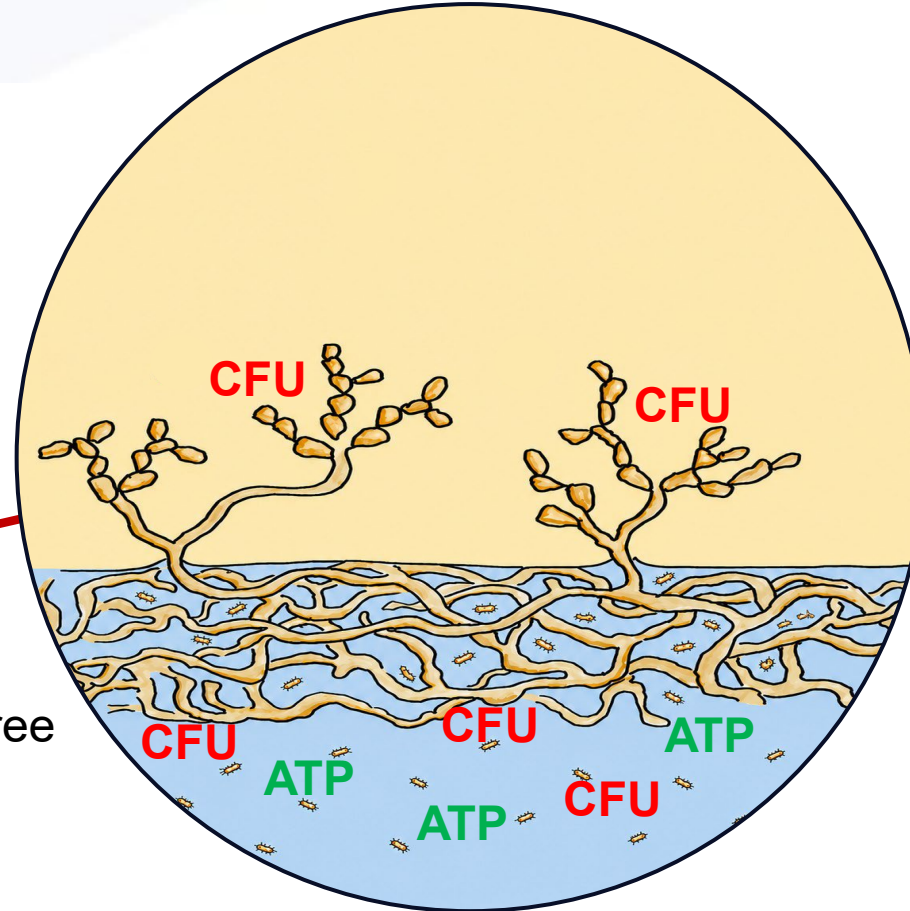
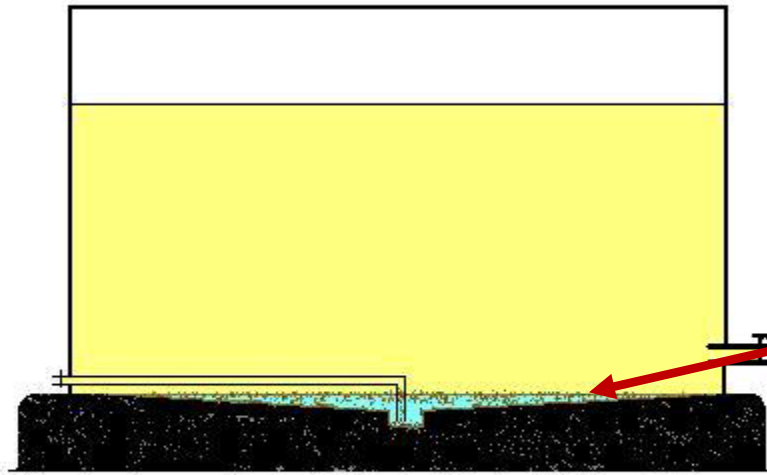
What does MICROBMONITOR[®]2 detect?

- MicrobMonitor2 detects a wide range of bacteria and fungi (yeasts and moulds).*
 - 92% of the predominant genera detected in aviation fuel, established by review of the scientific literature, have been verified to grow in MicrobMonitor2.
- * = detected within 4 days incubation
- * = not detected (even after 7 days)
- MicrobMonitor2 can detect dormant microbial spores.

* Owen, L. et al., "Correlation between microbial biomass in aircraft fuel tanks and aviation fuel samples with CFU counts obtained by culture methods." *Proceedings of the 18th International Conference on Stability, Handling and Use of Liquid Fuels*, Louisville, USA, September 2024.

Bacteria	Fungi
<i>Acinetobacter</i> sp. *	<i>Acremonium strictum</i> *
<i>Alcaligenes faecalis</i> *	<i>Alternaria alternata</i> *
<i>Bacillus licheniformis</i> *	<i>Aspergillus fumigatus</i> *
<i>Burkholderia cepacia</i> *	<i>Candida boidinii</i> *
<i>Cellulosimicrobium cellulans</i> *	<i>Candida viswanathii</i> *
<i>Erwinia billingae</i> *	<i>Debaryomyces hansenii</i> *
<i>Gluconacetobacter hansenii</i> *	<i>Fusarium moniliforme</i> *
<i>Kocuria</i> sp. *	<i>Galactomyces</i> sp. *
<i>Kocuria rosea</i> *	<i>Hormoconis resinae</i> (3 strains) *
<i>Methylobacterium brachiatum</i> *	<i>Meyerozyma guilliermondii</i> *
<i>Methylobacterium radiotolerans</i> *	<i>Paecilomyces</i> sp. *
<i>Pseudomonas aeruginosa</i> (2 strains) *	<i>Penicillium</i> sp. *
<i>Pseudomonas oleovorans</i> *	<i>Pichia membranifaciens</i> *
<i>Pseudomonas putida</i> *	<i>Rhodotorula glutinis</i> *
<i>Pseudomonas</i> sp. *	<i>Wickerhamomyces anomalous</i> *
<i>Stenotrophomonas maltophilia</i> *	<i>Yarrowia lipolytica</i> *
<i>Ralstonia pickettii</i> *	<i>Pseudallescheria boydii</i> *
<i>Yersinia frederiksenii</i> *	

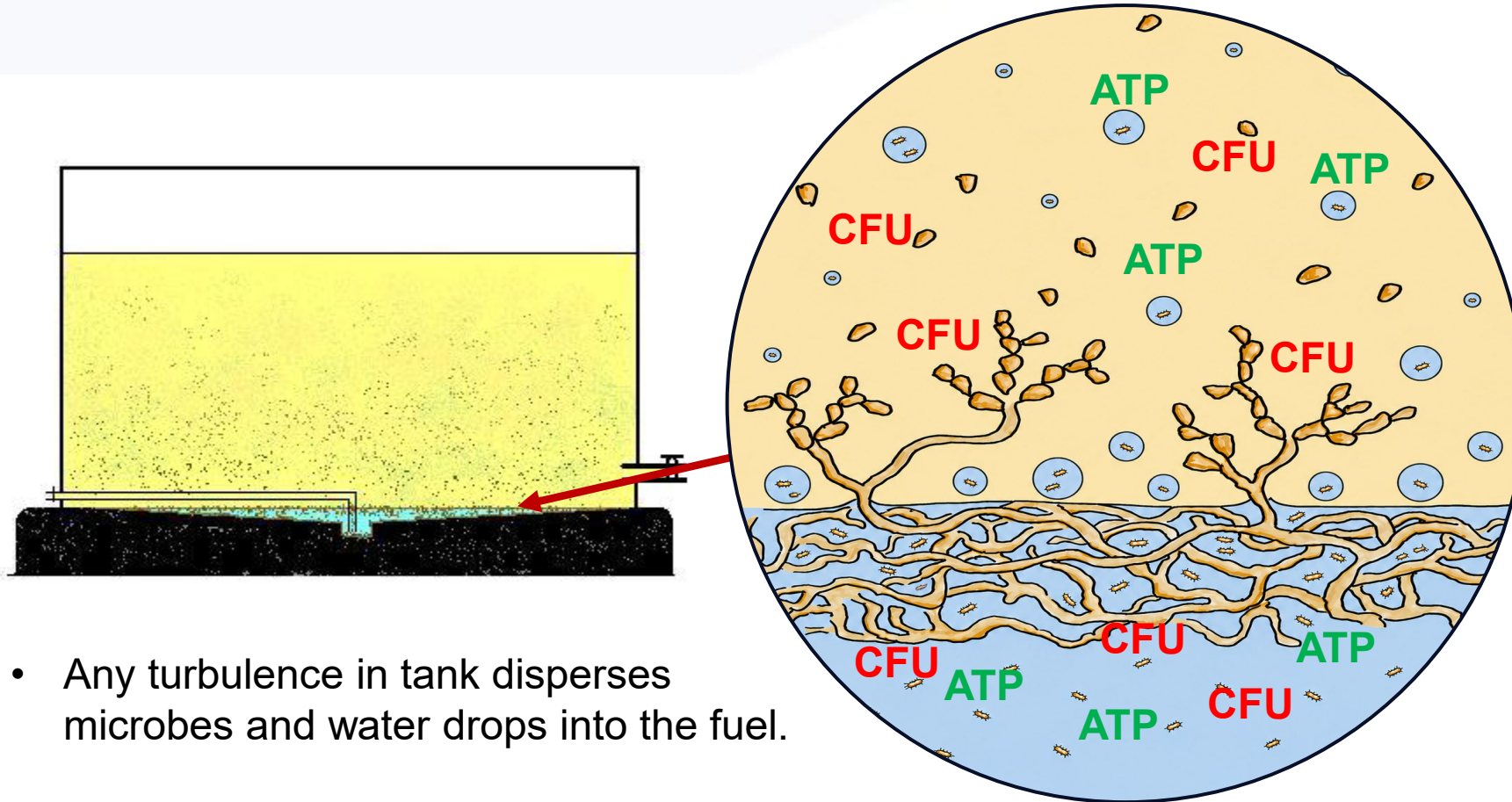
Microbial detection in Fuel and Water phase



- Active microbial growth occurs in free water phase.
- Water may be present in isolated pockets distant from the drain or sampling point.

- Fungi produce spores at the fuel:water interface.
- Spores are live but inactive.
- Spores are hydrophobic and repelled from the water phase and dispersed in the fuel.
- CFU testing detects both spores and active microbes.

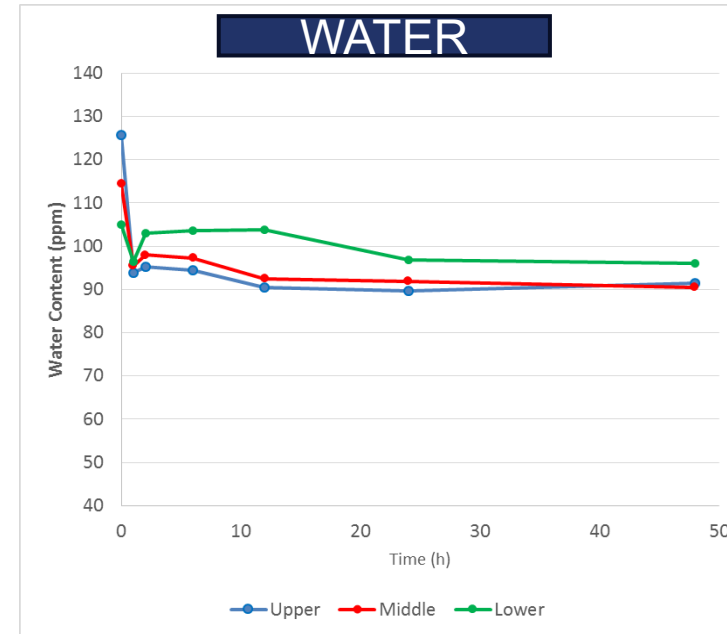
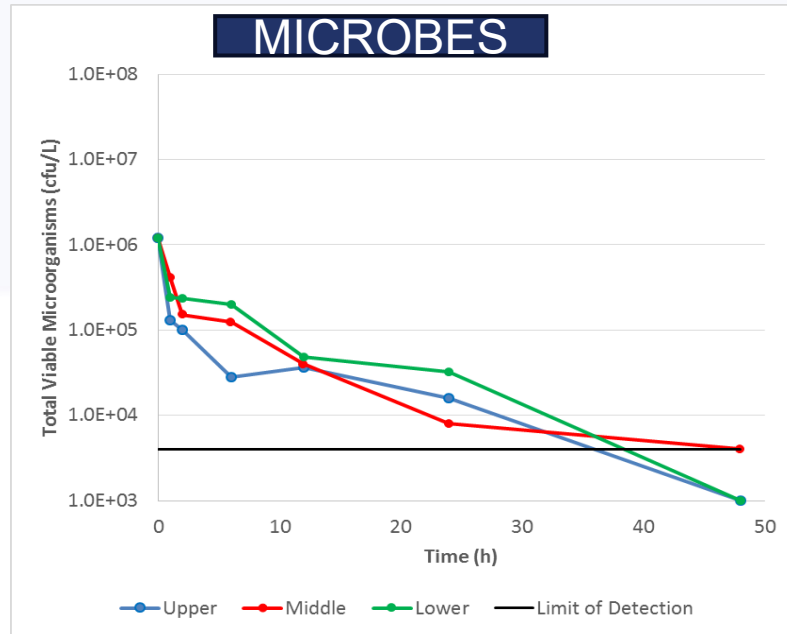
Microbial detection in Fuel and Water phase



- Any turbulence in tank disperses microbes and water drops into the fuel.

- When water drops are suspended in fuel both spores and active microbes can be detected in fuel phase.

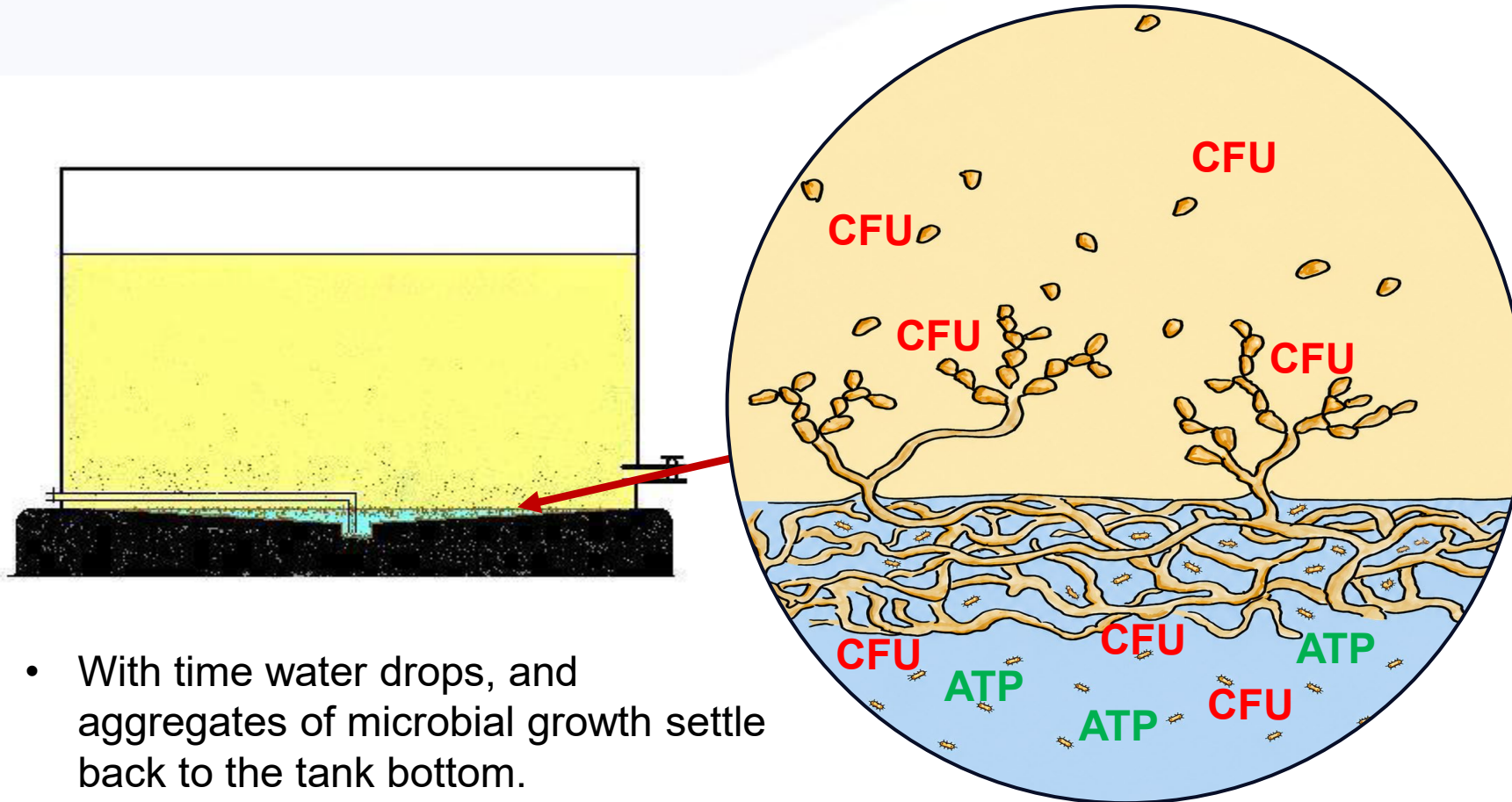
Settling of microbial contamination vs water



- Microbial contamination settles progressively with time.
- Water content in fuel decreases rapidly in first few hours as suspended free water drops settle then remains stable (dissolved water).
- Microbial contamination is not necessarily associated with suspended free water droplets.

Energy Institute Research Report EI 3428: Guidelines for the investigation of relationship between water content in biodiesels and microbial growth and contamination.

Microbial detection in Fuel and Water phase



- With time water drops, and aggregates of microbial growth settle back to the tank bottom.
- Microbes do not remain active in fuel phase for long.

- Spores remain dispersed in fuel.
- Spores in fuel provide an indication that active microbial growth is occurring in the tank even when water phase cannot be easily sampled.

Contamination Limits: Aviation Fuel Supply

- Contamination limits for drain or low point samples from the aviation fuel supply and distribution facilities as defined in JIG TID#1.

Test Method	Sample type	Normal Level Contamination	Warning Level Contamination	Action Level Contamination
MicrobMonitor®2 IP 613 / ASTM D7978	Fuel*	<10 ⁴ CFU/Litre	10 ⁴ - 10 ⁵ CFU/litre	>10 ⁵ CFU/litre
	Associated Water*	<10 ⁵ CFU/mL	10 ⁵ – 10 ⁶ CFU/mL	>10 ⁶ CFU/mL

***Note:** For tests of samples representative of bulk fuel at airports and samples from the into-plane operation, the more stringent CFU limits defined for samples from aircraft fuel tanks in IATA Guidance should be applied.

THANK YOU !



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