

VOLATILE FATTY ACIDS (VFA)



The Australian Water Quality Centre (AWQC) is dedicated to ensuring and responding to the public health requirements relating to the provision of water and wastewater services for communities in Australia and across the world.

Volatile fatty acid (VFA) analysis forms an important means of assessing the effectiveness of the digestion process within a wastewater treatment plant. This new analytical technique provides wastewater treatment plant operators with a much improved means of being able to optimise the operation of the digesters in the wastewater treatment plants. As such, operators are better able to diagnose issues and adjust processes in the treatment plant. When VFA is used with alkalinity, it is a useful tool for monitoring the digestion process in waste water treatment plants. It is much better than pH monitoring alone which may not indicate a problem until it is too late.

—○ Specialist water services

Ensuring public health

The key to optimising anaerobic digesters is to understand the composition of VFAs during all stages of the digestion process. Interpreting the VFA speciation results allows operators to monitor the current state of the anaerobic digesters and reassess the operational strategies to improve performance. The analysis of VFA concentrations and their changes on a regular basis allows early detection and diagnosis of anaerobic digester process upset. The traditional titration method does not differentiate VFA species, therefore cannot discover any potential biological stress that may lead to detrimental bacterial community change, if not rectified at an early stage. For example, the accumulation of butyrate or propionate in digester sludge composite is a common indicator of stress for acetogenic bacteria, whereas the accumulation of acetate indicates compromised methanogenic bacteria activity.

The Australian Water Quality Centre (AWQC) has recently developed a new test method that employs gas chromatography coupled with a flame ionization detector (GC/FID) to analyse VFAs. The new method provides the detailed VFA profile that reports results as eight individual volatile acids (acetic acid, propionic acid, butyric acid, isobutyric acid, valeric acid, isovaleric acid, caproic acid and heptanoic acid) as well as total VFA as acetic acid equivalent.

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The new GC/FID test price for the VFA method will be the same as the current titration method and the AWQC will be phasing out the titration method by December 2014.

Table 1: Limit of Reporting for VFA method

Limit of reporting (mg/L)	Titration method	GC/FID method
Total VFA as acetic acid	<5	<5
Acetic acid	-	<5
Propionic acid	-	<5
Butyric acid	-	<5
Isobutyric acid	-	<5
Valeric acid	-	<5
Isovaleric acid	-	<5
Caproic acid	-	<5
Heptanoic acid	-	<5

Figure 1: GC-FID Chromatogram of a VFA Standard

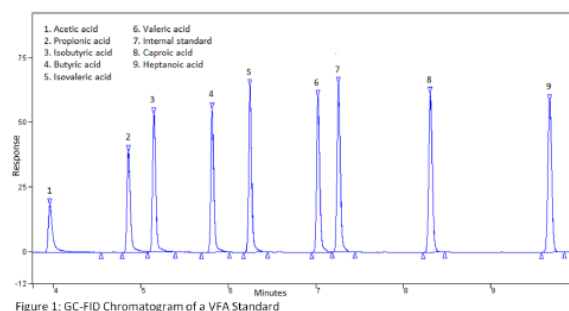


Figure 1: GC-FID Chromatogram of a VFA Standard

Sampling Requirements:

- Minimum 100mL PET or glass bottle for liquid samples
- Minimum 100mL sludge pot for sludge samples
- No air gap, transport and store at 4°C