

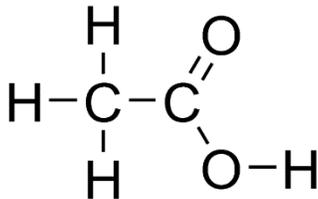
# Volatile Fatty Acid (VFA)

## Monitoring with the LiquID™ Station

### VOLATILE FATTY ACIDS

**Volatile fatty acids (VFA's)** such as acetic, formic, and butyric acid are byproducts of anaerobic bacterial digestion of organic matter and hence are a common constituent of wastewater process streams and sludge. The sodium (Na) and potassium (K) salts of VFA's (specifically, K and Na acetate) can also find their way into wastewater plant influent as storm drain runoff from airports where they are used to deice airplanes and runways.

Acetic acid (CH<sub>3</sub>COOH)  
(a common VFA)



In wastewater treatment facilities that perform **enhanced biological phosphorus removal (EBPR)**, VFA's are used to enable and optimize the biological removal process. They act as a trigger for the process as well as providing a growth advantage for phosphorus accumulating organisms (PAOs).

### TRADITIONAL VFA MEASUREMENTS

Existing VFA assay methods can be broken down into two broad classes. **Colorimetric/spectroscopic**, in which a water sample is treated with chemical reagents including those which produce a color change in the sample, which can then be correlated manually or by machine to the total VFA content of the process stream, and **gas-, liquid-, or ion-exclusion chromatography plus mass spectroscopy** testing of the water sample to yield signals proportional to the concentrations of each individual VFA type present in the process stream.

In general, the colorimetric-based VFA assays are inexpensive but labor-intensive, and have low sensitivity and poor accuracy. The HPLC/GCMS assays are slow and require expensive equipment and highly-skilled operators, but provide high sensitivity and high accuracy. **Neither of these assay techniques lends itself to continuous monitoring or to automation.**

### ABOUT LiquID™

The **LiquID™ Station** from **ZAPS Technologies** (pictured below) is an innovative, optical instrument for continuous water quality monitoring. The automated online instrument analyzes a continuous flow-through stream from a pressurized water sample line using multi-spectral light and software algorithms, and uses no reagents nor produces any waste other than the original sample (which is returned or wasted as appropriate). With this method, the **LiquID** is capable of monitoring a wide range of water quality parameters in a number of different industry applications, including those relevant to municipal water and wastewater treatment, water reuse systems and industrial process control.



### VFA MEASUREMENT WITH THE LiquID™ STATION

The **LiquID™** station from **ZAPS Technologies, Inc.** is a robust, ruggedized instrument, designed for monitoring in indoor or outdoor environments and matrixes ranging from ultrapure waters to natural ground or surface waters to wastewater. With broad spectrum, high-energy UV detection and intelligent on-board analytics, the **LiquID** station provides VFA monitoring with a higher sensitivity and in environments where many instruments fail. It is the first water quality assessment tool to provide continuous and automatic VFA monitoring without consumable reagents or human operators.

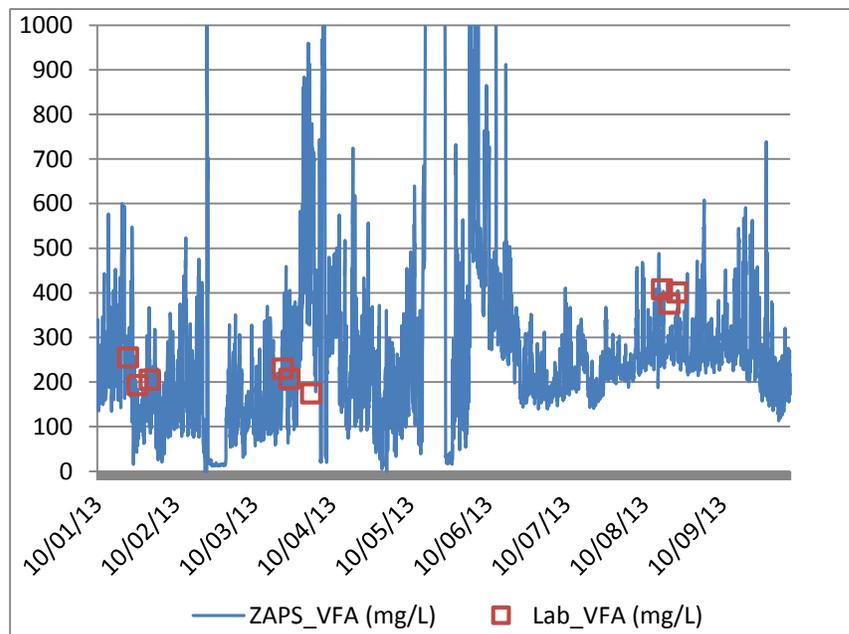
The **LiquID** station measures VFAs by illuminating the water sample with a powerful beam of light. This excites the VFA molecules in the matrix and causes them to give off light of their own, which serves as a characteristic signature of the VFA's chemical structure. The intensity of this *fluorescence signature*, as detected by the **LiquID** station, is a direct measure of the concentration of VFAs in the matrix.

These measurements are fast enough (approximately two minutes per sample) and accurate enough (detection range specification of 1 to 5000mg/L) to enable the plant operator to monitor and control the bio-P process profile in real time- without the need for consumable reagents, highly skilled chemical test technicians, dedicated wet chemical lab space, and expensive and manually-operated test machinery.

Below is a chart showing a continuous plot of VFA measurements taken by a **LiquID** station, continuously drawing its samples from the fermentate and providing a VFA reading once every two minutes. Process cycles and spikes, which are not detectable with twice-a-day manual sampling, are clearly resolved by the **LiquID** station's continuous data record.

Manually-drawn and analyzed samples are shown as red squares for comparison purposes.

The match between measurements made by the **LiquID** station and the manual method is satisfactory, but the **LiquID's** ability to furnish a minute-by-minute running record of actual VFA levels naturally makes the data from the **LiquID** far more useful to the plant operator. Signals from day-to-day within a week and minute-to-minute within a single day are easily visible.



### Contact ZAPS For More Information

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