

The Volaser: *In Situ* Measurements of Volumes of Faecal Sludge

The Volaser is a device that can measure the volume of faecal sludge inside onsite sanitation containments. This article presents results from Volaser field-tests and the plan for scaling up the prototype. [Nienke Andriessen¹](#), [Linda Strande¹](#)



Photo 1: Using the Volaser with the smartphone app in a septic tank in Lusaka, Zambia.

Introduction

For sustainable faecal sludge management, it is essential to understand the quantities and qualities (Q&Q) of faecal sludge (FS) that need to be managed, for example, when designing treatment facilities or emptying programmes. However, the construction of containments has not been standardised and maintenance records normally are not kept for FS stored in them. This makes it difficult to know how much FS accumulates inside such systems.

To measure containment size and *in situ* volumes of FS and assist in determining FS Q&Q at the citywide level, Eawag has developed the Volaser with ETH Zurich, Zurich University of the Arts and Tribecraft AG [1] [2]. It consists of a tripod stand with a distance laser measuring head, a collapsible pole to measure total depth and a smartphone app to operate the device (Photo 1). In 2019, the Volaser was tested in Sircilla, India; Kohalpur, Nepal; and Lusaka, Zambia, where, respectively, a total of 31, 45 and 421 containments of varying shapes and sizes were measured (Photo 2).

Field experience

The Volaser makes good measurements despite the different configurations and shapes of containments. Measurements were accurate to within <3.5 % of the total area measured and, according to professional emptiers and student researchers, it is easy to use. Measuring takes less than 10 minutes and can readily be combined with other tasks, i.e. containment inspections or emptying events. Production costs have been kept as low as possible; however, the trade-off is that it cannot be used in extreme cases – depths greater than 3 m or extremely large septic tanks. 3D printed parts made from commonly used polylactic acid (PLA) material are not robust enough to withstand temperatures in direct sunlight; thus, alternative materials for 3D



Photo 2: The Volaser prototype set-up with the tripod, top part and laser.

printing are being investigated. A smartphone with a gyroscope is required and, although the Volaser can measure total volumes of FS inside a containment, it cannot distinguish between different layers (e.g. sludge blanket and scum). In the field, a core sampling device was used for this [3].

Next steps

Being able to make reasonably accurate estimates of FS accumulation rates without having to empty containments or rely solely on rough estimates is a great improvement. Based on the field-testing, the Volaser concept was validated, and we have received many requests for prototype versions. To meet this demand, Eawag and Tribecraft are currently developing a field-ready product, as well as guidelines on self-assembly and use. Stay tuned until early 2021 for the final version! •

References

- [1] N. Andriessen, and L. Strande, Development of SPA-DET Approach for Faecal Sludge Quantities & Qualities, *Sandec News*, 20 (2019), 14.
- [2] L. Strande et al., Estimating quantities and qualities (Q&Q) of faecal sludge at community to citywide scales, in K. Velkushanova, et al., *Methods for Faecal Sludge Analysis*, IWA Publishing, (2020).
- [3] P. Prasad et al., Estimating faecal sludge quantities and qualities (Q&Q) in Sircilla, India, to test methods for quantification, (in preparation).

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