W.G.KRUMMRICH PLANT

ENVIRONMENTAL CONTROL GUIDELINE SP-4

ISOKINETIC SAMPLING USING A FLIP-FLOP SAMPLER

March 1972

SCOPE

This sampler is a modification of the "Isokinetic Waste Sampler for the Sauget Waste Treatment Plant" guideline SP-2.

To obtain a representative sample of waste stream containing solids or liquids in suspension with varying degrees of dispersion.

DIFFICULTIES ENCOUNTERED

a. The suspended materials tend to separate in the sample lines at low flow rate.

b. Small diameter sample lines plug easily and cannot be used to maintain isokinetic velocities in the sample lines.

c. Continuous pumping at isokinetic rates results in a very large sample.

d. Peristaltic pumps, while excellent in many respects, have a short life when operated continuously.

e. Suspended liquids separate on to the surface of collection vessels and cannot be completely re-suspended when it is necessary to withdraw aliquots of the collected material.

f. When the pumping is intermittent, the sample may not be representative until the line is flushed clear.

Problems a, b, c, and d were largely overcome by intermittent pumping into a 55 gallon drum equipped with a mechanical agitator (Ref. SP-2). However, problems e. became serious drawbacks when analyzing for trace amounts of a viscous oily material with very low solubility.

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The flip-flop sampler was developed to overcome these difficulties. It should be noted that it is adaptable to continuous pumping if a suitable pump can be found and also for proportional to flow sampling by electronically varying the pulse rate.

EQUIPMENT

1 - Peristaltic pump "Little Giant" model LG-101 with 110 v AC, 1725 RPM and 1/3 HP motor. Use 1/4" ID Tygon tubing.

2 - Cam Timer Model J3953 with A-18 gear rack. Meylan Stop Watch Corp.

3 - Pulse timer SV-800-013 modified at factory. Valcor Eng. Corp.

4 - Solenoid valve 54 P1903b modified at Monsanto. Valcor Eng. Corp.

5 - 2 1/2 gal. square jar. (Plastic or glass) Heavy duty glass

PRINCIPLE OF OPERATION

The peristaltic pump cannot be run continuously due to a tubing failure and to insure life to the tubing we use a cam timer. Timer setting can be adjusted according to our needs. We normally run the pump about 30 seconds every 15 minutes.

The cam timer energizes the pump and the pulse timer, the latter can be set to 1, 2 or 3 pulses during the ~~45~~ 30 seconds run. The frequency of pulses give us the size of the sample. If the sampler is programmed as described and the pulse timer set at 2 pulses it will collect about 1 gal. sample in 24 hours.

ISOKINETIC PICK-UP TIP

Using a new Tygon tubing the rate is about 1 GPM. With this information and estimating the sewer velocity we can size the tip of the pick-up tubing to have an isokinetic sampler.

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Sewer stream velocity = 3 ft./sec.

pumping rate = 1 gal./60 sec.

$Q = A \times V \qquad A = \frac{Q}{V}$

$$A = \frac{1 \times .1337}{3 \times 60} = .742 \times 10^{-3} \text{ ft}^2$$

$$D = \sqrt{\frac{.742 \times 10^{-3} \times 4}{3.14}} = \sqrt{.000945} = .0307 \text{ ft.}$$

Pick-up tip 0.307 ft. (0.031) = 1/4 sch. 40 ss pipe.

SAMPLER BOX

The sampler is housed in a plywood box (see drawing), the pump and the flip-flop sampler are located in the upper shelf and the sample jar is located in the lower shelf. The box can be winterized easily. The overflow line is a 3/4" ID rubber hose and is directed back to the sewer.

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