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COMPOSITE SAMPLING SYSTEM FOR WASTE WATER DISPOSAL

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ABSTRACT OF THE DISCLOSURE

A waste water sampling system in which uniformly sized effluent samples are collected at the end of each period during which a predetermined volumetric flow of effluent has occurred. A flow indicating device in response to the predetermined volume flow actuates a switch to operate the sample collecting device which utilizes an arm having a sampling cup at one end and a link at the other, the arm being reciprocated by a motor near its link end. In this way, a composite of these samples accurately reflects the composition of the effluent over the collection period.

BACKGROUND OF THE INVENTION

The successful design of treatment plants for water waste disposal requires an accurate picture of the average analysis of the waste water to be treated. In any given situation, it can be expected that not only will the analysis of the waste water change from time to time but also that the volumetric flow of waste will vary. The classic method of obtaining a picture of the analysis of the waste water is to manually collect samples at the end of predetermined time periods, say every hour, over some fixed time period such as twenty-four hours. The volume of these hourly collected samples is selected such as to be proportional to the flow of waste water at the time of collection and the composite of these samples, collected over the fixed time period, may be used to give a general picture of the average analysis of the waste water flowing within the fixed time period.

The principal drawback of such a method can be illustrated by considering an aggravated hypothetical case. For example, should the waste water flow and the strength of its analysis be at a low value or a minimum during each time of sample collection, with high flow surges of strong waste occurring in the intervals between collections, the composite sample obviously will be of such analysis as erroneously reflects the true conditions with which the engineer must deal.

BRIEF SUMMARY OF THE INVENTION

The present invention is based upon the principle of collecting uniformly sized samples over a fixed time period with the samples being collected on the basis of volumetric flow. Thus, as soon as a predetermined volumetric flow of waste water, or a multiple thereof, has occurred, one of the uniformly sized samples is taken. In this fashion, the composite sample more accurately reflects the average analysis or composition of the waste water during the collection period. Moreover, the present system allows smaller samples to be taken while still preserving the integrity of the average analysis.

The invention involves the use of a flow indicating device comprising a weir or measuring flume, a float and a recording and totalizing device connected to the float for integrating the flow rate with respect to time. As soon as the recording device indicates that the predetermined volumetric flow, or a multiple thereof, has occurred, switch means is actuated to cause a fixed volume sample to be taken and deposited in a composite sample collection device.

The fixed volume sample collection device is of simple but reliable nature, employing an arm carrying the sampling cup at one end and connected to a link at its other end with the arm being pivoted near its link end. The link is connected to the crank arm of a motor, which crank arm is shorter than the link-to-pivot portion of the sampling arm and disposed in vertically staggered relation with respect thereto so that the sampling arm sweeps through an arc of somewhat less than 180° during the first complete revolution of the crank arm and returns through this arc during the second complete revolution of the crank arm. Conveniently, the collection container, motor and sampling arm assembly may be mounted upon a weir or its equivalent which forms a supporting base therefor.

The electrical control for the motor assembly may be provided within the recorder case and it is preferred that this electrical control assembly utilize solid state components to minimize arcing and current consumption and weather related problems.

BRIEF DESCRIPTION OF THE FIGURES OF THE DRAWING

FIGURE 1 is an elevational view partly in section illustrating the construction of a preferred embodiment of the present invention;

FIGURE 2 is an enlarged view, partly in section, showing the sampling cup construction;

FIGURE 3 is a plan view as indicated generally by section line 3—3 in FIGURE 1 showing details of the float; and

FIGURE 4 is a circuit diagram of the control system.

DETAILED DESCRIPTION OF THE INVENTION

With reference now more particularly to FIGURE 1, reference character **10** indicates the waste water whereas the reference numeral **12** indicates a weir board, plate or flume placed across the flowing stream. As shown, the board **12** is provided with an opening **14**, the lower edge **16** of which defines a weir over which the waste water flows so that the height of the waste water upstream of the weir as indicated by the reference character **18** is indicative of the instantaneous volumetric flow over the weir. An anchor member **20** is pivotally connected as through a suitable bracket **22** fixed to weir **12** to extend upstream and is provided with a bifurcated end portion **24**, see particularly FIGURE 3, which pivotally mounts a float **26**. One end of a cable **28** or the like is anchored to a suitable eye **30** of the float and the other end of the cable, after passing around the pulley **32** of the recording device **34** is dead-ended at **36** on the recording device frame, there being a weight **38** maintaining the cable taut throughout. For this purpose, the weight may be provided with a pulley having a spindle **40**.

The weir plate **12** supports a base member **42** upon which is mounted a motor **44** driving, through a suitable gear reduction unit, an output shaft **46** to which is connected a crank arm **48**. The crank arm is connected to a link assembly indicated generally by the reference character **50** which extends between the crank arm and the lower end of a sampling arm **54** whereat it is pivotally connected as at **52**.

The sampling arm is pivotally connected as at **56** to the stand portion **58** mounted on the base **42** and carries, at the extremity of the portion **60** thereof beyond the pivot **56** a sampling cup indicated generally by the reference character **62**. The sampling cup as is shown in FIGURE 2 may take the form of an open ended tubular cup member **64** pivotally mounted to the upper extremity of the arm portion **60** with the arm portion **60** being provided with a rigid bail **66** which, when the parts are in the position of FIGURE 2, extends beneath the cup **64** and constrains