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Water Batcher for Concrete Mixer

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Summary

Measured quantity of water for making good quality concrete, is generally poured manually in the concrete mixer either with the help of buckets or any other type of containers. This practice introduces lot of human errors resulting in variations in the consistency and the strength of the concrete. A particular mix prepared by different gangs may not give the same desired strength. Although some types of water batchers are available in the country, these suffer from erroneous performance. Hence a need has always been felt to evolve a water batching device which could give accurate discharge without any probability of large errors. Further the device ought to match with the standard of available skill for operation and maintenance. A water batcher that has been designed and fabricated which can maintain the accuracy of discharge within the permissible limit as per IS. Code 1791-1961 is described.

Introduction

Water batcher is a device mounted on concrete mixers for supplying a predetermined quantity of water for every batch of concrete to be prepared. The existing water batching devices on concrete mixers available in the country suffer from large variations in their discharge. Normally in practice, water is poured with the help of buckets or any other type of containers. This practice introduces a lot of human error resulting in variations in the sftrength for the same mix. In view of this the work of designing an efficient and more accurate water batcher was taken up.

Existing Water Batchers

(i) Drum type

The drum type water batcher is mounted on two supports on its horizontal axis. It has a large opening to discharge water by turning a handle and a typically shaped float valve for inlet supply. An adjustable stopper is also provided on the horizontal scale to preset the quantity of water required for a batch. Normally water flows in excess due to momentum induced during the turning of the drum to discharge the water. Also in inclined position of the mixer, the float assembly does not remain truly vertical and hence the rectangular float does not have full contact with the water, thereby, the inlet device does not function effectively. No interlocking device is incorporated on the inlet valve. These inaccuracies are caused even though the desired discharge is present on the scale. Further, the set up also lacks an overflow outlet.

(ii) Radially Moving Syphon type

In some portable concrete mixers, a rectangular tank is bolted on the frame above the drum. This tank contains an inlet valve, a lever for operation and a radially moving syphon for discharging the water. When the syphon is standing vertically, the water level in the tank remains below the receiving end of the syphon. The hand lever when turned through a semicircular scale upto the desired value of discharge correspondingly turns the syphon in radial direction. The receiving end of the syphon comes below the surface of water and thus the discharge takes place. No valve has been provided on the discharge end of the syphon. For every discharge, the syphon is required to be moved in the radial direction. This causes a great disturbance in the water, leading to inaccuracies. It is observed that the time taken for the discharge is also quite considerable.

Piston Controlled Batchers

In this type the predetermined volume of water is set by an axially moving piston inside the batcher tank. A reservoir tank is provided which is connected to the batcher tank through

a valve. A lever when operated opens the discharging valve and closes the receiving valve of the batcher tank. The drawback in this tpye of water batcher is that the water flows under gravity from the batcher tank and takes considerable time in discharging the required quantity to the mixer drum.

Only the first two types of water batchers have been generally provided on the concrete mixers in the country. Both types have been tested and it was observed that there are large variations in the discharge values. The third type namely (Piston controlled batcher) has been tried in other countries but as yet no water batcher has been designed and manufactured in this country.

Basic Consideration in designing a water batcher for Concrete mixer :
(i) Time of discharge

It is desired that the requisite quantity of water is discharged expeditiously from the batcher to the mixer drum. The use of syphon increases the discharge rate of water but is effective only when the receiving end is kept parallel to the surface of water. In a radially moving syphon, it has been observed that the last portion of discharge keeps on trickling for a longer duration on account of the angular position of the receiving end of syphon with the water.

(ii) *Interlock*

To ensure that water does not enter the batcher tank during the discharge, an interlock is required between the discharge valve and inlet valve.

(iii) *Discharge tolerances*

There should be consistency in the repeated tests and the variations in the discharge rates should be as small as possible.

Water Batcher Developed at C. B. R. I.

Considering these basic requirements of a water batcher, viz., the time of discharge, the interlocking of inlet and disrharge, the discharge tolerance, simplicity of operation and ease in maintenance, different set ups for batching the water, were analysed. As a result of analysis and trials, a water batcher Fig. 1 with a vertically moving centrally located syphon with an interlock arrangement to stop the entry of water into the water bateher during the disiharged period, has been designed, fabricated and put to trials.

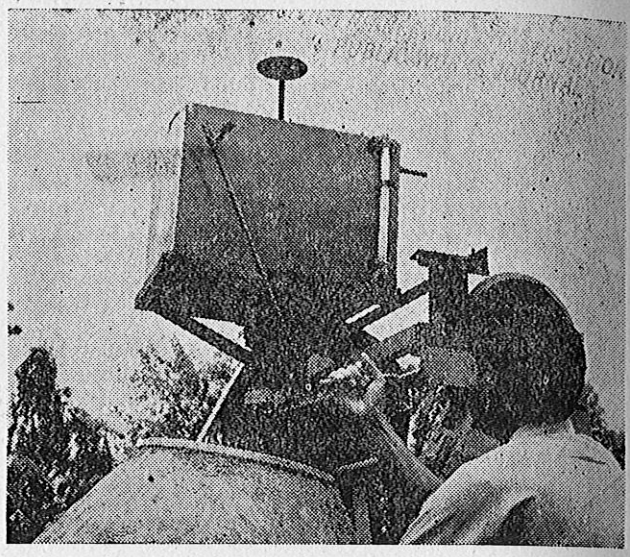
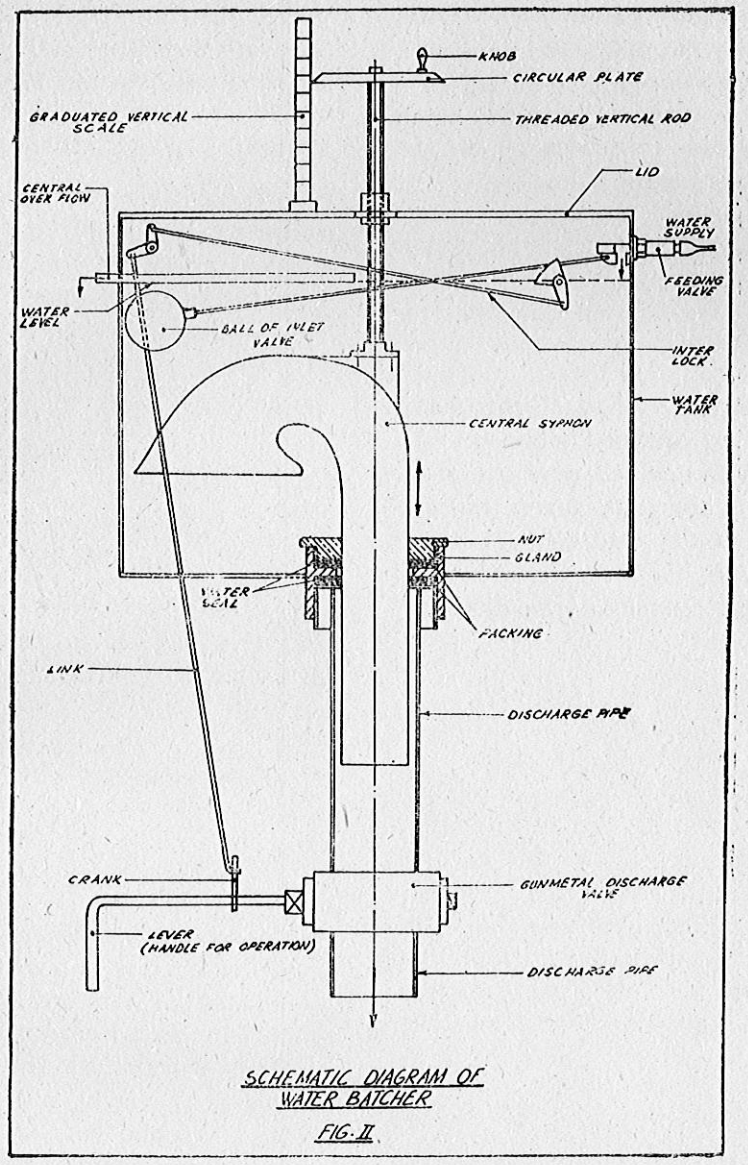


Fig. 1.

A schematic diagram giving the details of water batcher is shown (Fig. 2). It consists of a rectangular tank of completely welded M.S. sheet. It has a removable lid which is bolted on all four corners, at the top. A feeding valve shown on the right side in (Fig. 2) controls the water level and cuts off the incoming flow of water automatically by the upthrust on the ball of the float cock as soon as the tank is full of water. The bell mouth syphon made of aluminium can move up and down by the help of a threaded vertical rod. To set the water batcher to desired quantity of discharge a circular plate with a knob is provided on this vertical threaded rod. This, on moving, sets the bell mouth of syphon at any desired height and thereby control the quantity. The water between the top water level and the mouth of syphon is taken as one batch to be discharged. The central syphon is fired vertically by the help of gland, seals and packing in the centre of the bottom of the tank A standard discharge valve after improving its opening is provided on the outlet pipe so as to increase the quantity of discharge per second. The interlock system, having links with inlet valve and discharge valve has been provided to



SCHEMATIC DIAGRAM OF WATER BATCHER

FIG. II

prevent flow of water into the tank till the preset quantity is fully discharged. A single operation of the operating lever opens the discharge valve and simultaneously closes the inlet valve. Therefore, no water is allowed to come in during the discharge operation. A central overflow outlet is provided to safeguard the proper functioning of feeding valve in situations where the mixer is standing in inclined position. A vertical scale is provided to preset the discharge.

Operational Accuracy in Field Trials

The water batcher was mounted on a tilting type of mixer 140 T and 200 T to observe its performance. The average observed readings of discharge and the percentage errors observed are given in Table I.

S. No.	Standard Reading (Litres)	Average observed Reading (Litres)	% error
1.	20	20.080	+ .4
2.	25	24.966	— .14
3.	30	30.066	+ .22
4.	35	35.266	+ .76
5.	40	39.733	— .67
6.	45	45.216	+ .48
	Result : Max. error in discharge		+ .76%
			— .67%

While checking the scale accuracy in Dynamic conditions i.e. while the mixer is in full use, the tolerance of accuracy is found to lie between the limits of ± 1.5% to ± 20%. For the batch type of mixers the IS code 1791-1971 allows the variation in the delivered quantity of water, not more than ± 3%. However this water batcher is well within the tolerance limit of discharge specified.

CONCLUSIONS

The water batcher developed at this Institute has an interlocaing device between inlet valve and discharge valve which does not allow the water to come into the tank during the discharge of water. Also the central syphon arrangement cuts off the flow at once to avoid any sort of dribbling effect on the discharge valve. During trials this has given fairly accurate discharge and passes the permissible limit as per IS code 1791-1961.

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