METHOD FOR MEASURING CLARIFIER MUD CONSISTENCY

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ABSTRACT
At present, clarifier/filter stations are operated by manual control to obtain the desired mud consistency for the filters. As a first step to automating this process, an investigation was carried out into methods of measuring mud consistency between the clarifier and the mud mixer. A successful method using a venturi was developed.

Keywords: Sugarcane, clarifier/filter stations, mud consistency, measurement.

INTRODUCTION
There are various definitions of consistency, covering a wide range of substances, depending on the measurement system. Consistency-measuring devices deduce a value of consistency from measurements of other fluid properties. Given the relationship of consistency to percent solids, the term consistency has acquired the connotation of solids content; consequently, its scientific denotation is disregarded in some industries.

In the sugar industry, the consistency of primary mud, which is non-Newtonian and belongs to the Bingham plastic fluid family (Perry 1963), is not usually measured despite the availability of consistency meters. Primary mud is fed from the clarifiers to the mixer by gravity flow through pipes that are generally oversized to handle worst case mud thickness. There can also be quite wide (±3 units) variations of the primary mud consistency over a time span of just a few minutes.

VENTURI
This device is based on the principle that at a constant applied pressure, the velocity of a fluid (at a constant temperature) through a restriction is a function of consistency. The differential pressure in a venturi can be used as a measure of the velocity and hence the consistency of the primary-mud if the line pressure is kept constant.

The device was tested on primary mud at the Mount Edgecombe Mill. The dimensions of the venturi used for these tests are based on the Herschel design (Miller 1983): pipe diam., 23 mm, and throat, 10 mm. Figure 1 shows the flow diagram of the experimental setup at the Mount Edgecombe Mill. A side stream sample was taken from the primary mud pipe feeding the mud mixer and fed into the venturi header tank. This tank was designed to maintain a constant mud level with a self-cleaning screen to prevent solid pieces of mud >8 mm from flowing through the venturi.

During the 2-mo period that the venturi was installed at the mill, samples were collected randomly and analyzed for suspended solids. The results are presented in Figure 2. The "fitted curves" in all graphs were obtained by means of a polynomial best-fit to the data (to a maximum of the third power).

For the duration of this experiment, the samples collected varied from 6-10% suspended solids, of which bagacillo accounted for 1-2%. The output from the venturi was proportional to suspended solids.

DISCUSSION
Lab results show that the venturi can measure the consistency of primary mud between the ranges of 2.5-10% and that a temperature change of 80-90°C in the primary mud causes an output error of <10%. For the period that the venturi was installed at Mount Edgecombe, a small buildup of scale was noticed. The dimensions of the venturi used
were chosen for doing experimental work only. A larger venturi should be chosen when using a greater volume of primary mud, thereby eliminating the possibility of blockages in the venturi and reducing the significance of scale accumulations.

CONCLUSIONS
The work carried out in measuring consistency in a filter station was done with the purpose of obtaining a repeatable output rather than an extremely accurate one. The venturi device has been shown to fulfil this requirement of measuring suspended solids successfully. During normal operating conditions, the primary mud temperature variation will not cause a significant output error from the venturi and its effect can be ignored.

Figure 2. Differential pressure versus consistency.

REFERENCES