

ABSTRACT

The candle type pressure filter is a standard piece of equipment which is used for the filtration of suspensions. The type of suspension used in this work showed anomalous characteristics. The modelling of such a system requires the use of appropriate methods of experimental data interpretation. A review of the proposed methods given by various authors leads to the conclusion that there is a lack of universal representation of the deviations from Ruth's basic filtration equation.

Investigations were carried out into parameters affecting the operation of an axially vibrated candle pressure filter. Parameters investigated for different filter fabrics were:-

- (1) Those affecting the removal of mud after cake filtration;
- (2) Frequency of vibration;
- (3) Amplitude of vibration;
- (4) Types of filter aid;
- (5) Flow characteristics

Juice flow rate varied between  $20 \text{ l m}^{-2} \text{ min}^{-1}$  and  $10 \text{ l m}^{-2} \text{ min}^{-1}$ . However in terms of filtrate flow rate, turbidity and colour removal, Dacron gave the best overall results. The major ridges of the Dacron cloth ran axially as a result of which cake was removed by vibrations much more easily than for any other cloth. Mud removal was greatest when precoating was done. Cycle times varied from 20 to 30 minutes. It was possible to obtain up to four cycles without backwashing when air was used to aid in mud removal from the filter.

Colour and turbidity removal was best achieved at lower amplitudes with 3-4 mm being the optimum. At high amplitudes and frequencies (60 Hz, 7mm) the filter acted as an acoustic filter in that heavy bleeding occurred.

In this work a generalised analysis of the overall process of filtration under vibrating conditions is developed. This analysis gives, in a simplified form, the complicated functional relationship between average tube resistance and the other variable process parameters.

Two such relationships have been developed, as follows:-

$$(1) T = \frac{\mu \alpha_v^c}{2 A^2 \Delta P} V^2 + \frac{\mu}{A \Delta P} \left[ 2 R_0 - e^{(A^1 \lambda w + B^1)} \right] V + T_0$$

and

$$(2) \Delta \alpha = D e^{(E/w)^{-G}}$$

where

$$\Delta \alpha = \frac{\alpha_0 - \alpha_v}{\alpha_0}$$