INCREASE OF PRODUCTIVITY OPERATING WITH TWO COARSE SEED FILTERS IN PARALLEL

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Abstract

Increased concentration of solids in the precipitators generally increases the generation of fines in the circuit. However a high concentration of fine particles results in the best condition for productivity from precipitation. The lines 1/2/3 of the precipitation circuit have disk filters to filter coarse seed that is pumped from the discharge of the secondary classifier. Each line has two filters, one operating and the other on stand-by.

In order to increase the solids concentration in the chain of precipitators without increasing the solids concentration in the overflow of the secondary classifier, a test was conducted with two coarse seed filters.

The results of the test showed increased precipitation productivity because of the reduction in the median size of the fine particles (105 to 95 microns) and the increase in the concentration of solids to 440g/L at the end of chain. The results also showed that an optimum operating condition in the thickeners was maintained as a result of the reduction in flow by 600m³/h and maintaining solids in the secondary overflow between 110 and 120g/L.

1. Introduction

Increased concentration of solids in precipitation increases the generation of fines in the circuit. A high concentration of solids with fine particle size results in better conditions for precipitation productivity.

Currently the lines of precipitation 1/2/3 use disk filters for the coarse seed filtration, filtering the slurry from the discharge of the secondary classifier. Thus, only one filter operates per chain.

In order to operate with two coarse seed filters per chain, a test was conducted and the results are presented in this paper.

The main objective of the test was to evaluate the possibility of increasing the concentration of solids in the chain of precipitators without increasing the solids concentration in the secondary classifier. The gains associated with these results are:

- Higher productivity of precipitation because of the increase of solids concentration in the chain and the reduced flow of spent liquor that returns to the chain
- The ability to maintain an optimum operating condition in the thickeners by avoiding excess solids feeding the thickeners.

2. Development

The current operation of the lines 1/2/3 is presented in Figure 1. The coarse seed filtration is shown by the blue lines and the operation of the second filter is shown by the orange lines.

The second filter was fed by old pumps from an earlier cyclones installation, which receive the slurry from the overflow of the primary classifiers. This modification results in reduction of flow to the secondary and tertiary thickeners.

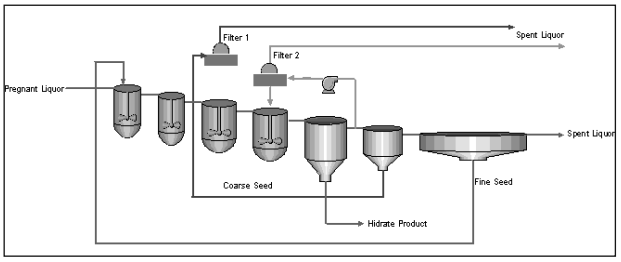

Figure 1.The way the filters currently operate and test highlights

The test period and test conditions are presented in Table 1. The average flow for chain 3 during the trial, was approximately 1200m³/h. Under normal conditions it operates between 700 and 900m³/h.

Table 1. Conditions of the test using two coarse seed filters.

Period		Filter	Flow	Operational Conditions
Start	End		m³/h	
11/7/2007	11/12/2007	E-48B-1C	800	Underflow of Secondary
		E-48B-2C	500	Overflow of Primary
11/13/2007	11/14/2007	E-48B-1C	700	Underflow of Secondary
		E-48B-2C	400	Overflow of Primary
11/15/2007	11/16/2007	E-48B-1C	800	Underflow of Secondary
		E-48B-2C	500	Overflow of Primary

3. Results

Presented in Figure 2 are the average pregnant liquor flow and the average of the flows feeding the thickeners. It appears that in the test period flows reduced by approximately 300m³/h per thickener (total 600m³/h). This is approximately the flow estimated by the mass balance.

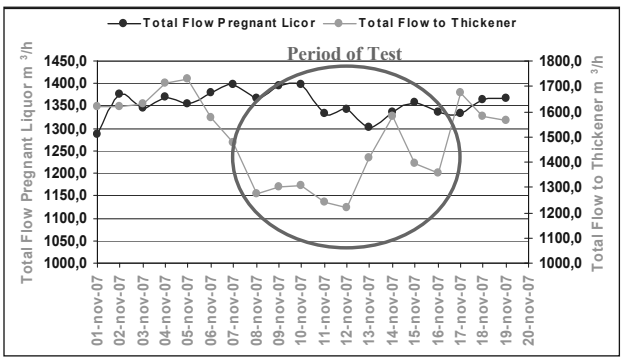

Figure 2. Total flow for the thickeners and total flow of pregnant liquor.

In Figure 3, the solids concentration at the end of chain and in the overflow of the secondary classifier is shown. As we can see, there was a reduction in values between 110 and 120g/L in the overflow of the secondary classifier (for values of solids concentration at the end of the chain up to 440g/L).

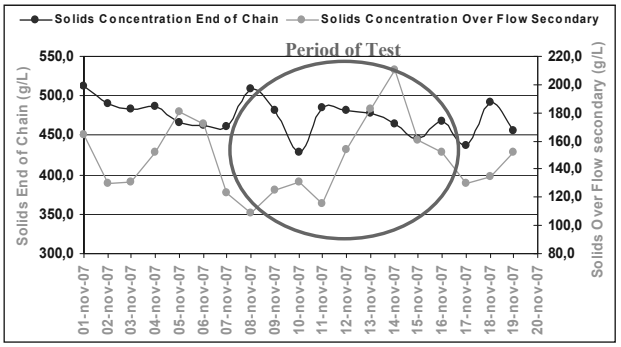

Figure 3. Solids concentration at the end of the chain and in the overflow of the secondary classifier.

Figure 4 shows the densities of the primary and secondary classifiers in operation, as well as the flow rate of discharge of the primary classifier. There was a decrease in the density of the discharge from the primary classifier in the testing period.

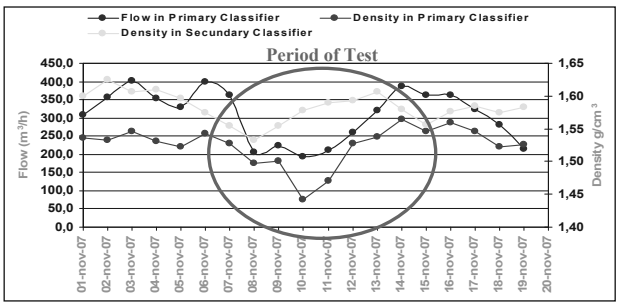

Figure 4. Primary underflow density and flow.

In Figure 5, the medians of the fine seed and the slurry at the end of the chain are shown. As we can see, there was a reduction in the median over the whole circuit because of the reduction in the flow to the secondary classifier providing a better classification.

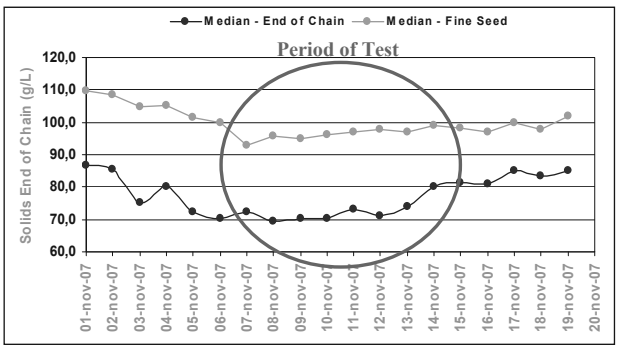

Figure 5. Median at the end of the chain and of fine seed.

Figure 6 presents the results of the ratio at the end of the chain during the tests. We can see considerable reduction in the ratio during the test period, which means a gain in the productivity.

The flow of the wash return was monitored and remained between 130 to 170m³/h, not influencing the results presented.

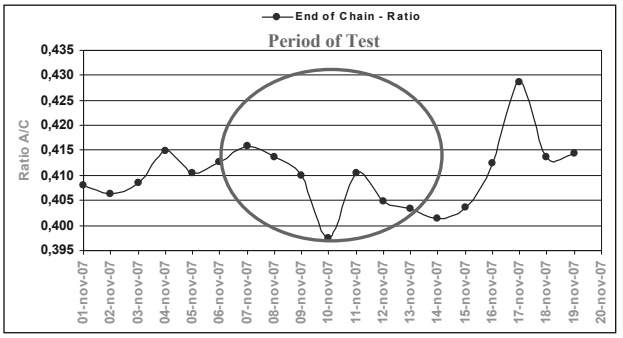

Figure 6. Ratio at the end of the chain

Figures 7 and 8 show the underflow in the thickeners during the test.

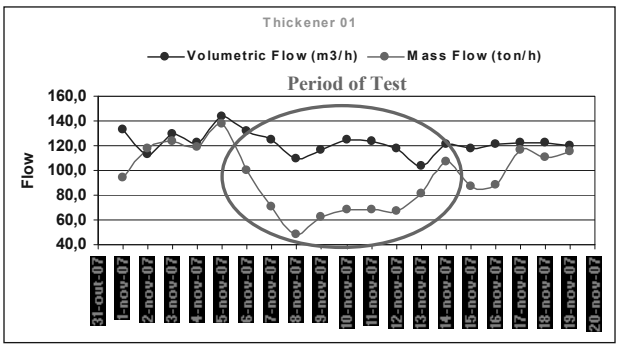

Figure 7. Underflow to thickener 1.

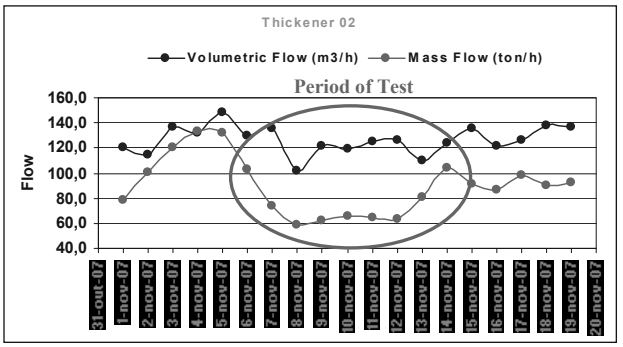

Figure 8. Underflow to thickener 2

These prove that the underflow of each thickener was considerably reduced, which resulted in a low torque and maintained an optimum operational condition. Figures 9 and 10 present these results.

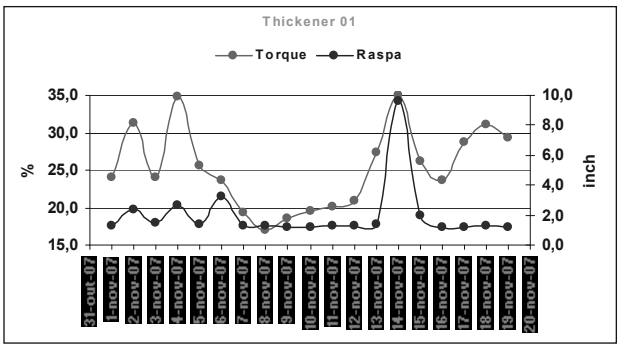

Figure 9. Torque and rake lift for thickener 1.

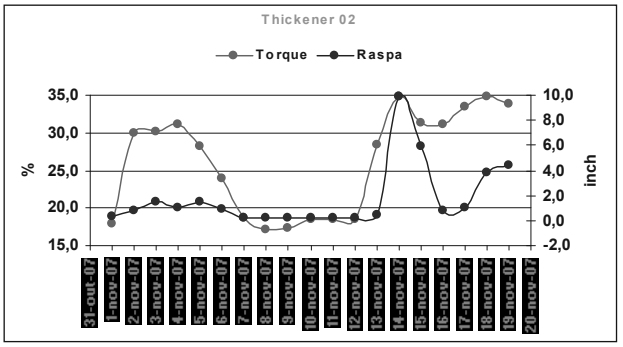

Figure 10. Torque and rake lift for thickener 2.

4. Conclusions

During the tests the total flow to the thickeners reduced by approximately 600m³/h while the concentration of solids in the overflow of the thickeners was maintained between 110 and 120g/L (for a final concentration of solids at the end of the chain of 440g/L). The concentration of solids at the end of the chain strongly influenced the concentration of solids in the overflow of the secondary classifier, even when these were by-passed by approximately 600m³/h to the secondary classifier.

There was a reduction in the median size of fine seed (from 80 to 70 microns) and slurry particles at the end of the chain (105 to 95 microns) after the test started. However these did not continue to reduce over the duration of the test. It is important to emphasise that a reduction in the median size of fine seed while the concentration of solids in the overflow of the secondary classifier and at the end of chain is maintained, provides a gain in precipitation productivity without the risk of overloading thickeners. The reduction in the ratio at the end of the chain found during the test indicates quantifies this gain.

The gain in productivity based on a reduction of 0.002 points in the final chain is 0.5g/L, which implies a gain in annual production of approximately 11,000t/year. This is based on lines 1/2/3 operating and 80% availability of the filters while operating two filters for each line.

During the test a reduction in the density of underflow from the primary classifier occurred. This needs to be better monitored in the next test.

The results indicate a strong probability of production gains resulting from the simultaneous operation of two seed filters for each line of precipitation (1/2/3).