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DEWATERING THE FINE COAL USING THE LAB-SCALE CONVENTIONAL PRESSURE FILTRATION AND STEAM PRESSURE FILTRATION: A CASE STUDY FROM CUA-ONG COAL WASHING PLANT, VIETNAM

Thanh-Hai Pham
Department of Mineral processing, Faculty of Mining, Hanoi University of Mining and Geology
Address: No.18 Vien Street, Duc Thang Ward, Bac Tu Liem District, Ha Noi, Vietnam
Corresponding author Email: phamthanhhai@humg.edu.vn

I. Introduction

Cua-Ong Coal Washing Plant (CCWP) is operated by Vietnam National Coal-Mineral Industries Holding Corporation Limited and located in Quang Ninh coal basin of north-earthen Vietnam. Fine coal from two factories is collected to the Dewatering plant (Figure 1). [1]

The filtration process can be divided into three main phases: cake formation, mechanical displacement, and drying. For the 1st steps, the cake formation phase finishes when the pores of the filter cake are fully filled with mother liquid. The 2nd step: (1) For the conventional filtration, compressed air is applied. (2) For steam pressure filtration, steam pressure is applied. The next step, the drying phase of CPF uses compressed air. While the successive phase in steam pressure filtration shows excellent advantages and can be applied in two ways: pressurized air and saturated/superheated steam (Figure 2, Figure 3 and Figure 4). [2,3,4,5]

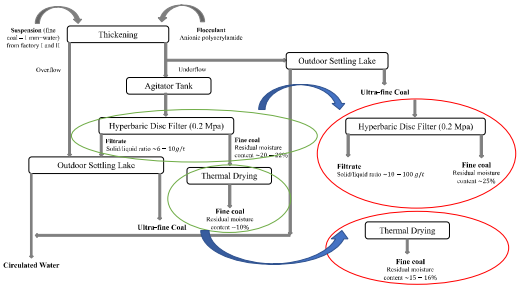

Figure 1. The Dewatering plant flowsheet of Cua-Ong coal washing plant

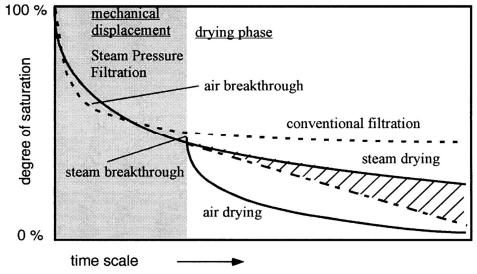

Figure 2. The Dewatering plant flowsheet of Cua-Ong coal washing plant

Figure 3. Lab-scale conventional filtration rig

Figure 4. Lab-scale steam pressure filtration rig

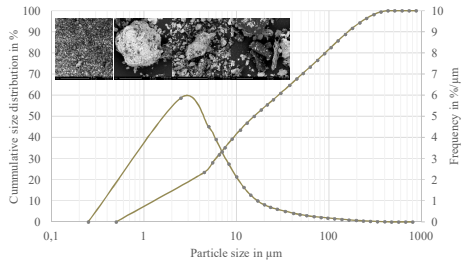

Figure 5. Particle size distribution of coal sample

II. Characteristic of coal

The coal sample shows a broader distribution. The below 10 µm particle size account for 45 % and 90% of particles is below 0.125 mm. The particle shape is irregular and the flake –shape (Figure 5).

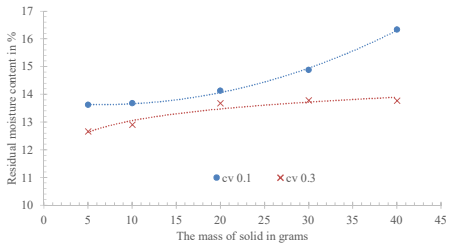

Figure 9. The effect of height of filter cake on residual moisture content using STP

IV. Residual moisture content of filter cake in 3rd phase using steam pressure filtration

Experimental results show that, when using SPF including the 3rd phase of filtration (drying phase), the residual moisture content of the material is significantly reduced (Figure 9 and Figure 10).

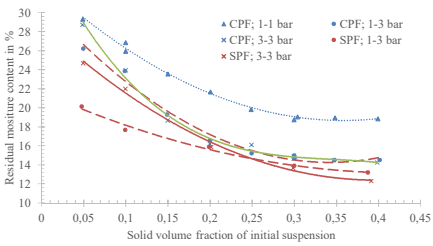

Figure 6. The effect of solid volume fraction of slurry on residual moisture content

III. The effect of solid fraction and height of filter cake on residual moisture content in the 2nd phase

It can be seen by increasing the volume fraction, the residual moisture content reduces. The effect of filter cake height on deliquoring efficiency is not clear. when the filter cake increases from 3 mm to 22 mm, the moisture content increase is about a maximal 2% of the value (Figure 6, Figure 7 and Figure 8).

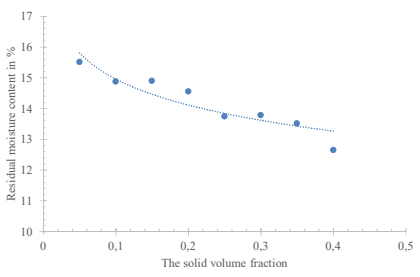

Figure 10. The effect of solid volume fraction of slurry on residual moisture content using STP

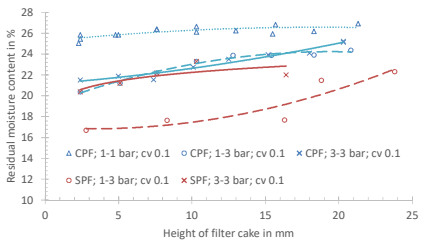

Figure 7. The effect of solid volume fraction of slurry on residual moisture content

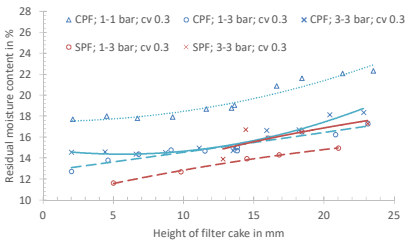

Figure 8. The effect of height of filter cake on residual moisture content

V. Conclusion

(1) The Cua-Ong fine coal has dominant fine and ultra-fine sizes and wide particle size distribution. (2) The results show that the dewatering efficiency increases by increasing the solid volume fraction. The filter cake thickness does not affect the material moisture but affects the capacity of the filter. (3) The pre-test of coal dewatering using SPF for a whole filtration cycle was conducted with the result of final moisture content approximately 12%.

VI. Outlook

(1) Sufficient studies are needed on the optimal operating parameters when using SPF; (2) Implement testing this coal on a pilot- scale; (3) Detailed economic evaluations are necessary when applied to Cua-Ong fine coal; (4) Carrying on further tests on other materials in order to confirm the superiority of this new device.

Refferences

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