

Experimental procedure

There are filter plates could be operated, we set the one that we are using so that only the specific plate was operated. The unit needs a blocking off the first and the first plates using fitted rubber gaskets when the unit are all correct to the specification

The filter pad was then measured and weighed 46.06 for the first experiment and 41.45 for the second experiment

First run the system to calibrate and to clean the unit, ensure that the pumps and pressure control valves settings are specified

Then switched on the unit and fill the tank with 25 liters of water, 500 grams of calcium carbonate was then added to the water therefore it becomes slurry, let the pump run so that the calcium carbonate is fully mixed into the water solution. The circulated pump installed in the filter press assured that the solute was continuously agitating in the solvent

The feed stream pressure when filtering the slurry at a constant pressure of 1 bar and collected the filtrate in six runs for the both of the experiment 1800 ml measuring cylinder, the cylinder was used to measure how long it took to fill the measuring cylinder for each six runs

Shut the system down and close the pressure valve

Afterwards all six runs are measured, Air is blown through the filter press to remove any excess filtrate

Unscrew the filtrate mat from the filter frame and check the solid particle calcium carbonate formation, after dry the mat using an oven heater, this could take a few hours to get an accurate result on

the reading. The parameters of the filtrate mat are diameter and the weight of the mat

For the second experiment, the above procedure is repeated and the filtrate mat is 41.45 grams lighter and the pressure is increased by 1 bar therefore 3 bars

Experimental observation

The calcium carbonate powder has added to the water inside the tank which results the agitation of the circulation pump. The continuous circulation keeps the concentration of the slurry constant and more important prevents the calcium carbonate from settling therefore the mixing is more accurate. The constant mixing is automatic in the unit but the pressure applied is done manually and therefore keeping an eye on the pressure gauge to keep the pressure constant because once the pressure gauge is set, it fluctuates above and below the specified pressure. A small change on the pressure can affect the whole experiment obtained throughout the experiment. Any values that are different from theoretical value are human error.

The 500 gram of calcium carbonate powder can be visible seen in the solution when mixing in the water a milky colour as soon as the circulation pump mixes the solution fully the colour starts to dilute and this can be observed throughout the experiment.

The unit when the fluid starts to flow in the filter plates there is a slight water leakage of water around the filter plate once the experiment finishes the pressure stream is applied to get rid of any excess filtrate and fluid that may remain on the porous of the mat.

Calculation sheet for the filter press experiment

	units	Run 1	Run 2
cake mass	kg	0.24598	0.26637
cake area	m ²	0.0324	0.0324
cake depth	m	0.0045	0.0047
pb	kgm ⁻³	1687.105624	1749.211978
ps	kgm ⁻³	2800	2800
1-e	-	0.602537723	0.624718564
e	-	0.397462277	0.375281436
graph rise	m ⁻³ s	101.4	40.5
graph run	m ³	0.01	0.01
graph gradient	m ⁻⁶ s	10140	4050
vP	pa	100000	200000
mvP	kgm ⁻⁷ s ⁻¹	1014000000	810000000
w	kgm ⁻³	20	20
u	pa s	1	1
a	kg ⁻¹ m	53222.832	42515.28
5(1-e)/(pse³)	kg ⁻¹ m ³	0.017135961	0.021106933
s²	m ⁻²	3.01914126	2014280.304
s	m ⁻¹	1762.360527	1419.253432
x	m	0.003404521	0.004227575
sp cake resis b	kgm ⁻⁷ s ⁻¹	507000000	405000000
y intercept	m ⁻³ s	120130	59100
cloth resist a	kgm ⁻⁴ s ⁻¹	12013000000	11820000000
v'	m ³	11.84714004	14.59259259
graph check:-			
Final vol	m ³	0.012	0.012
final t (calc)	s	1442.29008	709.4916
Final t (measured)	s	3196	2205
%error in t calc		1.215920392	2.107859205