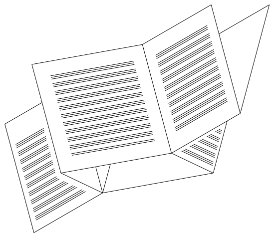
Pocket Guide to Filter Leaf Tests



Introduction

The filter leaf test is used to simulate the operation of a rotary drum vacuum filter (RDVF). This simple test provides information on the filtration flux rate, F_R, of the suspension as a function of the equivalent drum rotational speed, R.

Tests must be carried out on representative suspension samples using equipment arranged in accordance with Figure 1.

The basic split within the filtration cycle is shown in Figure 2.

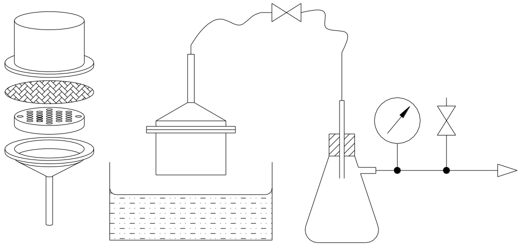


Figure 1

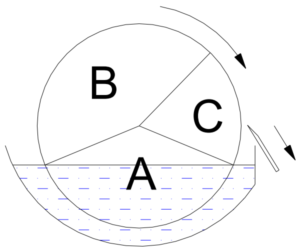


Figure 2

A = Filtering zone

B = Dewatering and drying zone

C = Non vacuum zone (solids discharge)

The following equations provide approximate times for sections A and B of the filtration cycle.

[Zone A] Filtration (form) Time:

$$T_F = \frac{60\sigma}{R}$$

[Zone B] Dewatering / Drying Time:

$$T_D = \frac{10\,(4 - 3\sigma)}{R}$$

And, $T_D = T_{ID} + T_W + T_{FD}$

$$T_{ID} = \frac{5\,(21 - 36\sigma)}{6R}$$

$$T_W = \frac{25}{2R}$$

$$T_{FD} = \frac{10}{R}$$

For the majority of applications,

$0.1 < R < 1.0$

$0.22 < \sigma < 0.375$

[typ. σ=0.375]

Test Procedure

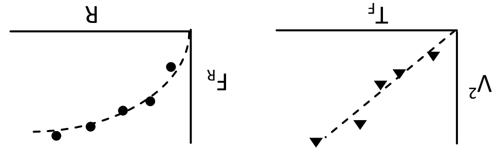
1. Put a representative sample into the sample container and gently agitate.
2. Start the vacuum.
3. Immerse the filter leaf into the sample container and continue to gently agitate the suspension.
4. After T_F seconds, remove the filter leaf and gently rotate the leaf into its normal upright position.
5. After a further T_D seconds, switch off the vacuum.
6. Measure the volume of filtrate collected during the test, V.
7. Record weight of wet filter cake.
8. Record the filter cake thickness.
9. Record the discharge characteristics of the filter cake from the filter medium.
10. Record any other observations (e.g. filtrate clarity).
11. Dry a sample of the filter cake and determine the moisture content.
12. Repeat the test (varying the equivalent drum rotational speed, R).
13. Collate the data (see example table below).

Test	R	σ	T_F	T_D	V
1	0.1	0.375	225	288	V_1
2	0.2	0.375	113	144	V_2
⋮	⋮	⋮	⋮	⋮	⋮
n	R_n	σ_n	T_{Fn}	T_{Dn}	V_n

Plot V^2 vs T_F. This should be a straight line passing through the origin.

Calculate the filtrate flux rate, F_R.

Filtrate flux rate, $F_R = \frac{0.0036\,V\,\sigma}{A\,T_F}$



Nomenclature

A = Area of the test leaf [m^2]

F_R = Filtrate flux rate [$m^3/m^2/hr$]

R = Drum rotational speed [min^{-1}]

σ = Fractional drum submergence [-]

T_F = Filtration (form) time [seconds]

T_D = Dewatering time [seconds]

T_{ID} = Initial dewatering time [seconds]

T_W = Cake washing time [seconds]

T_{FD} = Final dewatering time [seconds]

V = Filtrate volume [ml]

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