EXPERIMENT 1

Subject

Sieve Analysis and Powder Preparation

Objective

To learn sampling methods of powder raw materials and what they are used for
To measure particle size distribution of powder raw materials with sieve analysis method.

Theory

Sampling Methods

Coning and Quartering, The batch of particulate solids is spread onto a clean, flat,and smooth floor that can be easily swept. It is piled into a conical heap (first step). The first step is often repeated twice or three times. The heap is then spread out Ynto a circular cake (second step). The cake is divided radially into four quarters (third step). Two opposite quarters make up a sample while the other two are rejected (fourth step).

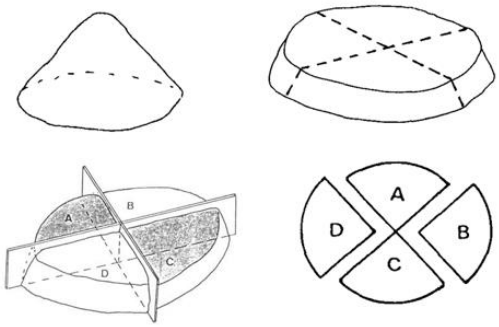


Figure 1. Schematic illustration of coning and quartering sampling method.

Fractional shovelling is at the same time the cheapest and the most reliable of all hand splitting methods. It can be designed either as a true or as a degenerate.

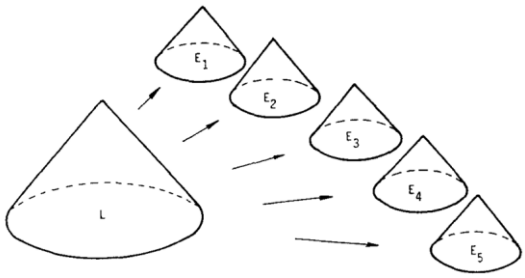


Figure 2. Schematic illustration of fractional shovelling sampling method.

The Jones riffle splitter is schematized on figure 3. It is an assembly that comprises an even number (usually between 12 and 20) of equally sized chutes, adjacent chutes discharging at opposite sides.

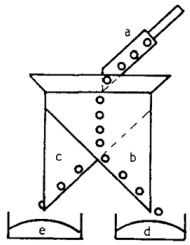


Figure 3. Schematic illustration of riffle splitter

The primary function of precision particle analysis is to obtain quantitative data about the size and size distribution of particles in the material. There is a wide range of instrumental and other methods of particle size analysis available.

Figure 4. Images of typical sieve set and shaker.

Mesh size is referring to the mesh number (a US measurement standard) and its relationship to the size of the openings in the mesh and thus the size of particles that can pass through these openings. Figuring out the mesh number is simple. All you do is count the number of openings in one linear inch of screen. This count is the mesh number. A 4-mesh screen means there are four little square openings across one inch of screen. A 100-mesh screen has 100 openings per inch, and so on.

As the number indicating the mesh size increases, the size of the openings and thus the size of particles captured by the screen decreases. Higher mesh numbers = smaller particle sizes. It is very important to remember that mesh size is not a precise measurement of the mesh opening size. This is because screens can be made with different materials with different thicknesses of strands or wire. The thicker the strands, the smaller the openings that a particle can pass through, and vice versa.

Procedure

- Clean the sieves of sieve shaker using cleaning brush if any particles are struck in the openings.
- Record the weight of each sieve and receiving pan.
- Dry the specimen in oven for 3-4 minutes to get the dried specimen (ignore, if the specimen is already dried).
- Weigh the specimen and record its weight.

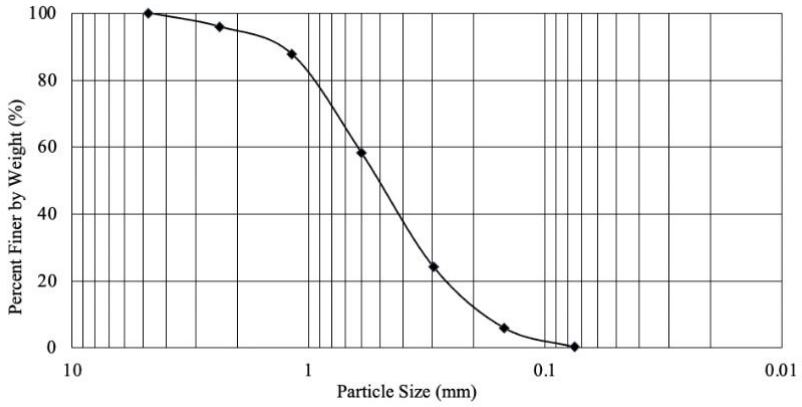
- Arrange the sieves in order as the smaller openings sieve to the last and larger openings sieve to the top.
- Keep the weight recorded specimen on the top sieve and then keep the complete sieve stack on the sieve shaker (Don't forget to keep the lid and receiving pan).
- Allow the shaker to work 5 minutes.
- Remove the sieve stack from the shaker and record the weight of each sieve and receiving pan separately.

Sample Data Sheet

Sieve No	*Opening (mm)*	*Sieve Wieght (g)*	*Sieve + Powder Wt. (g)*	*Wt. Of Powder Retained (g)*	*Percent Retained*	*Cumulative Percent Retained*	*Percent Finer*
4	*4.75*	*521*	*521*	*0*	*0*	*0*	*100*
8	*2.36*	*491.8*	*504*	*12.2*	*4.07*	*4.07*	*95.93*
16	*1.18*	*426*	*450.5*	*24.5*	*8.17*	*12.24*	*87.76*
30	*0.60*	*401.8*	*490*	*88.2*	*29.4*	*41.64*	*58.36*
50	*0.297*	*375.5*	*478*	*102.5*	*34.17*	*75.81*	*24.19*
100	*0.149*	*355.3*	*410*	*54.7*	*18.23*	*94.04*	*5.96*
200	*0.075*	*351.1*	*368.2*	*17.1*	*5.7*	*99.74*	*0.26*
Pan	-	*364.2*	*365*	*0.8*	-	-	-

Sample Calculation

For #8 sieve, Total amount of soil is 300 g
Sieve weight = 491.8 g
Sieve + powder weight = 504 g
Weight of powder retained = (504 – 491.8) = 12.2 g
Percent retained= 12.2/300 × 100 = 4.07%
Cumulative percent retained= 0 + 4.07 = 4.07%
Percent finer= 100 – 4.07= 95.93%
The particle-size distribution of the powder sample can be obtained by plotting the percent finer with the corresponding sieve on **semi-log graph paper**, as shown below. An example of the particle-size distribution curve is shown in below.



The values of D10, D50, and D80, which are the diameters that correspond to the percent finer of 10%, 50%, and 80%, respectively can be determined from the particle-size distribution curve.

Content of the Report

- Use report cover page template fort he first page of report. (You can download from web site of department)
- Every page should have page number. Text size should be 12 punto.
- Briefly explain the experiment's aim and theory with your own words.
- Draw a table as shown in the sample, with your experiment data.
- Show the total and loss amount of powder in weight under your table.
- Draw percent finer by weight (%) and particle size (mm) graph on semi-log graph paper. You can attached at the end of the report.
- Calculate D10, D50 and D80 values. And also Show in the graph.