

## **DETERMINATION OF PARTICLE SIZE DISTRIBUTION BY SIEVING METHOD**

### **AIM:**

To determine the average particle size and find out their distribution pattern for the given granules by sieve analysis method.

### **PRINCIPLE:**

Sieve method gives sieve diameter, sieve diameter is defined as the diameter of the sphere that possess through the sieve aperture as the asymmetric particle sieve method directly give weight distribution. Particles having size range from 50 and 1500 $\mu$ m are estimated by sieving method. In this method, the size is expressed as  $d_{\text{sieve}}$ . The sieving method finds application in dosage and development of tablets and capsules. Normally 15 percent of fine powder (passed through mesh 100) should be present in granulated material to get a proper flow of material and achieve good compaction in tableting. Therefore, percent of coarse and fine can be quickly estimated. Sieves for pharmaceutical testing are constructed from wire cloth with square meshes, woven from wire of brass, bronze, stainless steel or any other suitable material.

### **Designations and Dimensions of I.P specification sieves**

<b>Sieve Number</b>	<b>Aperture Size Micrometer</b>	<b>Sieve Number</b>	<b>Aperture Size Micrometer</b>
10	1700	44	325
12	1400	60	250
16	1000	85	35
22	710	100	36
25	600	120	34
30	500	150	36
36	425	170	35

### **Advantages of sieving method**

1. It is inexpensive, simple and rapid with reproducible results.
2. Sieving method is useful when particles are having size range between 50 and 1500 $\mu\text{m}$ .

### **Disadvantage of sieving method**

1. Lower limit of the particle size is 50 $\mu\text{m}$ .
2. If the powder is not dry, apertures become clogged with particles leading to improper sieving.
3. During shaking, attrition occurs causing size reduction of particles. This leads to errors in estimation.

### **Factors influencing the sieving method**

Factors influencing sieving are weight of sample, duration of shaking and type of motion. The types of motion influencing sieving are vibratory motion, (most efficient), side tap motion, bottom pat motion, rotary motion with tap and rotary motion. The type of motion standardized. Care should be taken in order to get reproducible results.

### **PROCEDURE:**

1. Standard sieves set is selected (sieve no: 10, 22, 36, 44, 65, 80, 100,120) arrange them in such manner that the coarsest remains at the top and finest at the bottom.
2. Weigh approximately 50g of sample, place the sample on the coarsest sieve no.10.
3. Fix the above sieves set on hand sieve shaker and shaken for 20 minutes.
4. Collect the Sample retained on each sieve into a paper, weigh all the sample.
5. Report the weights retained on each sieve in the table against corresponding sieve number.

Sieve No	Aperture Size As Per I.P (µm)	Arithmetic Mean Size of opening (d) (µm)	Weight of Granules Retained on Sieve over Size (g m)	% Wt of Granules Retained (Under Size) N	Cumulative % Granules retained (Under Size)	Weight Size (n×d)	% Under Size	% Over Size (100-% Under Size)
10	1700	1205	2.1	2.1%	2.1	2530.5	2.1	97.9
22	710	922.5	71.5	71.5%	73.6	65958.75	73.6	26.4
36	425	602.5	13.6	13.6%	87.2	8194	87.2	12.8
44	355	302.5	2.5	2.55%	89.7	756.25	89.7	10.3
60	250	215	3.0	3.0%	92.7	645	92.7	7.3
85	180	165	1.7	1.7%	94.4	280.5	94.4	5.6
100	150	137.5	2.3	2.3%	96.7	316.25	96.7	3.3
120	125	62.5	1.0	1.0%	97.7	62.5	97.7	2.3
pan	0	0	1.1	1.1%	98.8	0	98.8	1.2
			$\sum n=98.8$			$\sum(n \times d)=78743$		

$$\text{Average diameter} = \frac{\sum(n^2)}{\sum n}$$

$$= \frac{7777777777.7777}{9977}$$

=

7

9

7

.

0

0

1

μ

m

**Report:**

The average diameter of the given granules was found to be = μm