

Fission:

- 1- We can calculate each new virus's radius using these equations knowing the sum of area of little viruses is equal to the first big virus.

$$\pi R^2 = 2\pi r^2 \rightarrow r^2 = \frac{R^2}{2}$$

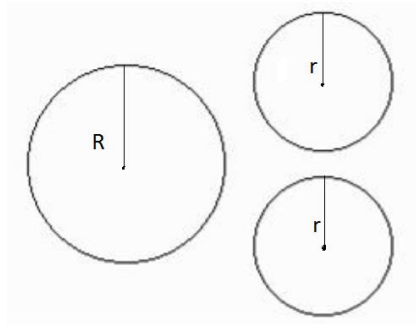


Figure 1

- 2- It can be demonstrated that the maximum distance between the center of two circles in a rectangle is gained if their surroundings are tangent to length and width of the rectangle like fig 2:

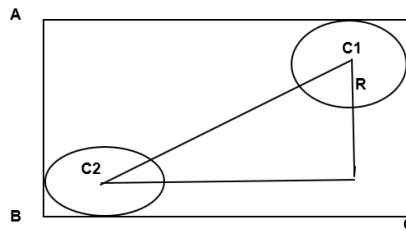


Figure 2

- 3- Using Pythagorean theorem we can calculate “C1 C2” using this equation:
 $(AB - 2r)^2 + (BC - 2r)^2 = (C1C2)^2$

Fusion:

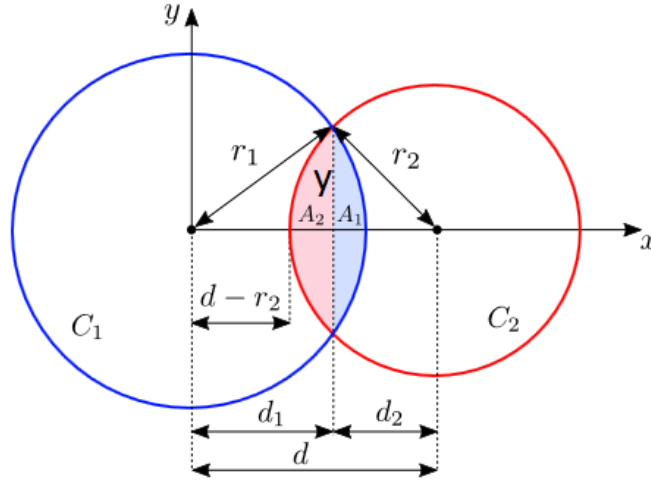


Figure 3

Using fig 3 we can calculate A1 and A2 as follow:

1- $d_1^2 + y^2 = r_1^2$

$(d - d_1)^2 + y^2 = r_2^2$

$\rightarrow d_1 = \frac{d^2 - r_2^2 + r_1^2}{2d}$

2- Now we can calculate the angle between r_1 and d_1 . let's name it Teta:

$Teta = \arccos\left(\frac{d_1}{r_1}\right)$

3- We can calculate the sector of C1 which contains A1 using this formula:

$$\frac{2 * Teta * 3.14 * r_1^2}{360}$$

4- At last we can obtain the area of A1 using this equation:

$A1 = \text{sector} - \text{insideRectangel}$

5- We can easily gain the area of the rectangle inside the sector by calculating the y .

6- We have to run all these stages for C2 and A2;

7- At last , the compaction rate can be obtained using this formula:

$$\frac{3.14 * r_1^2 + 3.14 * r_2^2 - A1 - A2}{3.14 * r_1^2 + 3.14 * r_2^2}$$