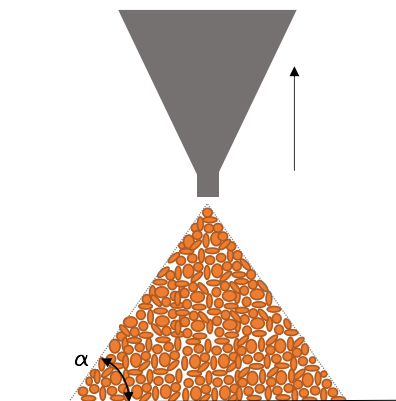




Basic knowledge: physical properties of bulk solids IV; Angle of Repose

The angle of repose (α) of bulk solids is the steepest angle of descent relative to the horizontal plane to which a material can be piled. If the angle becomes greater than the angle of repose, then the solids on the surface start to slide. The angle of repose can be between 0° to 90° .

Physical properties such as particle shape, size and surface roughness have significant effects on the angle of repose – as does particle size distribution, bulk density and moisture. Moisture, in particular, can significantly impact the angle of repose in positive or negative way.



The angle of repose can be determined in many ways. A simple method is to use a funnel that is filled with the material and place it over a horizontal surface so the tip is touching the surface. Then move the funnel slowly upward so that the cone of particles can slowly grow. It helps if the tip of the funnel is close to the tip of the cone in order to avoid any impact from the fall of the particles. Once the pile has reached a certain height, the flow of material can be stopped, and the angle of repose can be measured or calculated from the diameter of the cone and the height of the pile.

There are other methods to determine the angle of repose. Most of them are determination methods that are close to industrial equipment. For example, in the revolving cylinder method, the material is placed in a cylinder with transparent ends. The cylinder is then rotated, allowing the material to form an angle to the horizontal, which is the angle of repose. This would make sense if your intend is to use the material in a drum or kiln.

The angle of repose isn't the most scientific characteristic of a bulk solid, granular material or powder, but it is a simple test that can be performed by everybody without specific tools. In addition, it gives a good indication of the flowability and cohesiveness.

Next time, we will learn about thermal conductivity, an advanced property for heating and cooling. As always, please do not hesitate to message me with questions/comments.



Gerald Marinitsch, has broad and comprehensive background in management, mechanical and process engineering and since 2014 is working with a team of experts at Solex on heat exchangers for bulk solids.

'After several years of working with bulk solids heat exchangers, I realized that bulk solids knowledge is not widely spread throughout the engineering society. Consequently, I decided to summarize some basic knowledge in a series of articles '

+43/650/420 23 66 – Gerald.Marinitsch@solexthermal.com