Calculating Residence Time

Question

I am conveying and processing a specific bulk material that needs to stay in the conveyor for a certain amount of time for a curing process. We are injecting a gas into the conveyor to mix with the solids and need a specific time in the conveyor for the reaction to take place. How do I know how long my bulk material will be in the screw conveyor?

Answer

The length time a bulk material spends inside the screw conveyor is known as residence time. A few inputs are needed to determine the residence time of a screw conveyor. Residence time (RT) is a function of screw pitch (P), conveyor speed (S), and the centerline distance from the inlet to the discharge (L). With these values a simple formula can be used to determine residence time:

$$RT = \frac{\text{Centerline distance (L)}}{\text{Speed (S) x Pitch (P)}}$$

RT: Minutes
L: Inches
S: Revolutions per minute (RPM)
P: Inches

It is also possible to calculate the required centerline distance between inlet and discharge if residence time is given. The same factors are used to determine this value:

$$L = RT \times S \times P$$

Any of the above factors can be manipulated to yield a desired residence time to meet the needs of your application. Knowing the residence time is especially critical when designing conveyors for pyrolysis, gasification, and other thermal processing applications.

KWS can help you solve even the most complex bulk material handling problems. Our team of experienced professionals has solved thousands of bulk material handling problems for over 50 years. Please contact KWS today!!
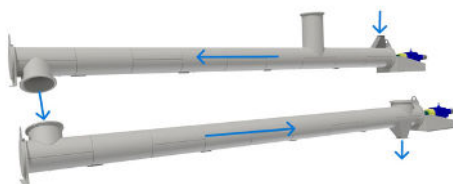
Residence Time is critical When Designing for Pyrolysis, Gasification, and Other Thermal Processing Applications

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