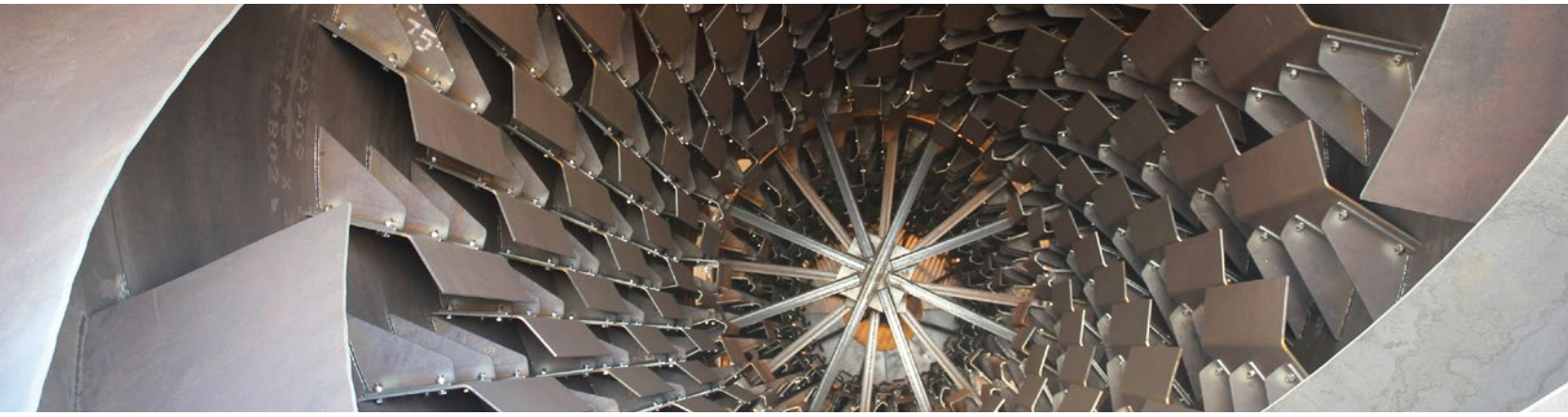
FEECO INTERNATIONAL

FLIGHT SIMULATOR
TESTING



WHY FLIGHT DESIGN MATTERS

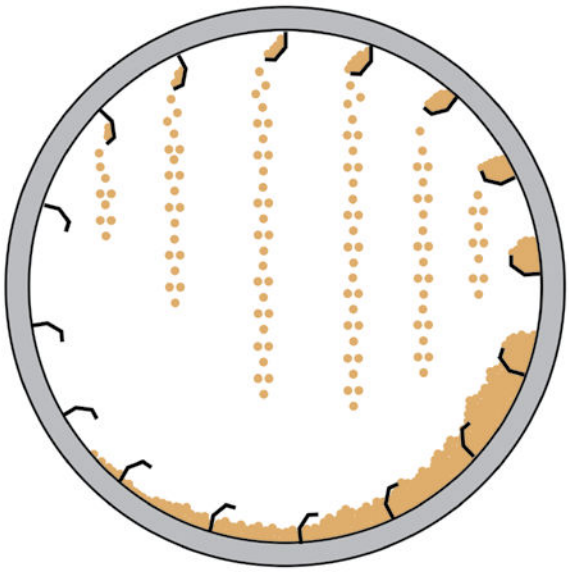
Flights, also known as material lifters, are a key component in the performance of rotary dryers and coolers.

As the unit rotates, flights pick up the material, carry it higher, and drop it through the air stream, creating what is referred to as a curtain - a shower of material spanning the width of the drum's interior.

The optimal curtain will maximize heat transfer between the material and process air. However, all materials behave differently; some may have a high angle of repose; others may tend to stick or cause build-up. Flights must be designed to work with the unique characteristics of the material in order to create the ideal curtain.

A variety of factors work together to influence how the material will respond: flight size and geometry, spacing, material of construction, drum speed, loading, and more.

The FEECO flight simulator is a valuable complement to the testing services offered in the FEECO Innovation Center. This versatile tool can provide a wealth of information. Whether you need to determine the best flight design or pattern for a new system, optimize the flights in an existing unit, or test a change in process conditions, the FEECO Innovation Center can help!



The diagram above illustrates how flights create the curtain in a rotary dryer to maximize heat transfer.

HOW THE FLIGHT SIMULATOR WORKS

The 45" diameter x 24" deep rotating drum can simulate process conditions in a commercial size unit.

Lifters are mounted equally spaced along the circumference of the test unit and easily changed for testing various options. Data from existing flight designs can be scaled for comparison.

A variable speed drive is used to adjust the rotational speed of the drum, while a clear plastic cover allows

The pictures above show the same lifter configuration at two different rotational speeds. The picture on the left shows a good distribution of solids across the width of the unit. The gaps seen in the picture would be filled in by off-setting the lifters. In the picture on the right, the rotational speed is increased and the lifters empty later, giving a poorer distribution.

for visual observation throughout the testing process.

DATA GATHERED

The flight simulator tests your specific sample of material to gather a number of data points that will allow process experts to determine the optimal combination of flight design, pattern, drum loading and speed to achieve the best results. This includes:

- Number of flights
- Flight design (radial, single bend, double bend)
- Flight pattern (staggered, in-line, etc.)
- Loading (amount of material in drum at one time)
- Drum speed (RPM)
- Moisture content
- Particle size distribution

Various tests are performed to analyze performance of the selected variables, including:

Degradation (Attrition) Tests - Analyzes how the selected variables impact the amount of attrition (the breakdown of granules into fines)

Flight Fillage Tests - Measures the volume of material in a flight at a given point to determine the rate at which material is being discharged

Visual Analysis - To determine the impact of the selected variables on the material behavior; is the material showering or discharging in clumps; is bridging between flights occurring; are the lifters completely emptying?

The image above shows the testing of a bed disturber (aka a mixing flight) with a talc material. The goal of the test was to determine how well the talc was being mixed as a result of the bed disturber. In a process setting, this would ensure uniform temperature throughout the bed.

A black tracer was added to the simulator as a visual indicator of effectiveness. The black disappeared within 3-4 revolutions of the unit, showing that the disturber was effective.

Once process experts have come to a conclusion, parameters can be tested in our continuous, pilot scale rotary dryer to confirm process success.

The flight simulator is just one of the tools FEECO process experts use to engineer custom equipment suited to your unique process needs. For more information, contact us today!