

Definition of Accuracy

Weigh feeder accuracy is a measure of how closely a feeder discharges material at the desired flow rate. A complete expression of accuracy includes measurements of repeatability and linearity. Repeatability measures the extent of discharge variability at a given flow rate. Linearity gauges the deviation of average flow rate over the feeder's full operating range.

Measurements of both repeatability and linearity are made by independently weighing a series of timed catch samples obtained from the discharge stream. Sample weights are then used to compute repeatability and linearity statistics.

Repeatability:

Coperion K-Tron loss-in-weight feeders have been designed to perform to the following repeatability standard:

0.25% to 0.5% of sample average at 2 sigma, based on a minimum of 30 consecutive samples of one-minute, 0.5 kg (~1.0 lb), 0.5% of gross scale capacity, or 30 screw revolutions (30 pump strokes for liquid feeders), whichever is greater, over a turndown of 20:1 from maximum design rate for free-flowing granular and powdered materials.

Coperion K-Tron weigh belt feeders have been designed to perform to the following repeatability standard:

0.5% of sample average at 2 sigma, based on a minimum of 30 consecutive samples of one-minute, 0.5 kg (~1.0 lb) or one belt revolution, whichever is greater, over a turndown of 20:1 from maximum design rate for free-flowing granular and powdered materials with a minimum belt loading of 0.8 kg/m (~0.57 lb/ft).

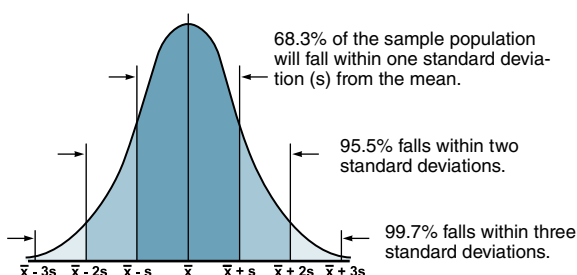
The diversity of materials and their associated handling characteristics require that repeatability performance for a particular combination of feeder and material be determined through laboratory testing.

To quantify the variability of the feeder's discharge stream, the concept of standard deviation is employed. Assuming a random distribution of sample weights around the mean sample weight, the weight of 95.5% of the samples will lie within 2 sigma (standard deviations) from the mean.

Standard deviation, s , is defined as...

$$s = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n - 1}}$$

where x_i is sample weight, $\bar{x}$ is average sample weight, and n is the number of samples.



Linearity:

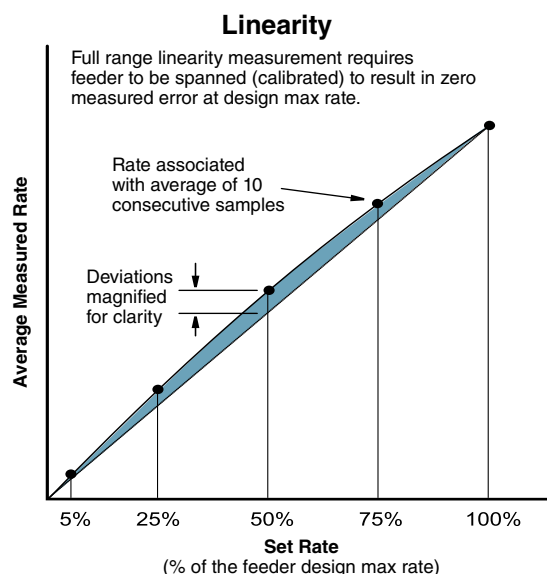
Coperion K-Tron loss-in-weight feeders have been designed to perform to the following linearity standard:

$\pm 0.25\%$ of set rate based on the mean value of a minimum of 10 consecutive samples of one-minute, 0.5 kg (~1.0 lb), 0.5% of gross scale capacity, or 30 screw revolutions (30 pump strokes for liquid feeders), whichever is greater, over a turndown of 20:1 from maximum design rate for free-flowing granular and powdered materials.

Coperion K-Tron weigh belt feeders have been designed to perform to the following linearity standard:

$\pm 0.5\%$ of set rate based on a minimum of 10 consecutive samples of one-minute, 0.5 kg (~1.0 lb) or one belt revolution, whichever is greater, over a turndown of 20:1 from maximum design rate for free-flowing granular and powdered materials with a minimum belt loading of 0.8 kg/m (~0.57 lb/ft).

The diversity of materials and their associated handling characteristics require that linearity performance for a particular combination of feeder and material be determined through laboratory testing.



Note that the above definition quantifies linearity performance over the full operating range of the feeder. Many applications involve feeder operation at a constant rate or over a very limited range of rates. In these cases, it is normal practice to re-span (calibrate) the feeder to eliminate or minimize linearity error within the operating range.

Sampling Procedure:

To most fairly and accurately report the performance of its feeders, Coperion K-Tron employs a sampling procedure called differential dynamic sampling. In this approach, all samples are obtained consecutively and continuously. The feeder under test discharges directly to a sampling container on a high precision electronic scale. Scale readings are automatically communicated to a computer every five seconds (or every second if required by the application). Sample weights for each interval are determined, and all required statistical quantities are computed and presented in a comprehensive, formalized report.

Critical Application Performance Standards (CAPS):

Many demanding applications require feeder performance testing and documentation involving shorter timescales or smaller sample weights than those specified in the standard repeatability statement presented above. For example, high-speed plastics compounding operations must achieve and maintain blend integrity on a nearly second-to-second basis.

Coperion K-Tron offers feeder performance testing for these stringent requirements. Measuring feeder performance at very low rates and/or over very brief timescales permits meaningful evaluation of available feeder components, configurations and settings to identify the one arrangement that optimizes performance for the specific application.

Test Certificate **Continuous Test** 

Test Number: 111.111.24-01 Date: Thursday, 8. February 2024 Page 1 / 2
Setpoint tested: 32.0000 kg/h

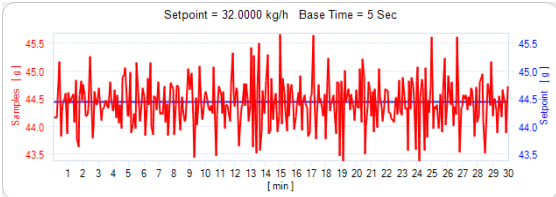
Customer: Plastic Parts Company GmbH
Address: Sample Street 21
1234 Sampletown
Switzerland

Bulk Material: Native Pea Starch
Chemical Name: -
Density: 0.617 kg/dm3
Material Type: powder
Color: white
Flow Characteristics: rel. good flowing
Particle Size: 0.00 mm
Humidity: -

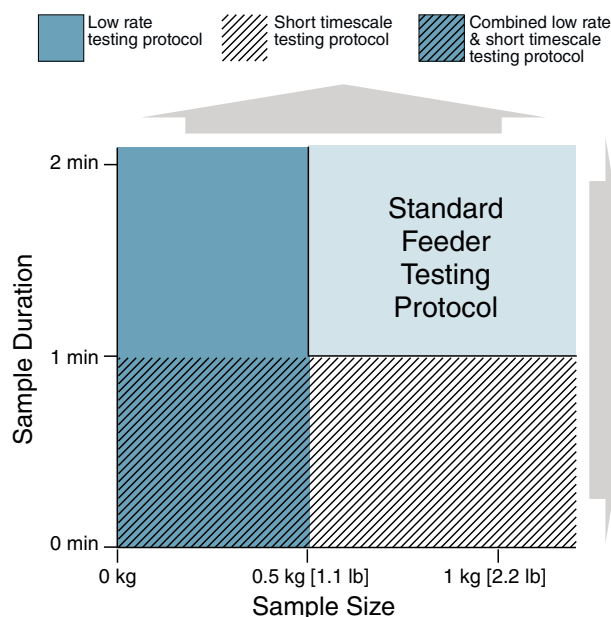
Feeder: K2-ML-D5-T35 H
Scale: D5 120 kg
Avg. Motor Speed: 150 rpm
Avg. Screw Speed: 45 rpm
Reducer: high 3.34:1
Drive Motor: Servo motor
Hopper Volume: 50 l
Refilling: manually
Screw: TCF
Screw Tube: standard
Tray: -
Gate Size: -
Belt Speed: 0.00 m/min
Belt Load: 0.00 kg/m
Vertical Agitator: -
Horizontal Agitator: standard
Actiflow: -
Feed Range: 1.00 kg/h - 350.0 kg/h
Controller Type: KCM III
Software: V1.3
CtrlBoardSoftware: 9700-82016

Continuous Test Results
Test Time: 30 min
Setpoint: 32.0000 kg/h
Testscale Range: 24.0 kg Span: 1.00050 SFT Configuration: -1-----
SFT: 1
S/N: -
S/W: 9700-81934-G

Base Time	1 Sec	5 Sec	10 Sec	15 Sec	30 Sec	60 Sec
Sample Count	1800	360	180	120	60	30
Std. Deviation [g]	0.1028	0.4072	0.5543	0.5839	0.6072	0.5610
Std. Deviation (%)	1.1571	0.9168	0.6245	0.4962	0.2278	0.1053
2Sigma Std. Dev [%]	2.3142	1.8336	1.2491	0.8763	0.4556	0.2105
Sample Mean [g]	8.88889	44.4444	88.8889	133.333	266.667	533.333
Setpoint [g]	8.88889	44.4444	88.8889	133.333	266.667	533.333
Setpoint Dev [%]	-0.0558	-0.0558	-0.0558	-0.0558	-0.0558	-0.0558

Sample Graph
5 Sec Samples


CAPS Feeder Testing Protocols



Sample Coperion K-Tron Test Lab Report