The following section details standard procedures for calibrating cold feed bins on a batch plant. This procedure assumes adjustment of the gate openings to regulate flow from each cold feed bin. Gates are adjusted to meet production requirements for the hot bins. This details the traditional approach to regulating cold feed flow. Most batch plants today, however, have variable speed belts on their cold feed bins, just like drum-mixer plants. Feeder speeds are adjusted to match hot bin requirements. To see how this is accomplished, refer to Module 3 or Module 7, both of which have explanations of how to calibrate cold feed bin feeders by regulating belt speed.
**Best Management Practices**  
**Cold Feed Gate Openings**

- Gate openings for coarse and intermediate aggregates should not be less than 2 1/2 to 3 times the max particle size.
- For sand and other fine materials, the opening should never be less than one inch.

As a general guideline, the gate openings for the coarse and intermediate aggregates should not be set less than 2-1/2 to 3 times the maximum particle size. This ensures material will flow freely from the bin. If the belt speed is too high to allow the gate to be opened, consider changing the drive speed to lower the output. This will draw less material from each bin with each belt revolution, and allow you to open up the gates to achieve proper flow and a proper opening.

For sand and other fine materials, the opening should never be less than one inch. If ignored, the bin will be prone to bridging. Again, consider changing the belt speed to meet this guideline.

The formula shown in this illustration is used to calculate the feed rate in pounds per minute:

\[
\text{Feed Rate (lb/min)} = \frac{\text{Material (pounds)}}{\text{Belt Section Length (ft)}} \times \text{Belt Speed (ft/min)}
\]
Basic Process

• Set the gate at 25% of its maximum opening and start the feeder
• Weigh the material in a tared container for an interval or number of revolutions
• This gives one point
• Repeat the process for 3 more openings (50%, 75%, 100%)
• Repeat for each feeder

The basic process for cold feed calibration involves the following general steps.

These steps assume feeder output is going to be regulated by gate opening. If the feeder output is going to be regulated by changing the speed of the belt with a variable speed motor, review the calibration procedures for drum plants in Module 8.
1) Set the gate at 25% of its maximum opening size and start the feeder.
2) Calculate the flow rate at that opening. This determines one point.
3) Repeat the process for 3 more openings…at 50%, 75%, and 100% open.
4) Graph the output, and create a calibration chart based on these four points, using the graduated markings on the feeder for x-axis, and output on the y-axis.
5) Repeat for each feeder.

Basic process - cont.

• Establish the collecting belt speed in feet per minute
• Set the gate opening
• Run material on empty collecting belt
• Stop the belt
• Sweep the belt X feet
• Dry the material
• Weigh
• Calculate the flow in lb/minute
When the feed rates are computed, they should be plotted on a calibration chart with the gate opening plotted on the x-axis (inches typically), and the feeder output plotted on the y-axis (lb/min typically).

Aggregate proportions required for the mix formula are used to determine cold feed draws.

The required flow rate from the feeder is then determined by calculating the flow requirements in lbs/min using the formula shown in the illustration.

\[ q = T \times P \times \left(\frac{100}{3}\right) \]

Where:
- \( q \) = required rate of flow, lbs/min
- \( T \) = Plant production, tons/hr
- \( P \) = Percent by weight of total mix (expressed as a decimal)

\[ \frac{100}{3} = \left(2000 \text{ lb/ton}\right) \times \left(60 \text{ min/hr}\right) \]

factor to convert to lbs/min

\[ q = \frac{T \times P}{3} \]
Required per bin

Production Rate: 250 tons/hour

Bin 1: \( q = \frac{TP}{3} = \frac{250 \times 37.6}{3} = 3132 \text{ lbs/min} \)
Bin 2: \( q = \frac{TP}{3} = \frac{250 \times 28.2}{3} = 2350 \text{ lbs/min} \)
Bin 3: \( q = \frac{TP}{3} = \frac{250 \times 18.82}{3} = 1568 \text{ lbs/min} \)
Bin 4: \( q = \frac{TP}{3} = \frac{250 \times 9.4}{3} = 783 \text{ lbs/min} \)

Computing the math leads to flow requirements in lbs/min as shown.

For each bin, read the gate opening in inches off the calibration chart, based on the required flow rate of the aggregate.

This must be done for each bin.
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Initial gate openings

- Bin #1 4 1/2 inches
- Bin #2 4 1/4 inches
- Bin #3 3 1/4 inches
- Bin #4 2 inches

Reading off the calibration chart, the following gate openings are arrived at.

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Accuracy of gate openings

Gate openings should be set within ± 1/4 inch

(not a specification, but a BMP guideline)

Note that it is advisable to set the gate openings for the feeders to ± 1/4 inch.

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Cold Feed Calibration Practice Problem
Given

- Same Charts as used in class
- Mix has 5.5% asphalt
- Production rate is 450 tons per hour
- Aggregate proportions
  - Bin 1 = 35%
  - Bin 2 = 35%
  - Bin 3 = 20%
  - Bin 4 = 10%
- What should the initial gate openings be?

Let’s compute the gate openings for the production scenario shown in the illustration.
What should the initial gate openings be?
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Calibration Chart

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Equation

\[ q = \frac{T \times P}{3} \]

Where
- \( q \) = required rate of flow, lbs/min
- \( T \) = Plant production, tons/hr
- \( P \) = Percent by weight of total mix
- \( \frac{3}{3} \) = factor to convert to lbs/min

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Required per bin

Production Rate: 450 tons/hour

Bin 1: \( q = \frac{TP}{3} = \)

Bin 2: \( q = \frac{TP}{3} = \)

Bin 3: \( q = \frac{TP}{3} = \)

Bin 4: \( q = \frac{TP}{3} = \)
Initial gate openings

- Bin # 1  
- Bin # 2  
- Bin # 3  
- Bin # 4  

ANSWERS

Batch Plants – Cold Feed Calibration Practice Problem

Cold Feed Calibration Practice Problem
Given

- Same Charts as used in class
- Mix has 5.5% asphalt
- Production rate is 450 tons per hour
- Aggregate proportions
  - Bin 1 = 35%
  - Bin 2 = 35%
  - Bin 3 = 20%
  - Bin 4 = 10%
- What should the initial gate openings be?

Let’s compute the gate openings for the production scenario shown in the illustration.
What should the initial gate openings be?

Aggregate Proportions

If the mix has 5.5% asphalt

- Bin 1 35% or $0.945 \times 0.35 = 33\%$
- Bin 2 35% or $0.945 \times 0.35 = 33\%$
- Bin 3 20% or $0.945 \times 0.20 = 19\%$
- Bin 4 10% or $0.945 \times 0.10 = 9.5\%$

Calculation

Feed Rate (lb/ min) = \[
\frac{\text{Material (pounds)}}{\text{Belt Section Length (ft)}} \times \text{Belt Speed (ft/min)}
\]
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Calibration Chart

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Equation

\[ q = \frac{T \times P}{3} \]

Where  
- \( q \) = required rate of flow, lbs/min  
- \( T \) = Plant production, tons/hr  
- \( P \) = Percent by weight of total mix  
- 3 = factor to convert to lbs/min

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Required per bin

Production Rate: 450 tons/hour

- Bin 1:  \( q = \frac{TP}{3} = \frac{450 \times 33}{3} = 4950 \text{ lbs/min} \)
- Bin 2:  \( q = \frac{TP}{3} = \frac{450 \times 33}{3} = 4950 \text{ lbs/min} \)
- Bin 3:  \( q = \frac{TP}{3} = \frac{450 \times 19}{3} = 2850 \text{ lbs/min} \)
- Bin 4:  \( q = \frac{TP}{3} = \frac{450 \times 9.5}{3} = 1425 \text{ lbs/min} \)

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BINS 1 & 2 Calibration Chart

Gate Opening (inches)

lbss of aggregate per minute

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BINS 3 & 4 Calibration Chart

Gate Opening (inches)

lbss of aggregate per minute

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Initial gate openings

- Bin # 1  7 inches
- Bin # 2  8 ½ inches
- Bin # 3  6 inches
- Bin # 4  3 ¾ inches