# COMPUTING BUCKET ELEVATOR CAPACITY

**Note:** Traditional formulas for computing elevator capacity are based on the bucket manufacturer's published gross bucket capacity. KC Supply recommends using water level bucket capacities because published gross capacities are inaccurate and irrelevant. KC Supply can provide the water level capacity for any size and brand of bucket.

To figure the capacity of a bucket elevator you must first know the following:

1. **CAPACITY** of the bucket at water level (cubic inches).
2. **SPACING** of the buckets on the belt or chain (centers).
3. **NUMBER OF ROWS** of buckets on the belt or chain.
4. **SPEED** of the belt or chain (feet per minute). See formula below.
5. **PRODUCT WEIGHT** per cubic foot (only if answer is desired in tons or metric tons).

Then proceed as follows: Multiply the capacity of the bucket times the spacing multiplier in the table below times the number of rows of buckets. This will give the capacity in cubic inches of each running foot of the belt or chain. Multiply this times the speed of the belt or chain for the capacity discharged per minute. Then multiply by 60 to get the capacity discharged per hour. The answer will be in cubic inches.

Convert as follows:

| | |
|---|---|
| **BUSHELS** | - Divide by 2,150 to convert bushels. |
| **CUBIC FEET** | - Divide by 1,728 to convert to cubic feet. |
| **TONS** | - Multiply cubic feet capacity times weight of product per cubic foot and divide by 2,000. |
| **METRIC TONS** | - Multiply cubic feet capacity times weight of product per cubic foot and divide by 2,204.62. |

You now have the water level capacity of the elevator. Actual capacity would range from 10% to 20% above water level. For engineering purposes, Tapco recommends using 10% above water level capacity. Greater capacity may be realized in the elevator, however, this is dependent on several factors besides the buckets: head and boot design, loading and discharge, angle of repose of the product, etc..

## CAPACITY FORMULAS (Based on water level bucket fill)

For BUSHELS per hour:

| capacity of bucket water level | | spacing multiplier | | number of rows | | speed feet/min. | | min./hr. | | cu. in./bu. | | bu./hr. water level | | +10% actual capacity | | bu./hr. actual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| _____ | x | _____ | x | _____ | x | _____ | x | 60 | ÷ | 2,150 | = | _____ | x | 1.10 | = | _____ |
| _____ | x | _____ | x | _____ | x | _____ | x | 60 | ÷ | 2,150 | = | _____ | x | 1.10 | = | _____ |
| _____ | x | _____ | x | _____ | x | _____ | x | 60 | ÷ | 2,150 | = | _____ | x | 1.10 | = | _____ |
| _____ | x | _____ | x | _____ | x | _____ | x | 60 | ÷ | 2,150 | = | _____ | x | 1.10 | = | _____ |

For CUBIC FEET per hour:

| capacity of bucket water level | | spacing multiplier | | number of rows | | speed feet/min. | | min./hr. | | cu. in./cu. ft. | | cu. ft./hr. water level | | +10% actual capacity | | cu. ft./hr. actual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| _____ | x | _____ | x | _____ | x | _____ | x | 60 | ÷ | 1,728 | = | _____ | x | 1.10 | = | _____ |
| _____ | x | _____ | x | _____ | x | _____ | x | 60 | ÷ | 1,728 | = | _____ | x | 1.10 | = | _____ |
| _____ | x | _____ | x | _____ | x | _____ | x | 60 | ÷ | 1,728 | = | _____ | x | 1.10 | = | _____ |
| _____ | x | _____ | x | _____ | x | _____ | x | 60 | ÷ | 1,728 | = | _____ | x | 1.10 | = | _____ |

For TONS per hour: First determine cubic feet/hr. at water level using above formula then proceed as follows:

| cu. ft./hr. water level | | product weight per cu. ft.(lbs.) | | lbs./ton | | tons/hr. water level | | +10% actual capacity | | tons/hr. actual |
|---|---|---|---|---|---|---|---|---|---|---|
| _____ | x | _____ | ÷ | 2,000 | = | _____ | x | 1.10 | = | _____ |
| _____ | x | _____ | ÷ | 2,000 | = | _____ | x | 1.10 | = | _____ |
| _____ | x | _____ | ÷ | 2,000 | = | _____ | x | 1.10 | = | _____ |

For METRIC TONS per hour: First determine cubic feet/hr. at water level using above formula then proceed as follows:

| cu. ft./hr. water level | | product weight per cu. ft.(lbs.) | | lbs. metric tons | | metric tons/hr. water level | | +10% actual capacity | | metric tons/hr. actual |
|---|---|---|---|---|---|---|---|---|---|---|
| _____ | x | _____ | ÷ | 2,204.62 | = | _____ | x | 1.10 | = | _____ |
| _____ | x | _____ | ÷ | 2,204.62 | = | _____ | x | 1.10 | = | _____ |
| _____ | x | _____ | ÷ | 2,204.62 | = | _____ | x | 1.10 | = | _____ |

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SPACING multipliers: For determining number of buckets per foot of belt or chain. Below multipliers are calculated by dividing one foot (12") by the bucket spacing dimension in inches.

| Bucket Spacing on belt or chain | 3½" | 4" | 4½" | 5" | 5½" | 6" | 6½" | 7" | 7½" | 8" | 8½" | 9" | 9½" | 10" | 10½" | 11" | 11½" | 12" | 13" | 14" | 15" | 16" | 17" | 18" |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Multiplier | 3.43 | 3.00 | 2.67 | 2.40 | 2.18 | 2.00 | 1.85 | 1.71 | 1.60 | 1.50 | 1.41 | 1.33 | 1.26 | 1.20 | 1.14 | 1.09 | 1.04 | 1.00 | .92 | .86 | .80 | .75 | .71 | .67 |

FEET PER MINUTE FORMULA: Belt or chain speed can be determined if the head pulley or sprocket diameter and R.P.M. of the head shaft is known.

| π | | head pulley dia./in. | | RPM | | in./ft. | | feet/min. |
|---|---|---|---|---|---|---|---|---|
| 3.1416 | x | _____ | x | _____ | ÷ | 12 | = | _____ |

SPEED RANGE FOR TAPCO BUCKETS - Contact Tapco Inc. for engineering recommendations on either new or existing elevators.