COMPUTING BUCKET ELEVATOR CAPACITY

Note: Traditional formulas for computing elevator capacity are based on the bucket manufacturer's published gross bucket capacity. Tapco recommends using water level bucket capacities because published gross capacities are inaccurate and irrelevant. Tapco 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	=	_____

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.