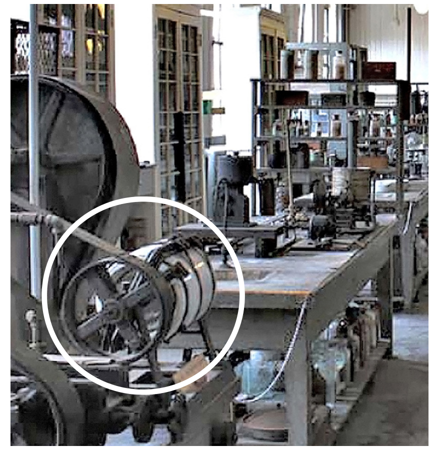
Jars & Jar Rolling Mills for Wet & Dry Size Reduction

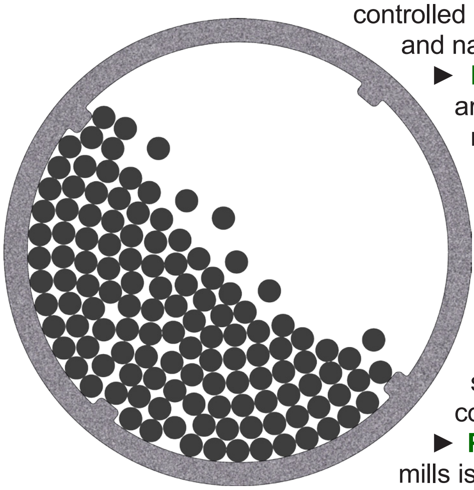
Talk with the Experts
630-350-3012



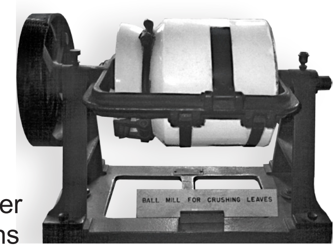
1911 Abbe Jar in Edison Lab

PAUL O. ABBE Jars and Jar Rolling Mills have been used for wet and dry milling for over 100 years in labs around the world. Even Thomas A. Edison recognized the advantages of ABBE Milling Jars and utilized them at his Menlo Park laboratory. Today, the same tumble milling principles are utilized for size reduction of ceramics, semi-conductors, rare-earth metals, mineral assay, nutraceuticals, pharmaceuticals, cosmetics and general chemicals.

Advantages of Tumble Milling:



- ► **FINE PARTICLES & NARROW DISTRIBUTION** - Tumble milling takes place over a controlled period of time and results in both fine particle size and narrow size distribution.
- ► **MILL & DISPERSE** - When wet milling, solids are both size reduced and dispersed in the liquid medium.
- ► **LOW TEMPERATURE** - Tumble milling avoids temperature spikes by putting more energy into milling and less into unwanted frictional heat.
- ► **LOW CONTAMINATION** - The energy efficient impact of media results in less media-to-media friction and less product contamination.
- ► **CONTROLLABLE** - Variables including rotational speed, media size and milling duration can be independently controlled with predictable effects on milling results.
- ► **PREDICTABLE SCALE-UP** - Scale-up from small to larger mills is predictable. Tumble milling is one of the few unit operations that actually improves with increasing size.



Original Abbe Jar

Engineered to Perform and Last: ABBE Jar Rolling Mills are industrial grade machines designed to operate continuously for many years. ABBE Jar Rolling Mills have no equivalent in laboratory supply catalogs. Every roll is manufactured from steel with a thick polyurethane outer layer which is machined for concentricity and smooth operation. Each roll end is supported by industrial roller bearings mounted on a heavy-duty welded steel frame with chemical and corrosion resistant epoxy or powder coating. Roll space in adjustable to accommodate different size ABBE jars. The exclusive modular design allows for the addition up to four tiers after installation with common tools.

Modular Jar Rolling Mill Designs:

- Roller lengths: 36”, 48” or 60”
- Number of tiers: 1, 2, 3 or 4
- Number of rollers per tier: 2, 3, 4 or 5
- Variable speed drive and tachometer
- Options: Digital shut-off timer
  Sound deadening enclosures
  Stainless steel frame
  Explosion-proof motors & controls
  Independent speed controls for each tier

Laboratory Jar Rolling Mill *with variable speed drive, tachometer (Ceramic Jar optional)*
Standard electrics 110 volt, single phase, 60 Hz.
Rollers: 2” diameter x 24” long, 3 rolls optional.

*ABBE **Milling Jars** are available in alumina fortified ceramic, stainless steel, carbon steel, nylon, polyurethane & rubber lined.*

See page 4 for jar capacities and dimensions.

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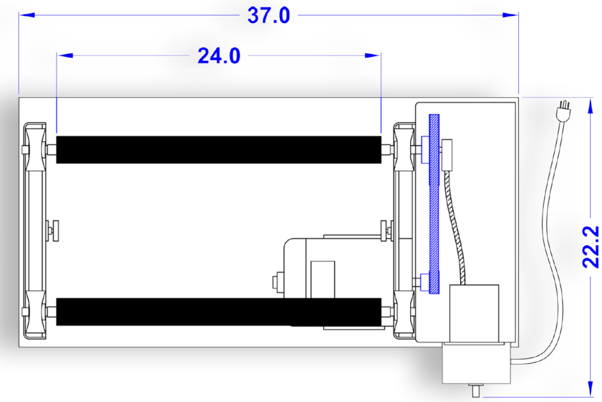
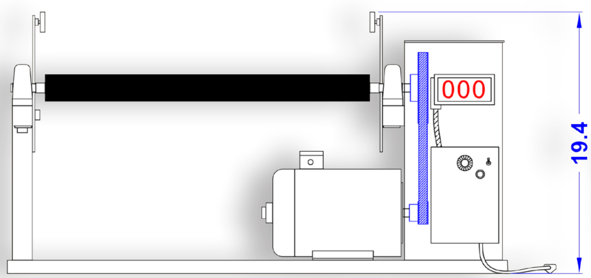
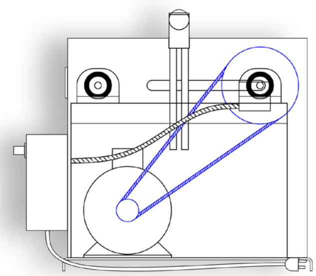
Laboratory Jar Rolling Mill (benchtop design)

Polyurethane lined jars are *lightweight, abrasion resistant and quite* - a great alternative to steel or ceramic jars. Liners are easily replaced. *See page 4 for all jar designs.*







Rollers:
- *machined polyurethane over steel*
- *rollers: 2” diameter x 24” long rolls*
- *2 roller bearings supporting each roll*
- *2 rolls standard (3 rolls optional)*
- *adjustable roller spacing*

Support Frame:
- *formed and welded steel*
- *rotating nylon jar stops*
- *white epoxy coating*

Drive:
- *0.25 HP DC drive*
- *quite belt drive*
- *roller speed 25-510 rpm*

Controls:
- *start/stop push buttons*
- *forward/reverse toggle switch*
- *speed control*
- *rpm display (reading directly off roller)*
- *110 volt, single phase, 60 Hz.*
- *NEMA-12 enclosure*
- *(optional) shut-off timer*

Dimensions:
- length 37”, depth 22.2”, height 19.4”
- weight 140 pounds

Modular Jar Rolling MillS

Rollers:
- *machined polyurethane over steel*
- *2.5” diameter rollers (36” & 48” lengths)*
- *3” diameter rollers (60” length)*
- *2 roller bearings supporting each roll end*
- *2 rolls per tier standard (3, 4 or 5 rolls optional)*
- *adjustable roller spacing*

Support Frame:
- *formed and welded steel*
- *rotating nylon jar stops*
- *tan epoxy or powder coating*

Drive:
- *2 HP AC drive*
- *gear reducer and chain & sprocket*
- *roller speed 25-510 rpm*

Controls:
- *start/stop push buttons*
- *forward/reverse toggle switch*
- *speed control*
- *rpm display (reading directly off roller)*
- *230 volt, 3-phase, 60 Hz*
- *NEMA-12 enclosure*

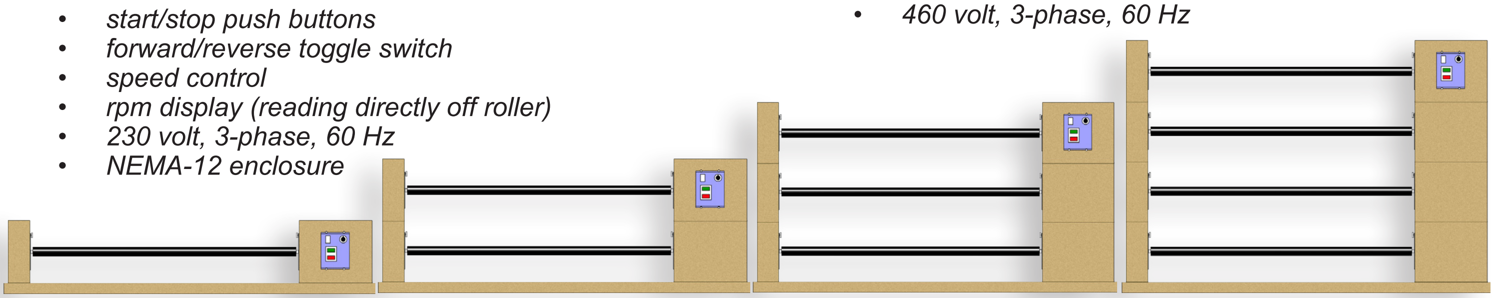
Options *(see next page for examples)*

Rollers:
- *stainless steel rolls for solvent resistance*
- *3, 4 or 5 rolls per tier*
- *2, 3 or 4 tiers (tiers are modular and can be added even after installation)*

Support Frame:
- *all stainless steel frame*
- *sound enclosure*

Drive:
- *independent drive & speed controls on each tier*
- *direct drive gear reducer (eliminates chain drives)*
- *all driven rollers (no idler rolls)*

Controls:
- *shut-off timer*
- *NEMA-4X wash down*
- *NEMA-7&9 explosion proof*
- *460 volt, 3-phase, 60 Hz*



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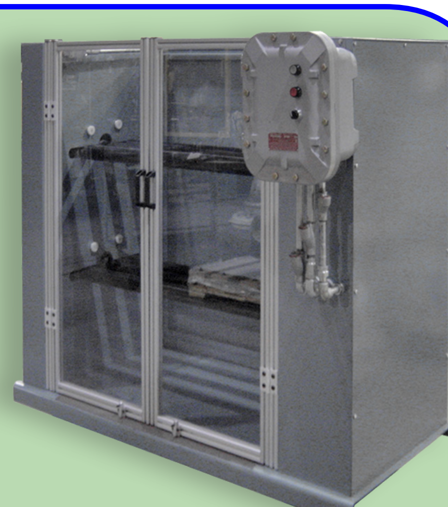
3-tier, 3 rollers per tier with explosion proof NEMA-7&9 controls.

Stainless steel 2-tier, 2 rollers per tier.

Full Enclosure - 3-tiers, 2 rollers per tier with explosion proof NEMA-7&9 controls.



Full Enclosure - Stainless steel frame, 2-tier, 3 rollers per tier with explosion proof NEMA-7&9 controls.

Independent direct coupled right-angle gear drives and separate speed controls and RPM readout for each tier.

Synchronized Rollers: All 20 rollers on 4 tiers are driven at same speed from a single drive.

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Alumina (40%) Reinforce Porcelain Jars (no lifters)

Total Volume		Dimensions			Weight	Percent of Critical Speed*				
USG	*Liters*	*Length*	*OD*	*ID*	lbs.	*55%*	*60%*	*65%*	*70%*	*75%*
0.4	1.4	8	5.3	4.5	4.8	78	85	92	99	106
0.9	3.4	10	7.8	6.5	15	62	68	74	79	85
1.7	6.3	11.6	8.8	7.6	25	57	62	67	72	77
2.6	9.8	13.2	11.2	10	35	49	53	58	62	66

*based on 1/2" media

Abbethane Jars - Polyurethane Liner (cast in lifters)

replaceable liner

Total Volume		Dimensions			Weight	Percent of Critical Speed*				
USG	*Liters*	*Length*	*OD*	*ID*	lbs.	*55%*	*60%*	*65%*	*70%*	*75%*
0.3	0.9	7.8	5.5	4.3	4	80	88	95	102	110
1.6	6.1	12	9	7.8	13	56	61	66	71	76
3.0	11.4	14	11.8	9.5	28	50	55	59	64	68

*based on 1/2" media

Nylon Jars (no lifters)

Total Volume		Dimensions			Weight	Percent of Critical Speed*				
USG	*Liters*	*Length*	*OD*	*ID*	lbs.	*55%*	*60%*	*65%*	*70%*	*75%*
0.3	0.9	7.8	5.5	4.5	3	78	85	92	99	106
1.6	6.1	12	9	8	11	55	60	65	70	75
3.0	11.4	14	11.8	9.7	24	49	54	58	63	67

*based on 1/2" media

Stainless Steel Jars (lifters optional)
Carbon Steel Jars (lifters optional)
Buna Rubber Lined Carbon Steel Jars (lifters optional)

Total Volume		Dimensions			Weight	Percent of Critical Speed*				
USG	*Liters*	*Length*	*OD*	*ID*	lbs.	*55%*	*60%*	*65%*	*70%*	*75%*
0.1	0.4	5.5	3.3	3	2	103	113	122	131	141
0.3	1.2	7.5	5	4.8	8	75	82	89	95	102
0.6	2.2	8.5	6	5.6	12	68	74	80	87	93
1.6	6.2	11.8	8.5	8	30	55	60	65	70	75
3.6	13.7	11.8	12.3	11.5	42	45	49	53	57	61
5.0	18.9	13	13	12.5	60	43	47	51	55	59

*based on 1/2" media

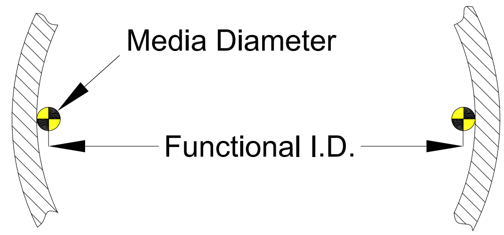
Capacities and dimensions are approximate and may change without notice - grinding media not included.

Jar and Roller RPM Calculations

1) Determine Jar Critical Speed:

Critical Speed - This is the speed at which the mill must rotate to centrifuge the outer layer of media against the inside wall of the mill.
Functional Inside Diameter - For the purpose of determining critical speed, the Functional I.D. is the mill inside diameter minus the diameter of one ball of media.

$$\text{Critical Speed} = \frac{265.45}{\sqrt{\text{Functional Inside Diameter}}}$$



2) Determine Jar RPM: *(a range of Jar rpm's are listed on the previous page)*

To detemine Jar RPM, multiply the Critical Speed from #1 above by 0.55 to 0.75.

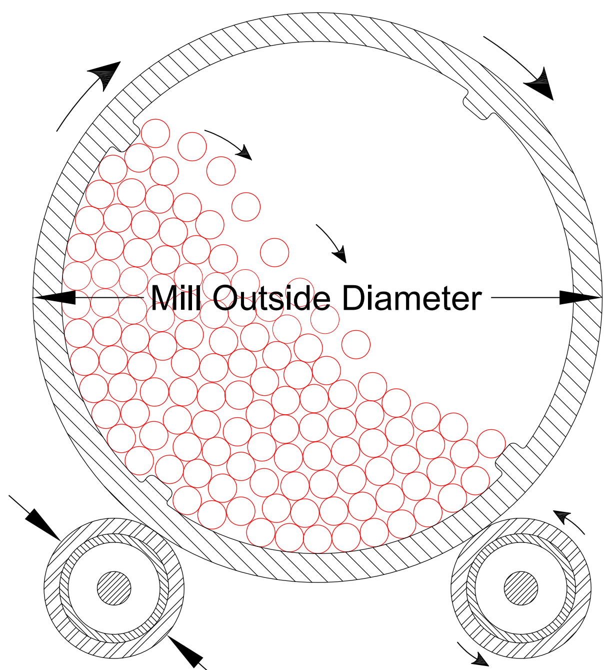
Jar RPM Guidlines:

Optimal Speed (55% to 75% of C.S.) will provide efficient tumbling and cascading of media producing consistent and efficient size reduction.
Low Speed (<55% of C.S.) will result in media slippage, especially if there are no lifter bars, resulting in poor milling and increased shell and media wear.
High Speed (>75% of C.S.) will cause the media to be thrown inside the mill, impacting each other and the mill shell (i.e., caratacting). This will increase milling intensity but will greatly increase media and shell wear. *(Higher speeds are used for metal flaking where "hammering" and flattening of ductile metals are desired).*

3) Determine Roller RPM (to obtain Jar RPM from #2 above):

$$\text{Roller RPM} = \text{Jar RPM} \times \left(\frac{\text{Jar outside diameter}}{\text{Roller diameter}}\right)$$

Roller Diameters:	2"	24" lab model
	2.5"	36" & 48" long rolls
	3"	60" long rolls



Other calculation..

Determine Jar RPM when Roller RPM is known:

$$\text{Jar RPM} = \frac{\text{Roller RPM}}{\left(\frac{\text{Jar outside diameter}}{\text{Roller diameter}}\right)}$$

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