

# UNION PROCESS CIRCULATION ATTRITORS



**CIRCULATION  
ATTRITORS**



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## Union Process "Q" and "QL" Attritors Achieve Ultra-Fine, Uniform Dispersions Quickly and Consistently

### History

From a revolutionary idea proposed and developed by Dr. Andrew Szegvari in 1945, Attritor technology grew to become the basis for Union Process, Inc., an independent family-owned American company founded in Akron, Ohio. Today, Attritors are considered to be the most efficient grinding/dispersing systems and are used in hundreds of industries and research laboratories worldwide.

### How Attritors Work

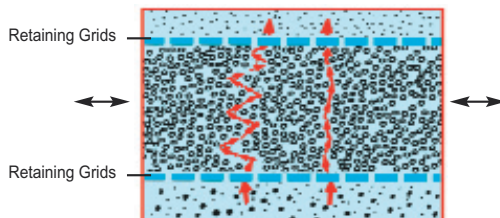
The Attritor is often referred to generically as an "internally agitated high energy media mill." The operation of an Attritor is simple and effective. The material to be ground is placed in a stationary tank with the grinding media. The materials and media are then agitated by a shaft with arms, rotating at high speed. This causes the media to exert both shearing and impact forces on the material. The final result of this remarkably efficient process is extremely fine material, measured in microns or fractions of microns, distributed on a very narrow curve.

### The Circulation Attritor

The circulation grinding Attritor ("Q" machine) is a combination of an Attritor and a large holding tank which is generally about ten times the size of the Attritor. The Attritor is filled with media and contains grids which restrain the media while the slurry is allowed to pass through.

The unique principle of the "Q" Attritor is the high circulating (pumping) rate. The entire contents of the holding tank are passed through the Attritor at least once every 7-1/2 minutes, or about 8 times per hour.

**Figure 1: Passage Of A Small & Large Particle Through A Layer Of Agitated Media**

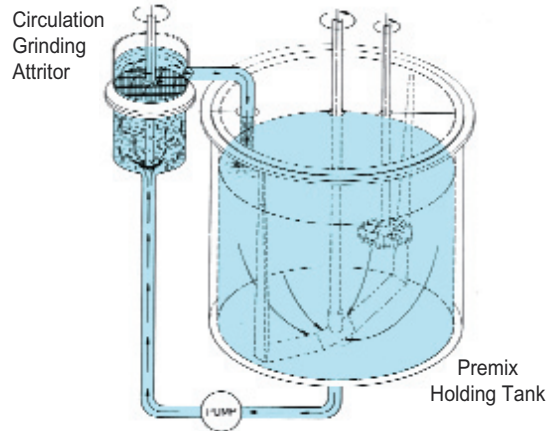


This high pumping rate results in a faster grind and a narrower particle size distribution. This phenomenon is explained by the principle of preferential grinding (See Figure 1). The fast pumping stream through the agitated media bed makes the "Q" machine grinding chamber act as a dynamic sieve or filter, allowing the fine particles to pass and move quickly through, while the coarser particles follow a more tortuous path through the media bed.

With the circulation process, unlike a continuous machine with the slurry making a single pass, the material makes many passes through the grinding chamber until the desired particle size is obtained.

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Grinding media used in circulation Attritors range in size from 3/32" to 1/4" in diameter. Chrome, steel, steatite, and zirconium oxide are commonly used media.



### The Union Process Advantage

From years of experience in designing and building thousands of Attritors for use all over the world, Union Process has developed the "know-how" to custom-design units for specific requirements, whether for production or laboratory use, employing either a dry or wet grinding process. Union Process maintains a well-equipped laboratory and pilot plant where actual production conditions can be simulated to assure that the Attritor we build for you will satisfy your requirements. Skilled technical service representatives are available for consultation. They can arrange visits to customer and prospective customer facilities to answer questions and provide solutions.

### Advantages of Using a Circulation Attritor

- Faster grinding with narrower particle size distribution
- Uninterrupted, large-scale production
- Excellent temperature control
- Simple and safe to operate
- Low maintenance and power consumption

### Common Applications for Attritors

- Paints, toners, inks
- Ceramics
- Agricultural flowables
- Food products
- Chocolate, confectionery
- Paper coatings, calcium carbonate, clay
- Chemicals
- Ferrites
- Metal oxides
- Minerals, ores, coal
- Sulphur dispersions

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## "Q" and "QL" SERIES

The circulation Attritor is used for difficult to grind and disperse materials and for the ultimate in micron size and quality. The main advantage of the "Q" series is the very narrow particle size distribution that can be achieved.

Large quantities of material can be ground with a smaller investment of grinding media and Attritor equipment. The slurry can be continuously monitored. Additional ingredients can be added to the premix tank at any time during the grinding, with sensitive materials being added near the end of the grinding cycle. Excellent temperature control is possible, since the slurry spends only 20-30 seconds in the grinding chamber and has plenty of time to be stabilized in the holding tank.

"Q" series Attritors are available in sizes ranging from the laboratory size Q-2 model up to the large-scale production model Q-100. For very large production, several Q-100 Attritors can be hooked up to a single holding tank.

Circulation Attritors designated as "QL" include specially configured arms and disks for special applications and increased performance.

A variety of accessories meeting different conditions, from cover seals for a totally enclosed system to metal-free systems, are available.

### Standard Features

- Special 450% starting torque, 2-speed, 2-winding motors for easy startup and cleaning
- Standard (TEFC) or explosion-proof electric motor and controls
- Grinding tank (304SS) jacketed for heating or cooling
- Tank swivels for shaft removal and cleaning
- 4140 steel shaft with hardened tool steel agitator arms
- Media discharge valve
- Choice of variable-speed gear pump or air diaphragm pump



Q-6 (with holding tank)

### Special Options

- **Tank Linings**—special linings for metal-free grinding are available. Choose from ceramic (alumina) tiles, food-grade rubber or polyurethane.
- **Arm Sleeves**—to accommodate metal-free systems, shaft arms may be sleeved with plastic, tungsten carbide, or zirconium oxide.
- **Covers**—can be equipped with a floating shaft seal to minimize solvent loss, or can be equipped with a MECO shaft seal for grinding under inert gases, complete with a product charging port, gas inlet and outlet.
- **Torque Meter**—for monitoring precise energy consumption which is used for determining grinding time and for added quality control.
- **Stationary Arms**—for high viscosity materials



Q-100

## ENGINEERING DATA

ATTRITOR MODEL	Q-2/QL-2	Q-6/QL-6	Q-15/QL-15	Q-25/QL-25	Q-50/QL-50	Q-100/QL-100
Grinding Tank Capacity (gals.) <sup>†</sup>	2.6	8.2	17	27.5	56	111
Media Volume (gals.) <sup>†</sup>	2.2	7.5	15	25	50	100
Recommended Holding Tank Capacity (gals.)	5 or 10	75	150	250	500	1,000
HP <sup>††</sup>	3-5	7.5-15	15-25	25-40	50-75	100-150
Pumping Rate <sup>†††</sup> (gpm)	3.5	11	22	35	70	130
Total Height (A)	54 <sup>**</sup>	74"	86"	96"	120"	124"
Base to Discharge Spout (B)	–	32"	37"	43"	53"	59"
Floor Space (W x D)	26" x 50 <sup>**</sup>	33" x 46"	37" x 53"	41" x 60"	50" x 70"	63" x 78"
Weight (lbs.) w/o media	800 <sup>*</sup>	1800	3000	4000	6500	9900

DIMENSIONS AND WEIGHTS ARE APPROXIMATE.

Circulation Attritors designated as "QL" include specially configured arms and disks for special applications.

<sup>†</sup> Less for lined tanks.

<sup>††</sup> With high density media larger than 3/16", and with QL models, higher horsepower is required.

<sup>†††</sup> Pumping rate is somewhat lower with ceramic grinding media or higher viscosity slurries.

<sup>\*</sup>Dimensions and weights are for complete system.

### Laboratory Model (Q-2)

The laboratory Attritor model Q-2 comes complete with variable speed drive motor, tachometer, 5 or 10 gallon stainless steel jacketed holding tank with anchor stirrer and high speed mixer.

Cover seals for completely sealed system are available.

The stainless steel grinding chamber can be lined with alumina, zirconium oxide, silicon nitride, silicon carbide, food-grade rubber, polyurethane, or Tefzel®. Agitator arms can be stainless steel, plastic, tungsten carbide, or zirconium oxide. For complete metal-free systems, the holding tank can be HALAR® or nylon coated. Variable speed pump – gear, lobe, or air – is provided. Complete slurry lines (stainless steel or plastic) with valve and quick disconnects are provided. Special instrumentation can be added if so desired.



**Q-2**

### Grinding Media

Union Process offers a large selection of highest quality grinding media. Materials range from steel to various ceramics to glass. A Union Process representative can advise you about which grinding media is best for your application.

For more information on our complete line of production and laboratory mills for grinding and dispersing, request a copy of our literature or download a copy from our website at [www.unionprocess.com](http://www.unionprocess.com).

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