

## Resodyn Acoustic Mixers, Inc.

*A Global Leader in industrial mixing and processing solutions. Harnessing the power of sound to generate unparalleled efficiency for the most complex of mixing needs.*

From its beginnings as a prototype tested in the garage of the company's founder, **ResonantAcoustic® Mixers (RAM)** have revolutionized the global industrial mixing – processing industry. The emergence of Resodyn Acoustic Mixers, Inc. was a direct result of its technological superiority regarding the mixing of energetic materials for the manufacturing of munitions, propellants, explosives, and pyrotechnics. ResonantAcoustic® Mixers shine where conventional mixing systems begin to fail. The company has established itself in the pharmaceutical mixing industry; battery/energy storage material processing industry; chemical production industry; aerospace-adhesives and sealant production industry; sintered metals, rapid prototyping and many more.

The RAM product line harnesses the power of resonance to enable powerful and efficient mixing of any combination of complex materials to include **Solid-Solid; Solid-Liquid; Liquid-Gas; Liquid-Liquid** and even **Highly Viscous Material Blends**. RAM systems are the **Universal Mixing Solution** for all mixing requirements and effectively eliminate the need for complex bladed mixing and processing equipment.

### The RAM Value Proposition:

- 10-100 X Faster Mixing Times
- Bladeless – Noncontact Mixing
- Consistent Homogenization
- Repeatability
- Scalability
- Durability
- Reliability
- Eco-friendly Operation
- Unparalleled Safety
- Custom Engineered Systems
- Operational Cost Savings
- Enables Innovation



## How it Works

**RAM Technology** employs the power of acoustic waves to create intense vibrations within a vessel holding the substances to be mixed. These vibrations generate localized pressure fluctuations and induce a phenomenon known as acoustic mixing. This process agitates materials at a particle level due to alternating pressure waves which break apart agglomerates, disperse particles and liquids causing rapid material dispersion, consistently resulting in a homogenous mixture.

## The Products



RAM equipment comes in variable sizes and configurations, each of which utilizes a **universal platform to generate efficient mixing at every scale**. All RAM systems deliver repeatable blends from bench to pilot to industrial production volumes. Resodyn Acoustic Mixers, Inc. provides the following batch processing equipment portfolio with varying payload capacities:

<b>LabRAM I</b>	<b>500 g</b>
<b>LabRAM II</b>	<b>1 kg</b>
<b>OmniRAM</b>	<b>5 kg</b>
<b>RAM 5</b>	<b>36 kg</b>
<b>RAM 55</b>	<b>420 kg</b>

Products can be certified for hazardous material mixing to include Class I Div. 1, Class II Div. 1, and ATEX Standards. Accessories include but are not limited to vacuum, jacketed vessel, and spray coating systems.



Resodyn also offers **Continuous Acoustic Mixing (CAM)** systems which are custom engineered per each client's specific material and mixing needs and have been identified by the company as **the future of high throughput mixing**. CAM systems provide for continuous product blending/mixing capacity of up to thousands of kg/hour.



Adoption of this advanced universal technology persists. Resodyn Acoustic Mixers, Inc. is also actively pursuing product/application development work to include **Continuous Acoustic Crystallizers** and **Continuous Acoustic Chemical Reactor**



## Frequently Asked Questions

### Q. What makes RAM special as it regards industrial mixing technologies?

A. Conventional industrial mixers have many drawbacks. These bladed systems struggle with achieving consistent results for materials with varying viscosities and/or particle sizes. The mechanical action of the blades can create excessive shear forces and generate local shear forces that can increase temperatures which can degrade sensitive materials. High shear forces can alter material properties. RAM's patented mixing process is bladeless and effectively rectifies the deficiencies posed by conventional mixing systems. The benefits of RAM include, but are not limited to dramatically improved mixing times, shear force reduction, minimal overheating of mixed materials, consistent product homogenization, and repeatable results from mix to mix.

### Q. Where has RAM been successfully implemented?

A. ResonantAcoustic® Mixing technology has been accepted and utilized worldwide in over 35 countries for a broad range of industrial applications.

### Q. What industries does RAM service?

A. Greater than 20 distinct industry markets have adopted RAM technology as a standard industrial mixing - processing practice. Each industry has specific requirements with countless individual applications. Primary industries for Resodyn Acoustic Mixers, Inc. include:

- Energetic Materials (munitions, propellants, explosives, and pyrotechnics)
- Pharmaceutical Products
- Energy Storage/Battery Material Processing
- Chemical Production
- Adhesives & Sealants (Aerospace and Defense)
- R & D Services
- Highly Viscous Materials
- Specialty Products

The company actively services other applicable market areas but believes that its overall success is best served by concentrating on its primary markets.

### Q. What materials can be mixed?

A. The RAM product line is designed to mix virtually any combination of materials. The technology truly begins to shine where conventional (bladed) mixing systems begin to falter or altogether fail.

### Q. What types of materials does Ram successfully mix?

A. ResonantAcoustic® Mixers deliver a universal platform which produces repeatable results for any combination of solids, liquids, and gases. RAM is extremely well suited for the challenge of highly viscous materials. RAM successes include deagglomeration, sieving, and coating.

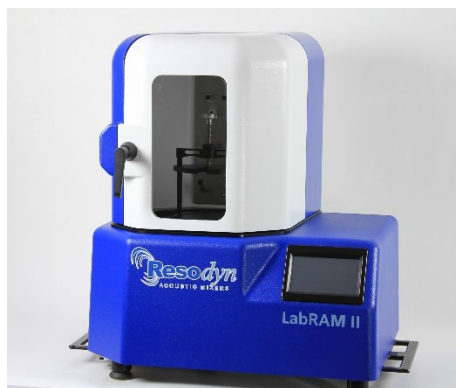


**Q. What sizes are available?**

A. ResonantAcoustic® Mixers range in size from bench scale batch production models - LabRAM I (500g payload capacity) to production scale batch models - RAM 55 (420 kg payload capacity). Resodyn's Continuous Acoustic Mixer creates ongoing production capacity of up to thousands of kg/hour.

**Q. What is the most popular model of RAM?**

A. To date, the company has sold more bench scale units (LabRAM II) than any other model.



**Q. What is the largest RAM batch system currently in operation?**

A. Significant developments for Resodyn Acoustic Mixers, Inc. include the sale, delivery, and installation of its ResonantAcoustic® Mixer 55 (RAM 55) to the U.S. Department of Defense at the McAlester Army Ammunition Plant in Oklahoma (U.S.A.). The RAM 55 is the largest batch system design currently offered by the company.

**Q. Is it scalable?**

A. Yes. RAM delivers a universal platform from bench scale to pilot scale through continuous production which provides consistent performance for scale up and technological development.

**Q. How is RAM powered?**

A. Depending on the model, RAM units are operated by standard 110v, 220v, or 480v (3 phase) power supplies.

**Q. How will RAM work for my materials?**

A. Resodyn Acoustic Mixers' external sales team provides both on-site and virtual mixing demonstrations. Complimentary lab mix testing is also available. For proprietary blends, the company maintains an equipment rental program (LabRAM I & II) which allows for material process testing in the privacy of your own facility.



**Q. What type of vessel (container) is required to mix in?**

A. Bench scale systems can accommodate any rigid container (glass, metal, or plastic). Production scale systems are more specific, and the company provides product specific vessels for use with each model.

**Q. Can RAM safely process hazardous materials?**

A. Yes. With its origination founded in the energetics industry, ResonantAcoustic® Mixers are available specifically for hazardous material mixing applications. These models are Class I Div. 1 and Class II Div. 1 rated for hazardous material processing. RAM H models are constructed of stainless steel, are redundantly grounded, and maintain purged enclosures to assure safe operation.

**Q. Can RAM be operated remotely?**

A. Yes. Remote operational capabilities are available and functional at a range of up to 2.5 miles.

**Q. Are RAM systems loud?**

A. No. RAM systems are acoustically sealed, insulated, and designed to typically be no louder than 70 decibels. Some exceptions may exist with select remote operated units.

**Q. Are RAM systems safe to operate?**

A. Due to its inherent safety features, the product's Safety Record is unblemished and has not resulted in any reported personal injuries or deaths.

**Q. Is there a long learning curve as it regards system operations?**

A. Operator training accompanies every purchase. RAM systems are very user friendly, and the operational parameters utilized at the bench scale are consistent throughout production scale up. The company offers a RAM 5 Certification Course and Certificate of Training regarding both operation and maintenance of its production capacity mixers.

**Q. Is the equipment difficult to clean & maintain?**

A. RAM batch processing systems are bladeless and self-contained within a closed mixing vessel, preventing batch cross-contamination and providing ease of cleanup. Resodyn's Continuous Acoustic Mixer employs a Clean-In-Place (CIP) process which efficiently cleans the system, reducing waste, and minimizing or possibly eliminating operator exposure to harmful cleaning agents.

**Q. Is RAM Environmentally Friendly?**

A. RAM provides for drastically reduced mixing and processing times (10-100 X faster than conventional mixing equipment) and often results in process step reduction supporting reduced energy consumption. RAM's mixing proficiency can result in drastically reduced material waste and can eliminate the need for solvents/chemicals for various mixing processes. RAM is cleaner than alternative conventional mixing systems.



## Resodyn Acoustic Mixers, Inc.

Resodyn Acoustic Mixers, Inc.'s worldwide office of record is located in Butte, Montana, USA. Resodyn Acoustic Mixers, Inc. serves the global industrial mixing and processing industry via manufacturing, distribution, and direct sale of its proprietary ResonantAcoustic® Mixer (RAM) product line. RAM is the driving force behind innovation in commercial mixing applications. Resodyn Acoustic Mixers, Inc. is committed to continuous technological enhancement and dedicated to maintaining its dominance as an industry leader through proactive product placement, constant process improvement, and consistent engineering superiority.

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