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PERMIX INDUSTRIAL VACUUM
DEAERATION TECHNOLOGY:
PRECISION MIXING FOR
EVERY INDUSTRY

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The Science of Removing Entrained Air from Liquids, Emulsions, and Pastes

Modern manufacturing relies on precise control over every aspect of product formulation. While ingredients and mixing processes receive significant attention, one factor that often determines the final quality of a product is air entrainment.

Air trapped within liquids, emulsions, slurries, and pastes can compromise product stability, appearance, shelf life, and performance. Even microscopic air bubbles can dramatically alter viscosity, oxidation rates, filling accuracy, and overall product consistency.

Industrial vacuum deaeration is the process used to eliminate these unwanted gases, ensuring that the final product meets the highest standards of quality and stability.

PerMix Vacuum Deaerators represent one of the most advanced and efficient technologies available for removing entrained air from industrial formulations across a wide range of industries.



Understanding Entrained Air in Industrial Processing

Air can enter a product at almost every stage of manufacturing. When ingredients are mixed, pumped, heated, or homogenized, small pockets of air become trapped within the product structure.

These air bubbles may be visible foam on the surface—or they may exist as microscopic bubbles distributed throughout the material.

Once trapped, these bubbles become extremely difficult to remove without specialized equipment.

Entrained air can originate from:

- ✓ High-speed mixing or agitation
- ✓ Homogenization processes
- ✓ Pump cavitation
- ✓ Powder addition during mixing
- ✓ Chemical reactions that release gases
- ✓ Fermentation processes
- ✓ Heating or cooling cycles
- ✓ Raw ingredients containing dissolved gases

The removal of this air is essential for maintaining product integrity.

The Problems Caused by Air in Liquid and Semi-Liquid Products

While air may appear harmless, its presence can significantly impact industrial processing.

Oxidation

Oxygen trapped in a formulation can react with sensitive ingredients. This reaction may degrade flavor compounds, fragrances, vitamins, pigments, or active pharmaceutical ingredients.

Reduced Shelf Life

Oxygen exposure accelerates chemical degradation and microbial growth in certain formulations.

Inconsistent Product Density

Air bubbles reduce the true density of the product, which creates inconsistencies during filling operations.

Inaccurate Filling

Entrained air causes volume variations during filling processes, which leads to packaging inconsistencies.

Foaming and Surface Defects

Products containing air may foam excessively during filling or application. This creates poor visual appearance and unstable textures.

Instability in Pumps and Processing Equipment

Air pockets can interfere with flow meters, sensors, and pumping systems, resulting in unstable processing conditions.

Removing air improves product quality while also improving the efficiency of the entire manufacturing process.

The Science Behind Vacuum Deaeration

Vacuum deaeration relies on a fundamental physical principle.

When pressure is reduced, gases expand and escape from liquids more easily.

Under atmospheric pressure, small air bubbles can remain trapped inside viscous products due to surface tension and internal resistance.

When the pressure is lowered inside a vacuum chamber:

- ✓ Gas bubbles expand rapidly
- ✓ Surface tension weakens
- ✓ Dissolved gases escape from the liquid
- ✓ Entrained air separates from the product matrix

By spreading the product into thin layers under vacuum conditions, the surface area available for gas release increases dramatically.

This allows air bubbles to rise, expand, and escape efficiently.



The PerMix Vacuum Deaeration Process

PerMix PDA Series Vacuum Deaerators use a highly engineered multi-stage process to maximize gas removal.

Step 1: Vacuum Creation

A powerful vacuum pump creates a low-pressure environment inside the deaeration chamber.

Step 2: Product Distribution

The incoming product is distributed onto a high-speed centrifugal disc.

Step 3: Thin Film Formation

The centrifugal disc spreads the product into a thin film across the surface of the chamber.

This thin layer dramatically increases the surface area of the product exposed to vacuum conditions.

Step 4: Bubble Expansion and Release

Under vacuum conditions, trapped gas bubbles expand and burst as the product forms a thin layer.

Step 5: Secondary Air Removal & Particle Refinement

The product passes through specialized sieves which further disrupt trapped bubbles and release residual gases.

Depending on the specific product character and processing requirements, the PDA can be configured with 0 to 3 sieves.

As the product passes through the sieve holes (typically 1-3mm), particles are subjected to shearing, folding, and size reduction.

This mechanical action results in a more homogeneous product and ensures even better separation of air from product particles.

Step 6: Gravity Separation

The deaerated product flows along the chamber walls where remaining gas separates naturally.

Step 7: Product Discharge

The fully deaerated product is discharged via a positive displacement pump.

This continuous process ensures efficient air removal even in high-viscosity materials.

Applications of Industrial Vacuum Deaeration

Vacuum deaeration is used in nearly every industry where liquids, pastes, emulsions, or slurries are processed.

Food Processing

Air removal improves product appearance, texture, and shelf life.

Applications include:

- ✓ Mayonnaise
- ✓ Sauces and dressings
- ✓ Fruit concentrates
- ✓ Dessert toppings
- ✓ Chocolate fillings
- ✓ Baby food
- ✓ Dairy emulsions
- ✓ Nutritional beverages

Cosmetics and Personal Care

Smooth textures and visual clarity are critical in cosmetic products.

Applications include:

- ✓ Skin creams
- ✓ Cosmetic emulsions
- ✓ Lotions
- ✓ Shampoos
- ✓ Toothpaste
- ✓ Cosmetic gels

Pharmaceutical Manufacturing

Pharmaceutical formulations require precise control of oxygen exposure.

Applications include:

- ✓ Medicinal creams
- ✓ Ointments
- ✓ Pharmaceutical suspensions
- ✓ Liquid medications
- ✓ Nutraceutical syrups
- ✓ Vaccine emulsions

Chemical Processing

Many chemical formulations require deaeration for stability and performance.

Applications include:

- ✓ Adhesives
- ✓ Paints and coatings
- ✓ Ink dispersions
- ✓ Lubricants
- ✓ PVC dispersions
- ✓ Polymer emulsions

Deaeration vs Degassing: Understanding the Difference

In industrial terminology, deaeration and degassing are sometimes used interchangeably, but there are important differences.

- ✓ **Degassing** typically refers to the removal of dissolved gases from liquids.
- ✓ **Deaeration** refers to the removal of both dissolved gases and entrained air bubbles.

Vacuum deaeration systems like those engineered by PerMix perform both functions simultaneously, making them far more effective for industrial processing.

Advantages of the PerMix PDA Vacuum Deaerator

PerMix systems deliver significant benefits for manufacturers.

Superior Air Removal Efficiency

Thin-film centrifugal distribution maximizes gas release.

Continuous Processing

Designed for integration into continuous manufacturing lines.

Wide Viscosity Handling

Capable of processing both low-viscosity liquids and thick pastes.

Sanitary Hygienic Design

Suitable for food, pharmaceutical, and cosmetic production environments.

Flexible Configuration

Customizable vacuum systems, discharge pumps, and construction materials.

Temperature Control Options

Heating and cooling jackets allow precise thermal management.

Explosion-Proof Construction

Available for processing flammable materials.

Integrated Particle Size Reduction

Unlike standard degassing units, the PerMix PDA series does more than just remove air. By utilizing a high-speed centrifugal disc and adjustable sieves, the system provides simultaneous particle size reduction and shearing. This dual-action process improves the texture and consistency of emulsions and pastes while ensuring a completely deaerated final product.

Engineering Excellence from PerMix

PerMix is recognized globally for its leadership in advanced mixing and processing technologies.

Our engineering philosophy focuses on delivering equipment that improves the entire production process, not just a single step.

Every PerMix deaeration system is designed with:

- ✓ Precision engineering
- ✓ Robust industrial construction
- ✓ Hygienic sanitary design
- ✓ Flexible integration with upstream equipment
- ✓ Long-term reliability and performance

Integration with Mixing and Homogenization Systems

PerMix deaerators are often integrated with other process technologies.

Common upstream systems include:

- ✓ high shear mixers
- ✓ homogenizers
- ✓ emulsifiers
- ✓ dispersers
- ✓ inline mixers

Downstream integration may include:

- ✓ filling machines
- ✓ packaging systems
- ✓ reactors
- ✓ cooling systems

This integration allows manufacturers to create fully optimized processing lines.



Custom Engineered Solutions

PerMix offers extensive customization options including:

- ✓ explosion-proof designs
- ✓ specialty alloys (Duplex, Hastelloy, Titanium)
- ✓ sanitary pharmaceutical-grade construction
- ✓ automated PLC control systems
- ✓ CIP cleaning systems
- ✓ integrated heating or cooling jackets

Each system can be tailored to the specific requirements of the customer's process.

Specifications

Model	Working Volume	Flowrate (Liter/hr)			Total Power	L	W	H	Weight
		Light Liquid	Viscous Product	Highly Viscous Product					
	(Liter)	(<300cPs)	(<5,000cPs)	(≥5,000cPs)	(kW)(*)	(mm)	(mm)	(mm)	(kg)
PDA-25-MD	25	1,500	900	300	3.01	1,300	800	1,710	240
PDA-25	25	1,500	900	300	4.51	1,300	800	1,710	280
PDA-65	65	4,000	2,500	800	9	1,900	1,200	2,050	500
PDA-125	125	8,000	5,000	1,600	12.5	2,110	1,160	2,160	1,500
PDA-300	300	15,000	9,000	3,000	13.7	2,245	1,500	2,400	2,000
PDA-550	550	20,000	12,500	4,000	29.1	2,400	1,625	2,550	2,800
PDA-1000	1,000	25,000	15,000	5,000	36.5	2,600	1,680	2,700	3,200
PDA-1200	1,200	30,000	18,000	6,000	42	2,755	1,850	2,875	3,500

Why Leading Manufacturers Choose PerMix

Manufacturers across the world trust PerMix equipment because of our commitment to engineering excellence and practical industrial solutions.

PerMix delivers:

- ✓ higher product quality
- ✓ greater process stability
- ✓ improved production efficiency
- ✓ long-term reliability

Our vacuum deaeration systems help manufacturers produce better products while reducing operational challenges.



PerMix Vacuum Deaerators Engineering the Future of Product Stability

Removing air from industrial products is not simply a finishing step—it is a critical stage that determines the final quality, performance, and shelf life of the product.

With decades of experience in advanced mixing and processing technologies, PerMix has developed deaeration solutions that deliver unmatched performance across a wide range of industries.

The result is a system that ensures your product leaves the production line stable, consistent, and ready for the market.



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Besides, PerMix has been building a network of agents located in Southeast Asia, Australia, Russia, Middle East, Africa, and other countries & regions.