

Aerospace Manufacturing Clean Faster. Perform Better. Vapor Degreasing for an Aerospace Edge.

In aerospace manufacturing, every detail matters. From propulsion systems to landing gear, every component must meet exacting standards for performance, reliability and—critically—cleanliness. When tolerances are tight and timelines even tighter, efficiency isn't optional, it's essential.

That's why vapor degreasing has become the go-to precision cleaning method for aerospace manufacturers around the world. This solvent-based technology not only ensures components are thoroughly cleaned but also helps operations run leaner and faster, all while supporting compliance with demanding regulatory and customer requirements.

Engineered for precision, speed and consistency, vapor degreasing offers a repeatable and validated cleaning process. It supports the rigorous performance and traceability standards aerospace manufacturers must meet—while driving measurable gains in throughput and cost-efficiency.

What Is Vapor Degreasing?

Vapor degreasing is a precision cleaning process that uses a specially engineered solvent in a closed-loop system to remove contaminants from complex parts. The cycle begins in the boil sump, where the solvent is heated to create a dense vapor cloud above. Parts are first immersed directly into the boil sump, where the boiling solvent dissolves and dislodges oils, greases, waxes, and other residues through direct contact. This immersion stage ensures a thorough first cleaning, even for parts with intricate geometries.

Following this, the parts are transferred into the rinse sump, which holds more clean solvent. This step further cleans the parts and removes any remaining debris or dissolved residues from the first stage. For the final phase, parts are moved into the vapor zone. Here, the solvent vapor condenses on the cooler parts, giving them a last, ultra-pure rinse while simultaneously evaporating any residual fluid. This last step ensures the components emerge clean, dry, and cool to touch, ready for immediate inspection, bonding, or assembly—without the need for added drying time.

Why Aerospace Manufacturers Rely on Vapor Degreasing

In aerospace, there is no room for error. Components not only need to perform flawlessly, they must also be traceable to specific processes and batch records. Vapor degreasing delivers this level of consistency while bringing several distinct advantages to the production floor:

- **Superior Cleaning of Complex Geometries**
Aircraft components often feature intricate internal geometries—blind holes, tight channels and micro-machined details—that are difficult or impossible to reach with manual or aqueous methods. Vapor degreasing fluids penetrate these features easily, removing contaminants with precision.
- **Repeatable, Validated Processes**
Aerospace regulations demand process validation, control and documentation. Vapor degreasing is a low-touch, highly automated system that ensures consistent results across production runs. Parameters can be tightly controlled, supporting AS9100 and NADCAP traceability requirements.
- **Shorter Cleaning Cycles**
Compared to aqueous systems, which may require multiple cleaning and drying stages, vapor degreasing completes the entire process quickly. There's no need for extended drying ovens or cool-down periods. This leads to shorter cycle times, fewer bottlenecks and improved throughput.
- **Minimal Downtime**
Modern vapor degreasers are designed for reliability. They include features like in-process filtration, solvent distillation and real-time monitoring to extend solvent life and reduce unplanned maintenance. This helps keep production lines moving and minimizes costly interruptions.

Lowering Costs Without Compromising Quality

Aerospace manufacturers work in a challenging economic landscape. While quality can never be sacrificed, the pressure to reduce costs is ever-present. Vapor degreasing strikes the balance between performance and efficiency:

- **Reduces Rework**
Clean parts contribute to stronger bonds, better coating adhesion and more reliable parts. By eliminating contamination early, vapor degreasing helps reduce rework and warranty issues downstream.
- **Minimizes Waste**
Closed-loop solvent recovery systems reclaim and purify used fluid for reuse. This

reduces overall solvent consumption, lowers hazardous waste disposal costs and improves environmental compliance.

- **Supports Lean Manufacturing**

With faster cleaning cycles and reduced handling, vapor degreasing aligns with lean principles. The process cuts unnecessary steps and labor, helping teams meet aggressive production schedules while improving quality outcomes.

Surface Readiness for Critical Aerospace Processes

In aerospace, cleaning isn't just about removing grime—it's about preparing parts for what comes next. Poor surface preparation can compromise downstream processes like painting, sealing or bonding, ultimately risking component failure in flight.

- **Pristine Surface Preparation**

Vapor degreasing fluids leave no water spots, residues or particulates behind. This ensures optimal surfaces for coating, welding, plating and sealing, improving bond strength and reducing the chance of defects.

- **Immediate Post-Cleaning Usability**

Because vapor-degreased parts emerge dry and cool, they can be handled immediately. There's no need to wait for drying ovens or air-drying steps, saving valuable time on the production line.

Choosing the Right Cleaning Fluids for Aerospace Needs

Not all cleaning fluids are created equal. The success of a vapor degreasing process depends heavily on the solvent selected. Aerospace manufacturers should consider three key criteria:

1. **Contaminant and Material Compatibility**

Fluids must effectively remove target contaminants—such as high-performance greases, hydraulic fluids and machining oils—without damaging sensitive materials like titanium, aluminum or composite substrates.

2. **Regulatory Compliance**

The solvent must follow aerospace OEM and Tier 1 supplier specifications and be aligned with regulations such as REACH (EU), RoHS and the U.S. EPA's SNAP program. Choosing a compliant fluid avoids costly reformulations or process revalidations later.

3. **Environmental Performance**

Today's best cleaning fluids offer low global warming potential (GWP), zero ozone depletion potential (ODP) and favorable safety profiles. These attributes are especially

important for aerospace manufacturers pursuing sustainability certifications and reduced environmental impact.

Meeting Aerospace Standards—Safely and Sustainably

Advanced vapor degreasing fluids are designed with both performance and responsibility in mind. They help manufacturers strike the right balance between effectiveness, safety and environmental impact:

- **Workplace Safety**
Many modern fluids are non-flammable, low in toxicity and exhibit low volatility. They offer favorable occupational exposure limits and are safe to handle with standard personal protective equipment (PPE) supporting enterprise-wide EHS initiatives.
- **Environmental Stewardship**
Next-generation solvents help companies reduce emissions, avoid ozone-depleting substances and limit greenhouse gas contributions. By switching to low-impact cleaning fluids, manufacturers can align their operations with long-term sustainability goals and customer expectations.

Proven Aerospace Applications

Vapor degreasing is already well established across the aerospace supply chain. Its reliability and repeatability make it a versatile tool for a wide range of applications:

- **Component Cleaning:** Bearings, fasteners, fuel system parts, hydraulic components and housings all benefit from thorough vapor degreasing.
- **Pre-Assembly Preparation:** Clean, residue-free surfaces ensure reliable adhesion for bonding and sealing applications.
- **Post-Machining Cleaning:** Vapor degreasing removes oils, metal shavings and particulates from complex, high-tolerance machined parts before inspection or coating.

Conclusion: A Smart Strategy for Aerospace Manufacturers

Vapor degreasing isn't just a cleaning process; it's a competitive edge. As aerospace manufacturers face increasing quality demands, tighter production windows and rising pressure to reduce environmental impact, vapor degreasing provides a clear path forward.

With its unmatched combination of speed, consistency and precision, this closed-loop process supports aerospace production from the shop floor to the flight line. For manufacturers aiming to clean faster, perform better and lead in a demanding industry, vapor degreasing is a smart, strategic investment in the future.

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