



Dry Ice Blasting

IN CONSTRUCTION COMPANY



AMS - Reduce nature harm with technology, to create value for customer

AMS

amsdryice.com



AMS
ASSET MAINTENANCE SOLUTIONS
BY TSG ENTERPRISE

ABOUT AMS

AMS IS GREEN TECHNOLOGY COMPANY

AMS is specialized in environmentally responsible restoration, surface preparation, part finishing, Dry ice supply system a contract service cleaning.

We provide the most technologically advanced dry ice cleaning system. To fulfill our mission of creating value to customer and protecting the environment , our machine and services produces media that is inert , non-conductive , non-corrosive and does not produce hazardous waste streams.

OUR MISSION

Protecting the Environment.

Improving organization efficiency

Ensuring employee safety

OUR VISION

Reduce nature harm with

technology, to create value for

customer.

CORE VALUES

Enhancing operational efficiency

Prioritize the worker safety

Advancing dry ice technology

WE REUSE RECYCLED CO₂ TO REDUCE WATER CONTAMINATION



Introduction

Dry ice blasting is used across the globe as a solution for surface cleaning, surface preparation and parts finishing in a wide range of industries. It is a preferred method because it is nonabrasive, nonconductive, non-toxic and does not create secondary waste.

This guide is designed to answer all of your questions about dry ice blasting. It will review everything from what dry ice blasting is to what you need to start cleaning.

You will learn that dry ice blasting is an environmentally responsible cleaning and surface preparation technique that will help you cut costs, decrease cleaning time and reduce labor allocated to cleaning projects.

You will also learn if dry ice blasting is right for you.



We are AMS

The global expert in environmentally sustainable cleaning, surface preparation chain management solutions.

Dry Ice Cleaning

AMS has developed the most efficient dry ice blast cleaning technology available. Our environmentally responsible systems are used for cleaning, surface preparation and parts finishing. Designed with unrivaled innovation, unmatched performance and based on years of customer input, our systems let you clean better and with less effort, thus increasing productivity and profit.

Who uses dry ice blasting?

Dry ice blasting is used for a wide variety of cleaning, surface preparation and parts finishing applications in a diverse range of industries.

Dry ice cleaning is successfully used in the following industries:

- Aerospace
- Construction
- Automotive
- Contract Cleaning
- Composite Tool Cleaning
- Electric Motor
- Engineered Wood
- Fire Restoration
- Food and Beverage
- Foundry
- Rubber
- General Maintenance & Facilities
- Historical Restoration
- Medical Device Manufacturing
- Mold Remediation
- Oil and Gas
- Packaging
- Plastics
- Power Generation
- Printing
- Textile



What is dry ice blasting?

Dry ice blasting, or dry ice cleaning, is similar to sand, bead and soda blasting in that it prepares and cleans surfaces using a medium accelerated in a pressurized air stream. It differs in that dry ice cleaning uses solid carbon dioxide (CO₂) pellets or MicroParticles, accelerated at high velocities to impinge on the surface and clean it. The particles sublime upon impact, lifting dirt and contaminants off the underlying substrate without damage.

The dry ice blasting process has unique characteristics that differentiate it from other cleaning methods and other media blasting methods.

The dry ice cleaning method is:

- Non-abrasive
- Non-conductive
- Non-flammable
- Non-toxic
- Environmentally responsible



The dry ice blasting process **does not create secondary waste**. The dry ice sublimates, or phase transitions from solid CO₂ to gaseous CO₂, when it impacts the surface being cleaned. This eliminates the secondary waste stream that is created with other media blasting techniques. The only remaining waste products are the dislodged contaminants, which can be vacuumed or swept away.

Dry ice blasting was originally developed to remove paint and coating from airplanes in the 1970's. The technology has been developed commercially by AMS.

Dry ice blasting is also known as CO₂ blasting or cryogenic cleaning.



What are the applications & uses?



Surface cleaning

Dry ice blasting is a *non-abrasive, non-conductive, non-toxic* cleaning method that *does not create secondary waste*. It is used to clean many types of surfaces in a multitude of commercial and manufacturing settings. Surfaces of tooling, machinery and finished parts can all be cleaned with dry ice.

Dry ice cleaning has a wide range on the aggression spectrum (from very aggressive to delicate cleaning). The compressed air pressure, dry ice particle size and dry ice feed rate can be adjusted and dialed down to clean very delicate and sensitive surfaces, such as soft alloys, electrical wires and sensors. It can also be dialed up to clean heavy and stubborn contaminants, such as asphalt, corrosion and weld slag.



What are the applications & uses?

Surface preparation

Dry ice cleaning can safely remove a variety of contaminants from parts, including oil, dust, all bitumen release agents, fingerprints and more without causing part surface damage. Dry ice cleaning is a *dry process* and eliminates the need for aqueous or chemical solutions when preparing a surface for painting. Coatings and paint can be applied immediately after cleaning because the surface is left completely dry.



Parts finishing

Dry ice cleaning can safely remove flash and burrs from a variety of materials: PEEK, PBT, Acetal, Nylon, LCP, ABS, UHMWPE, Nitinol and more. Due to its non-abrasive nature, dry ice leaves the surface undamaged and free of residual media. Dry ice blasting also provides a faster and more uniform flash and burr removal process than manual methods.

Before



After



EFFECTIVE CLEANING THAT REDUCES SCRAP RATES AND INCREASES MACHINE EQUIPMENT LIFE QUALITY



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Construction companies are continually driving to improve efficiency, operate in a safe manner and reduce their impact on the environment. Traditionally water and pressure washing has been an effective method of cleaning – however the large quantities of water needed, and the contaminated secondary waste produced which has to be disposed of properly – make it a costly operation in terms of labour, financials and the negative effect on the environment. Dry ice cleaning offers an effective alternative to pressure washing with water. Dry ice cleaning is chemical free, shot free, moisture free and creates no by product waste, is nonabrasive and non-flammable – it eliminates the need for cleaning water, and eliminates the need to dispose of that same water which becomes contaminated during the cleaning operation. Cleaning takes place hot and in situ reducing down time and helping to make your facility more efficient and improve productivity.

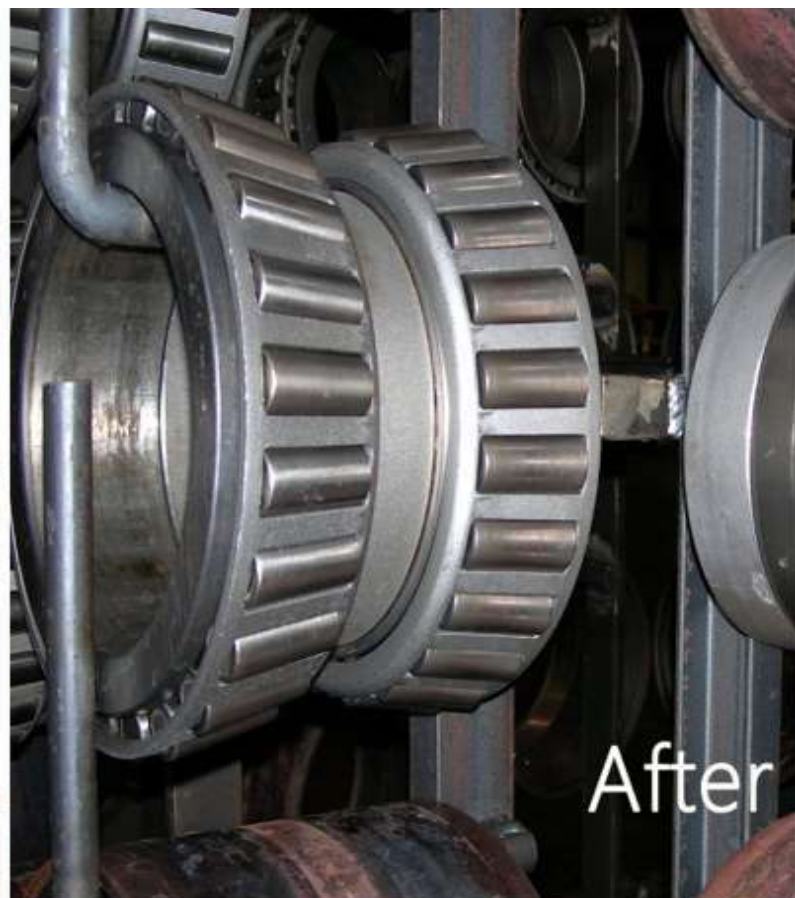




Dry Ice Cleaning is a Highly Efficient Alternative to Steam, Water, or Sandblasting

Unlike water or steam blasting, the dry ice method allows you to immediately put your equipment back into service, as it requires zero dry time. It also doesn't result in dirty, contaminated water that must be safely removed to reduce the risk of mold or mildew forming after cleaning.

Unlike sandblasting, dry ice cleaning is entirely non-abrasive and will not wear away the surface of your equipment, nor does it require your equipment to





What are the properties of dry ice blasting?

Properties of dry ice blasting:

1. Non-abrasive
2. No secondary waste
3. Environmentally responsible
4. Non-toxic
5. Non-conductive and non-flammable

1) Non-abrasive

Dry ice is a very soft media and can clean most surfaces without damage. It can clean sensitive surfaces, such as electronic equipment, printed circuit boards and plastic molds, without etching, profiling or changing surface dimensions.



2) No secondary waste

Dry ice sublimates upon impact with the surface being cleaned, which results in no secondary waste, *no residue* and *no moisture* introduced. This eliminates extra cleanup, disposal of secondary waste streams and additional cleaning preparation, such as masking delicate sensors or wrapping electronic components before cleaning. Elimination of secondary waste allows equipment to be cleaned *while online and still operating*.



What are the properties of dry ice blasting?



3) Environmentally responsible

The dry ice used in the dry ice cleaning process is made of *reclaimed CO₂* that is collected and recycled from other industrial processes. It *does not produce more CO₂* or add additional greenhouse gases to the atmosphere.

It also allows for the elimination of environmentally harmful cleaning chemicals and eliminates worker exposure to hazardous cleaning agents. It also does not produce any toxic waste that must be disposed of.

4) Non-toxic

Dry ice is a food grade media and is approved for use in FDA and USDA inspected facilities. It is colorless, tasteless, odorless and non-toxic.



5) Non-conductive and non-flammable

Dry ice is non-conductive and will not cause corrosion or rusting of surfaces. It also allows for electrical equipment to be safely cleaned. CO₂ is also a non-flammable gas and there is no risk of combustion.





What are the benefits of dry ice blasting?

Dry ice cleaning enables:

1. **Reduced costs**
2. **Improved productivity**
3. **Prolonged equipment life**
4. **Improved worker safety**
5. **Enhanced sustainability efforts**

Alternative cleaning methods are time consuming, labor intensive and costly. Manual scraping or scrubbing with wire brushes and water or chemicals can consume many hours and result in extended downtime. It can also cause damage to equipment and shorten asset life or make it less productive.

The unique characteristics of dry ice make it the perfect cleaning media.

Dry ice is *non-abrasive* and *non-conductive* and *will not damage surfaces* or equipment. It sublimates on impact, leaving behind *no secondary waste*. It is also *non-toxic* and *safe for employees*.

These attributes make dry ice cleaning an efficient, cost effective and *environmentally responsible* cleaning solution.



What are the benefits of dry ice blasting?

1) Reduced costs

Dry ice cleaning reduces labor costs because it can be done quickly by one person and in significantly less time than conventional manual labor. This enables a cleaner clean, even in situations that are difficult or unpopular to clean by hand or with other conventional methods. In some instances, cleaning time will be measured in **minutes instead of hours**.

2) Improved productivity

Dry ice blasting **does not require water or create secondary waste**, which allows equipment to be cleaned while **hot and online**. This eliminates the need to perform timely equipment disassembly and helps to reduce shut down times.

By cleaning equipment in less time, facilities are able to get **more production cycles** from existing equipment. Preventive maintenance or spot cleaning can also be done more frequently without impacting production. This increases tool uptime, which extends production runs and **reduces downtime** associated with cleaning.

3) Prolonged equipment life

Dry ice cleaning is a dry process that is non-abrasive and non-conductive; meaning it won't damage equipment and is safe for most surfaces, including electrical components. Other cleaning methods, such as manual scraping or scrubbing with chemical solvents, are abrasive and corrosive and can damage the equipment or wear it down. By **extending the life of key assets**, dry ice blasting can save significant amounts of money.

4) Improved worker safety

Dry ice cleaning **eliminates exposure to toxic cleaning materials**. The process also eliminates repetitive motions of hand cleaning, scrubbing, chiseling or activities that require pounding, sanding or scraping.

5) Enhanced sustainability efforts

When using solid grit media or water for cleaning hazardous materials, the cleaning media also becomes hazardous, requiring special handling, disposal and regulatory reporting. The resulting waste can also create downstream contamination that affects surrounding installations. **Dry ice does not create waste stream additions.**



How does it compare to other cleaning methods?

When comparing dry ice blasting to other cleaning methods, such as abrasive blasting (sand, bead, etc), soda blasting, pressure washing, chemical solvent washing and manual hand tools, it is important to ask the following questions of each:

The attributes of each cleaning method not only affect the cleaning result, but also dramatically affect the surface area being cleaned, the surrounding area and the safety of the person performing the cleaning.

Below is an overview of dry ice blasting vs. alternative cleaning methods.

Cleaning Method	Abrasive	Secondary Waste	Environmentally Responsible	Toxic	Electrically Conductive
Dry Ice Blasting	No	No	Yes	No	No
Abrasive Blasting	Yes	Yes	No	*	No
Soda Blasting	Yes	Yes	No	*	No
Pressure Washing	No	Yes	No	*	Yes
Solvents/Chemicals	No	Yes	No	Yes	N/A
Hand Tools	Yes	No	N/A	N/A	N/A

** Upon contact, the media becomes contaminated when used to clean hazardous substances and objects. These blasting materials are also then classified as toxic waste and require appropriate safe disposal.*



How does dry ice blasting work?



Impact of pellets creates a Kinetic Energy Effect. The soft dry ice is accelerated by compressed air through specially designed nozzles at supersonic speeds.



Cold temperature of dry ice pellets creates a Thermal Effect. The temperature of dry ice (-109°F/-78.5°C) causes the contaminant to embrittle. This helps break the bond between the substrate and the contaminant.



Expansion of the dry ice pellets. Dry ice pellets sublime upon impact, volumetrically expanding in size, removing the contaminant.



Because dry ice is non-abrasive and turns back into gas, you are left with a clean surface, no secondary waste and no damage to your equipment.



How does dry ice blasting work?

Dry ice blasting combines three primary factors to remove contaminants:

- Pellet Kinetic Energy
- Thermal Shock Effect
- Thermal Kinetic Effect

Pellet Kinetic Energy

Dry ice is accelerated by compressed air through a nozzle at supersonic speeds. When the dry ice collides with the substrate being cleaned it creates a kinetic effect. This effect has the largest contribution to the cleaning process when substrates are at ambient temperatures or below.

Even at high impact velocities and direct head-on impact angles, the kinetic effect of solid CO₂ pellets is minimal when compared to other media (grit, sand, This is due to the relative softness of a solid CO₂ particle (1.5 – 2 on the Mohs Scale of Hardness), which is not as dense and hard as other blasting media.

Also, the pellet changes phase from a solid to a gas, almost instantaneously, upon impact. Very little impact energy is transferred into the coating or substrate, so the dry ice cleaning process is considered to be non-abrasive.



How does dry ice blasting work?

Thermal Shock Effect

The temperature (-109° F / -78.9° C) of the dry ice causes thermodynamic shock, which causes the contaminant to embrittle and shrink. The resulting micro-cracking helps break the bond between the surface and the contaminant.

The instantaneous sublimation (phase change from solid to gas) of dry ice upon impact absorbs maximum heat from the very thin top layer of the surface contaminant. Maximum heat is absorbed due to latent heat of sublimation.

The very rapid transfer of heat into the dry ice from the coating top layer creates an extremely large temperature differential between successive micro-layers within the contaminant. This sharp thermal gradient produces localized high shear stresses between the micro-layers. The shear stresses produced are also dependent upon the contaminant's thermal conductivity and thermal coefficient of expansion / contraction, as well as the thermal mass of the underlying substrate. The high shear produced over a very brief period of time causes rapid micro-cracking between the layers leading to the failure of the bond between the contaminant and surface of the substrate.





How does dry ice blasting work?

Thermal kinetic Effect

Upon impact, the combined impact energy dissipation and extremely rapid heat transfer between the pellet and the surface causes the dry ice particles to sublime, or expand instantly, and return to the natural gas state. During this phase transition from solid to gas, the volume of dry ice expands up to 800 times in a few milliseconds and lifts the contaminant off of the substrate. This is effectively a "micro-explosion" at the point of contact.

The "micro-explosion" aids in the lifting of thermally-fractured coating particles from the substrate. This is because of the dry ice particle's lack of rebound energy, which tends to distribute its mass along the surface during the impact. The CO₂ gas expands outward along the surface and its resulting "explosion shock front" effectively provides an area of high pressure focused between the surface and the thermally fractured contaminant particles. This results in a very efficient lifting force to carry the particles away from the surface.



WHAT CAN BE CLEANED IN CONSTRUCTION

- TANK CLEANING.
- CONCRETE MIXER
- DRUM MIXER
- TOUGH RIDER
- TOWER HOIST
- RAIL TROLLEY SYSTEM
- WHEEL BARROW
- HAND CART
- MEASURING BOX
- POWER TROWEL CUM FLOATER
- CONCRETE GROOVE CUTTER
- VACUUM PUMP
- ROTARY SAND SIEVING MACHINE
- SAND SCREENING MACHINE – VIBRATORY
- COLUMN FEEDER

BEFORE



AFTER





WHAT DRY ICE CLEANING CAN DO

- 1) Improving Quality
- 2) Increasing Productivity
- 3) Prolonging Equipment Life
- 4) Improving Worker Safety
- 5) Reducing Costs
- 6) Supporting Environmental Initiatives



ADVANTAGE

- NO SECONDARY WASTE.
- NON ABRASIVE
- NON CONDUCTIVE
- ECO FRIENDLY
- NON TOXIC
- FASTEST METHOD

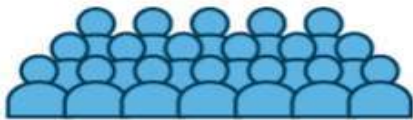




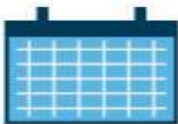
NEW PROCESS OF CLEANING

TRADITIONAL

**OLD
METHOD**



18 PEOPLE



3 DAYS



SHUT DOWN

MODERN

**ROBOTIC
DRY ICE
BLASTING**



2 PEOPLE



3 HOURS



OPERATIONAL



CONCLUSION

- ❑ Dramatically reduce equipment downtime, sanitation labor, cleaning prep time, and costs associated with replacing damaged equipment
- ❑ Helps to increase worker productivity and safety, both by allocating labor more efficiently
- ❑ Product life is also greatly improved
- ❑ Support sustainability and green initiatives by eliminating dependency on harmful chemicals and water
- ❑ Create a cleaner and safer production environment while reducing costs and ensuring the safety and quality of food products

CONTACT US



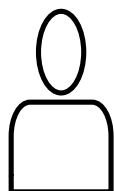
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