

GUIDE



WHY USE DRY ICE BLASTING?

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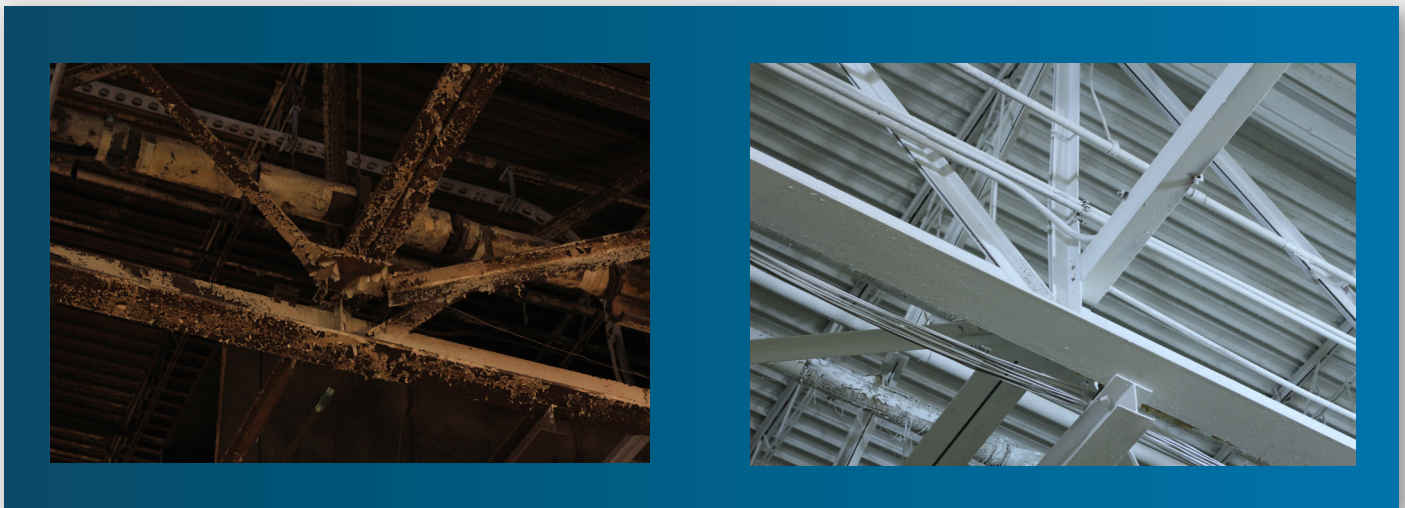
Learn why so many industries turn to this efficient and environmentally friendly solution for the most challenging cleaning projects.

Commercial and industrial cleaning projects can pose challenges ordinary cleaning companies cannot imagine.

Imagine, for example:

- Removing layers of glue coating a laminate machine for a manufacturer of **recreational vehicle cabinetry**
- Eliminating sulfurous fouling from thousands of **heat exchanger finned tubes** in a confined space, while using supplied air
- Rappelling 65 feet down into the dark to clean the surface of a **coffee bean silo**
- Removing **salt mine build-up** hundreds of feet into the earth
- Ridding a fragile **historic restoration project** of decades worth of dirt and grime
- Removing carbon buildup on **gas turbines** where even microscopic abrasion can damage the blades and lead to unforeseen costs of repair and downtime
- Removing **combustible dust** from ceiling rafters to reduce fire risk
- Eliminating **fire damage, rust and mold**
- Cleaning filthy and delicate **electronics and electrical equipment** without damage

Such cleaning efforts may sound exotic, but they're the kind of challenges that dry ice blasting—also known as CO2 cleaning—was developed to tackle. While more conventional, water-based and **abrasive cleaning methods** can be effective for many clean-up jobs, they often introduce quite a bit of additional mess in the process, along with water-borne risks like mold, mildew, bacterial contamination, and rust.



HIGHLIGHTS OF THIS GUIDE

This guide will introduce you to the many applications for using dry-ice blasting, along with a review of its key benefits. Here's an overview of the topics covered:

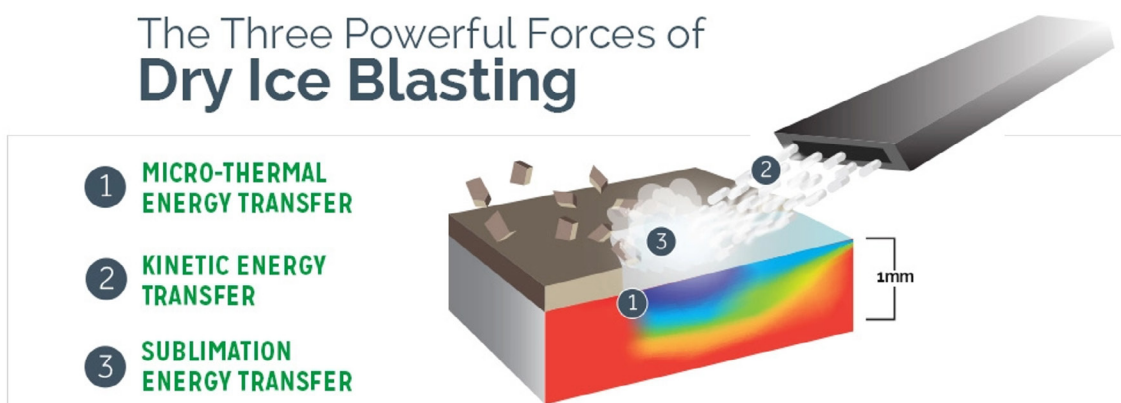
- What is dry ice blasting?
- Who uses dry ice blasting?
- What surfaces can dry ice blasting clean?
- What substances can be removed by dry ice blasting?
- What projects are not a good fit for dry ice blasting?
- How to determine if dry ice blasting is the best solution for your needs
- How to determine if you should buy your own dry ice blasting equipment or use a third-party provider

WHAT IS DRY ICE BLASTING?

Dry ice blasting is a unique, effective and non-abrasive cleaning process that uses different sizes and shapes of carbon dioxide ice pellets blasted through various nozzles to break up and remove a wide variety of buildup. It is effective at removing dust, grime, soot, rust, coatings, and deposits from the surface of equipment, architectural structures, historic restoration projects, fire-damaged buildings, manufacturing plants, food processing facilities, and more. Dry ice blasting is very customizable and can be delicate enough for circuit boards and aggressive enough to remove welding slag.

Because the ice sublimates upon contact (transforms from a solid into a gas), the only material that needs to be contained and cleaned up is what comes off the surface. The dry ice blasting process produces no collateral waste and can be used in locations where water, chemical-based cleaning, or media used in abrasive blasting poses unacceptable risks, like food and beverage production facilities, or manufacturing equipment with delicate mechanisms or exposed electrical components.

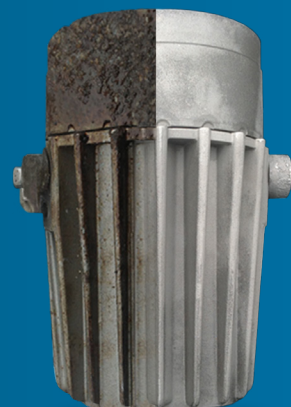
Dry ice blasting works by transferring energy to a surface in three powerful ways:



The advantages include the ability to tailor dry ice cleaning's powerful blasting to a delicate dusting when a lighter touch is needed. The absence of residual debris means equipment can typically be cleaned in place with dry ice blasting with very little downtime.

Other benefits include:

- Faster than most other cleaning methods
- No water
- No media mess
- No chemicals
- Non-toxic
- No damage (non-abrasive)
- Non-flammable
- Environmentally safe



WHO USES DRY ICE BLASTING?

Dry ice blasting has a long list of applications and settings, including cleaning structures and equipment vulnerable to water damage, difficult to access, too delicate for abrasive blasting methods, and where the introduction of chemicals or foreign media is not appropriate.

- **Refineries & Petrochemical Plants:** increased efficiency in boilers, furnaces and heat exchangers through removal of process fouling, soot, and scale from tube banks; in refineries, removal of catalyst from reformer or CCR screens that eliminates manual wire brush hand cleaning; grease and residue removal from rotating components like pumps, compressors, gear boxes, and motors
- **Power Plants:** cleaning turbines, generators, SCRs, HRSGs and more in situ and offline when the introduction of water or other media could create a hazard or would require an unacceptably long period of downtime for cleanup
- **Food Processors:** removal of combustible dust, grease, wax, glue, and food debris from food processing equipment as well as walls, ceilings and elsewhere in the building - all without the introduction of moisture or other matter that could contaminate food products or lead to mold or pathogen growth and to safely clean the interior of food storage structures and silos
- **Manufacturers:** safe cleaning-in-place of production facilities and equipment with minimal downtime
- **Historic Restoration Contractors:** gentle removal of decades of buildup without the risk of damage to a wide variety of building and structure surfaces
- **Disaster Restoration Specialists:** use dry ice blasting to remove soot, char, mold and mildew from fire or water-damaged structures

WHAT SURFACES CAN BE DRY ICE BLASTED?

A variety of surface materials can be successfully cleaned using dry ice blasting on ceilings, walls, floors, mechanicals, and machinery, including:

- Concrete
- Delicate items (Statues, Sculptures, etc.)
- Electrical components
- Masonry, including brick and stone
- Metal (aluminum, steel, etc.)
- Terrazzo
- Wood



WHAT CAN DRY ICE BLASTING REMOVE?

Dry ice blasting is effective at removing a wide array of dirt, grime and buildup as part of a renovation or restoration project or in preparation for repainting or maintenance. Among the many coatings, stains and adherents that can be removed are:

- Combustible dust
- Dirt and grime
- Fire retardant and insulation
- Flash rust and corrosion
- Fouling or scale
- Glue
- Graffiti
- Grease and oil
- Ink
- Mineral buildup
- Mold, mildew and fungus
- Paint (flaking, including lead-based)
- Plastic (injection molding leaks)
- Soot, char and carbon buildup

WHAT CLEANING JOBS ARE NOT A GOOD FIT FOR DRY ICE BLASTING?

Dry ice cleaning is not the right fit for every project. While the ability to use specialized nozzles and varying shapes and sizes of pellets means dry ice blasting can reach a lot of places other cleaning methods can't, it's not effective on every surface or for every type of buildup - including:

- Full paint removal jobs usually require more abrasive methods
- Some mineral deposits may also require abrasive blasting
- Dry ice blasting can remove most grease and oil, but hand cleaning is required if a "white glove clean" is required
- Soft items like drywall (gypsum) are not a good fit for dry ice blasting

Additionally, the extreme cold of dry ice blasting is not recommended for some surfaces, including ceramic, glass and a few types of small electronic sensors that can crack or become embrittled as a result.

Cleaning in a setting that can safely withstand the force of pressure washing and manage the by-products of water runoff should generally be cleaned this way as it can be more cost-effective.

HOW TO DETERMINE IF DRY ICE CLEANING IS RIGHT FOR YOU

If you have a challenging cleaning process for which the alternatives are potentially damaging, tedious, time-consuming, or come with too many risks and drawbacks, dry ice cleaning is an option you will want to explore. The force, water, cleanup, and containment requirements of pressure washing and hydroblasting can introduce risks and added labor that render such methods inadvisable in many settings.

While dry ice blasting is extremely effective in many settings for removing a long list of dirty and stubborn adherents, there are conditions for which dry ice blasting is more than just a good option; it's a game changer.

Here are a few scenarios where dry ice cleaning is ideal:

- As an alternative to tedious hand-cleaning of equipment or surfaces that can't be subjected to pressure washing or abrasive blasting
- To reduce lengthy periods of downtime and clean-up required with water or chemical-based abrasive cleaning
- To avoid the risks of water runoff in an area that contains electrical equipment
- To clean dust or debris in hard-to-reach or confined areas, like ceilings and overhead beams, or food storage silos
- To avoid the risks of water and moisture in a regulated environment like food or pharmaceutical production
- To avoid a bigger mess than the one you need to clean, as in places where manufacturing process dust and debris will harden if exposed to water

DRY ICE BLASTING OPTIONS: IN-HOUSE OR OUTSOURCED?

In some workplaces where dry ice cleaning must be done frequently or daily, like routine cleaning of injection molds, organizations may consider purchasing equipment to conduct dry ice blasting in-house.

Here are some considerations that may influence your decision to invest in the labor, equipment and training necessary to do your own dry ice cleaning.

Expense

Dry ice blasting equipment is a big investment – typically \$100,000 or more, not including the labor and training required to safely operate the equipment. But if you need dry ice cleaning on a weekly basis or more, have the staff available and need a consistent type of cleaning, it's an investment that could work in your favor.

Here's a rough breakdown of what you can expect to pay:

IN-HOUSE DRY ICE BLASTING	COST
Dry ice unit with basic nozzle	\$38,000 to \$100,000
Additional nozzles	\$2,000 each
Additional hose sections for extension and replacement	\$3,000 each
Diesel-powered after-cooled compressor "Shop Air" often isn't enough	\$80,000+
Dry ice pellets*	\$0.50 cents - \$1.00 per pound Plus \$500-\$1,000 in delivery costs
Diesel fuel	Market rate per 50 gallons (8 hours)

* About 1,500 pounds per 8 hours of cleaning time and has to be used within 5 days

Rental

Some companies will consider renting dry ice blasting equipment for their project. Though this is an option, the rental cost of everything needed for a single shift typically costs more than hiring seasoned professionals.

Logistics

Dry ice cleaning comes with some hefty logistical considerations. The pellets have to be used within five days before the quality begins to decline, so if you're not located close to a reliable supplier, you've got to be sure that you have what you need on hand when you need it - no more or less.

Labor & Training

There are solid advantages to using a high-quality dry ice cleaning provider, beyond the \$100,000+ investment you won't have to make. An experienced dry ice cleaning contractor, most importantly, can operate equipment safely at high pressures and safely handle and store dry ice. They are experts in dialing in optimal equipment settings for each application and can troubleshoot when required. Contractors are also well trained and spend time in a wide variety of industries and settings with the unique know-how earned through thousands of hours of hands-on experience. They are certified and screened for the physical capacity to carry out work that may require the use of respirators, confined spaces, and working at heights. This kind of work can pose significant risks to inexperienced operators. A qualified provider will also participate in and be rated by safety agencies like DISA, ISNetworld and Avetta.

Type of Cleaning

If your facility needs cleaning various equipment and parts of the facility, in different settings, you are probably better off relying on professional help, with the breadth of experience, specialized tools, and well-honed approaches professionals can provide.

THE POLAR CLEAN DIFFERENCE

Since 2011, facility managers, turnaround managers, project managers and restoration professionals have relied on Polar Clean for safe, effective, efficient, mess- and water-free cleaning needed for maintenance, shutdowns, emergencies, and restoration projects. Our processes have been honed over a decade of innovation that includes patented processes, government-funded R&D, and equipment designed to ensure the highest quality results, customized to the needs of our clients.

Polar Clean maintains scrupulous safety practices and participates in tailored safety programs through a variety of elite safety networks:

- ISNetworld® Prequalification and Monitoring
- Avetta® Compliance Certified
- First, Verify® Vendor Prequalification
- ComplyWorks Risk Management
- DISA Drug, Alcohol and Safety Compliance Solutions

Additional credentials:

- Qualified for nationwide emergency response
- Hundreds of successful refinery and petrochemical projects
- Tenured and highly skilled technicians
- Mastery of process includes numerous proprietary solutions
- Fully equipped service vehicles utilized onsite
- Experience and certifications for work at heights, in confined spaces, and with the use of respiratory equipment
- Full containment and control of air flow to limit or stop the release of pollutants into the air and surrounding environment
- Ability to provide hydroblasting and abrasive blasting methods when they are a better fit



About Polar Clean

Since 2011, facility managers, turnaround managers and restoration professionals have relied on Polar Clean for safe, efficient and mess-free cleaning needed for challenging commercial and industrial environments. Without the collateral damage and containment challenges of hydroblasting and other abrasive cleaning methods, dry ice blasting is ideal for preventive maintenance, shutdowns, emergencies, and restoration – for oil refineries, petrochemical plants, power plants, food processing facilities, manufacturing plants, and more. Polar Clean offers hydroblasting and other abrasive blasting services when they are a better fit. To determine the right cleaning method for your facility, contact Polar Clean for a dry ice blasting assessment: <https://polarclean.com>

