

PROJECTILE



TUBE CLEANING INC.



**PATENTED TUBE CLEANING
PRODUCTS AND EQUIPMENT**

www.projectiletube.com

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ABOUT US

Projectile Tube Cleaning came into inception in 1991 with the goal of manufacturing a superior mechanical tube cleaner and accompanying this product with quality maintenance services. Since then our company has expanded both its product and service lines, but still has the same goals. These goals revolve around satisfying our customers and can be broken down into three interwoven categories: Quality, Safety, and Progress.

QUALITY

Projectile Tube Cleaning's primary focus, and our purpose as a company, is to meet our customers' needs. A fundamental part of this includes providing products and services that are of the upmost quality. We are constantly assessing the quality of our products and services and from these assessments we are able to make adjustments that ensure high levels of quality. Any deviation from this level of quality will be swiftly addressed as we strive to continuously improve our products and services and thus satisfy our customers.



SAFETY

For Projectile Tube Cleaning safety is an extremely important part of delivering effective services. Our personnel are rigorously trained to identify potential hazards and to adapt in order to create a safer work environment. Our employees are instructed to put safety first and any deviation from this principle has serious consequences. Ultimately this strong focus on safe work practices results in a better environment for our employees and a better quality service for our customers.

PROGRESS

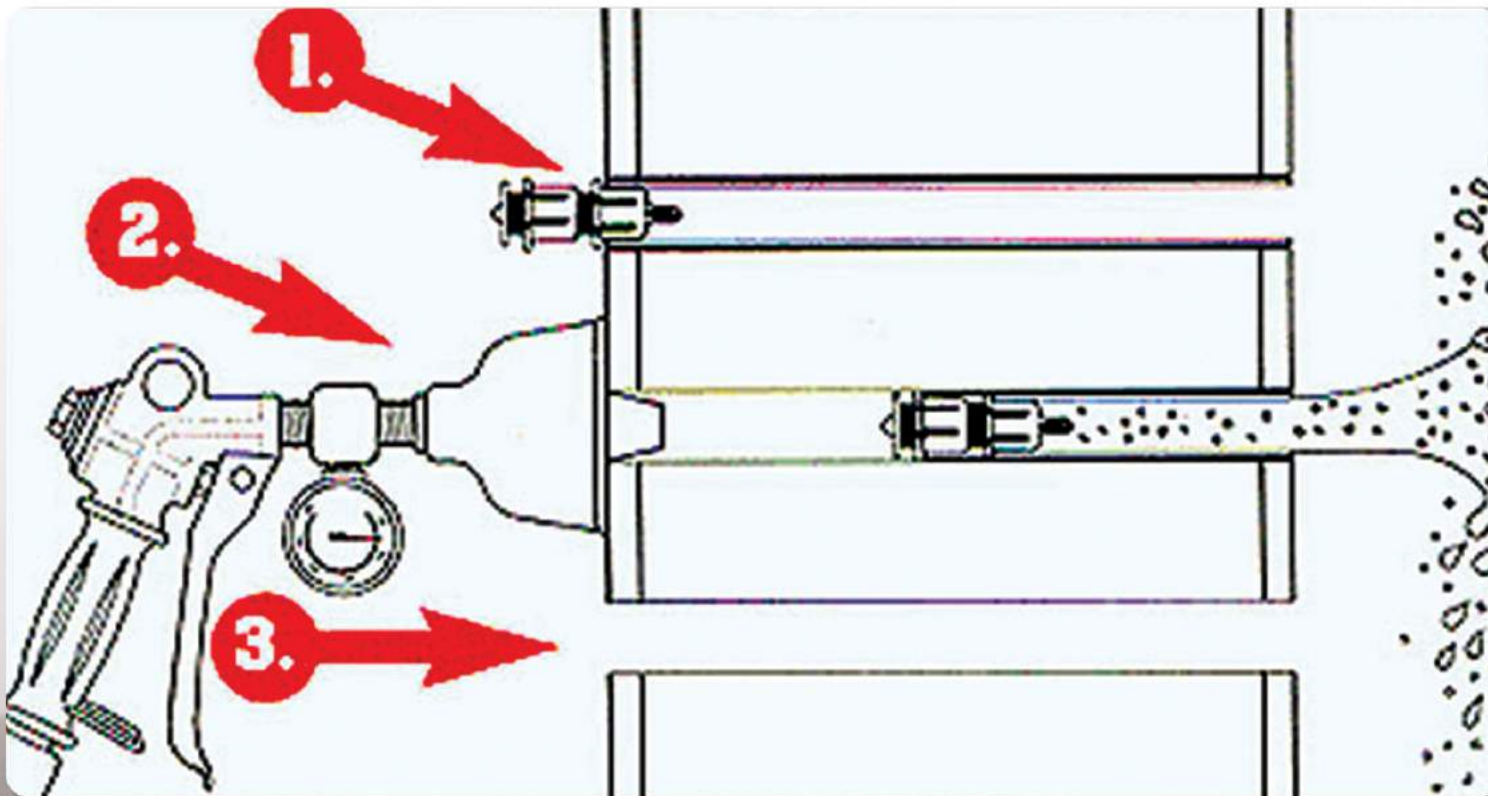
Projectile Tube Cleaning began with an innovative idea for how to make an existing product better. This innovative spirit is a fundamental part of our company's culture. One of our primary goals is to use this innovation in order to progress each individual customer and ultimately the entire industry to a higher level of quality and safety. Projectile Tube Cleaning is always thinking of new processes and methods that will help our customers progress to their goals in a more efficient and effective manner. We strive to instill a sense of innovation and progress in all of our employees. We are constantly focusing on not just what works, but what would work better; not just what is acceptable now, but what will be acceptable in the future.



TUBE CLEANING SYSTEM

Projectile's tube cleaning system, known as mechanical tube cleaning, involves using specially designed mechanical devices (tube projectiles) to remove deposits from the interior of various condenser and heat exchanger tubes. There are other methods for removing deposits from condenser and heat exchanger tubes including high pressure/ultra-high pressure water jetting (hydro-blasting) and chemical cleaning. Relative to these two methods, mechanical tube cleaning is superior due to that fact that mechanical tube cleaning is significantly faster. On average our crews can clean approximately 6,000 tubes per 12 hour shift. The speed associated with our process ultimately leads to cost savings for our customers.

How it Works



1 Insert projectile into the tube

2 Using Projectile's specialized water gun pull the trigger allowing water to flow. The specialized pumping system increases available water pressure to approximately 350-450psi. The water creates force behind the projectile and allows it to clean the tube traveling at approximately 15 feet per second.

3 The operator should hold the trigger until the gun's pressure gauge has dropped. This drop signifies that the projectile has exited and the tube has been cleaned.

TUBE CLEANING SYSTEM



Projectile Tube Cleaning vs. High Pressure Water Jetting

Projectile Tube Cleaning

- **Fast and Cost Effective:**
 - A crew of four laborers can clean approximately 6,000 tubes in 12 hours
- **Safe:**
 - Mechanical Tube Cleaning uses low water pressures to propel the projectiles
 - No inherent safety risks

High Pressure Water Jetting

- **Time Consuming:**
 - Our high pressure water customers say they can clean approximately 700 tubes in the same time frame
- **Dangerous:**
 - High Pressure Water cleaning uses extremely high pressures. High enough to induce serious bodily harm

TUBE CLEANING EQUIPMENT



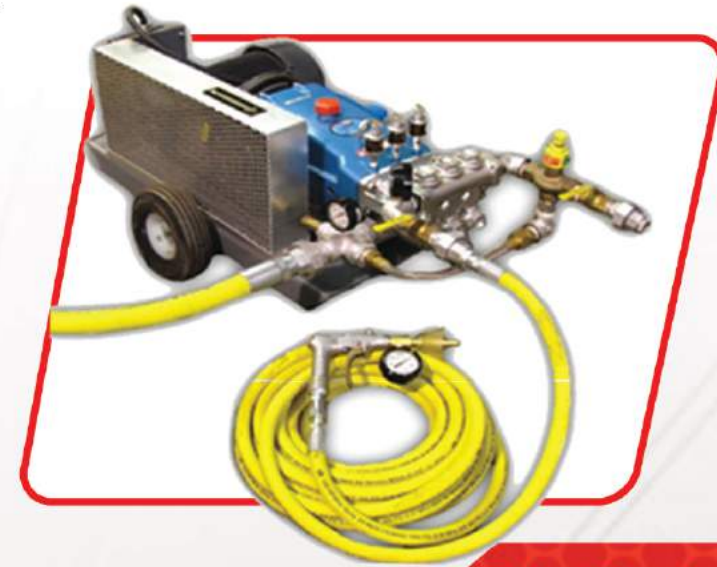
TUBE CLEANING EQUIPMENT

Mechanical Tube Cleaning Pump

Projectile's pumping system is used in conjunction with our tube projectiles (pages 7-8) in order to remove deposit from condenser and heat exchanger tubes. The system works by increasing the available water pressure up to as much as 800 psi in order to propel mechanical projectiles and flush out tube deposits. Although the pumping system has a maximum pressure of 800 psi, the majority of tube cleaning situations only require 300 to 450 psi. Projectile's pumping system is extremely user friendly and is perfect for a wide range of tube cleaning projects.

System Features:

- Positive displacement plunger pumps to pressurize water
- 10 horse power three phase motor
- Adjustable pressure regulators that allow you to increase and decrease the available pressure
- Increases flow rate to 35 gallons per minute



Tube Cleaning Water Gun

Projectile Tube Cleaning's Water Gun is designed with durability, function, and user friendliness in mind. Compared to other guns on the market, these guns have a smoother trigger action, which reduces user fatigue, and a more durable design and structure that translates to a longer lasting gun. Projectile Tube Cleaning offers their Tube Cleaning Water Gun as just the frame or a complete assembly which includes gun frame, heavy duty swivel, gauge adapter, gauge, splash guard, and a nozzle.

PATENTED PROJECTILES

Metal Projectile Tube Cleaner

Our patented Metal Projectile Tube Cleaner represents the pinnacle in mechanical tube cleaning devices. This tube cleaner is specifically designed for extremely difficult deposits and is able to outlast the competition's designs. The metal tube cleaner is able to remove all types of condenser tube deposits including mud, silt, slime, mineral deposits such as manganese and calcium based compounds, chemical and petroleum based deposits, oxidized compounds, and various micro and macro biologic fouling. Our patented design employs durable rubber bushings, which allow for a longer tube cleaner life expectancy of approximately 15 passes. The Metal Projectile can be used to clean heat exchanger and condenser tube sizes ranging from 5/8" to 1 1/4" (15.875mm to 31.750 mm) outer diameter (O.D.).



Our patented Plastic Projectile Tube Cleaner utilizes the same design as our Metal Projectile Tube Cleaner, but comes equipped with thick polymer blades. The polymer blades are perfect for softer condenser and heat exchanger deposits such as mud, silt, and slime. Compared with other plastic tube cleaners the Projectile design represents superior quality and competitive pricing. Plastic Projectiles are available for condenser and heat exchanger tube sizes ranging from 7/8" to 1" (22.225mm to 25.400mm) outer diameter (O.D.).

Plastic Projectile Tube Cleaner

U-Tube Projectile Tube Cleaner

Our patented U-Tube Projectile Tube Cleaner represents a smaller version of our Metal Projectile. The miniature design is specifically used to navigate tight radiuses found in u-tube heat exchangers. The design also utilizes a central, plastic pin which allows for greater flexibility when bending around radiuses. This design allows the entire tube to be cleaned not just the straight sections of the tubes. U-Tube Projectiles are available for heat exchanger tube sizes ranging from 5/8" to 1" (15.875mm to 25.400mm) outer diameter (O.D.) and may be available for larger diameter tubes based on special requests.



PROJECTILES

Nylon Brush

Projectile's nylon brush tube cleaners represent an industry standard design at industry competitive prices. The nylon brush is perfect for softer condenser and heat exchanger tube deposits such as mud, silt, and slime. The countless number of nylon filaments ensures that softer deposits are effectively agitated and removed from each tube. These brushes are also perfect for internally enhanced tubing in which metal projectiles may not be able to be used. Projectile's nylon brushes come in both finned end and bi-directional style designs. Nylon brushes are available for condenser and heat exchanger tube sizes ranging from 5/8" to 1 1/4" (15.875mm to 31.750 mm) outer diameter (O.D.).



Projectile's twisted wire stainless steel brushes are the most durable brush tube cleaners on the market. Compared with competitors' models, Projectile's stainless steel brush comprises much more wire filament, which ultimately provides superior cleaning. These brushes are a perfect for soft to medium condenser and heat exchanger tube deposits such as some mineral deposits and thick mud and clay deposits. The stainless steel brush also works well with removing harder deposits from internally enhanced tubes where Metal Projectiles may not be able to be used. The rubber end piece makes the brush more comfortable and user friendly as well as assists in propelling the brush down the tubes. Stainless steel brushes are available for condenser and heat exchanger tube sizes ranging from 3/4" to 1 1/4" (19.050mm to 31.750 mm) outer diameter (O.D.).

Stainless Steel Brush

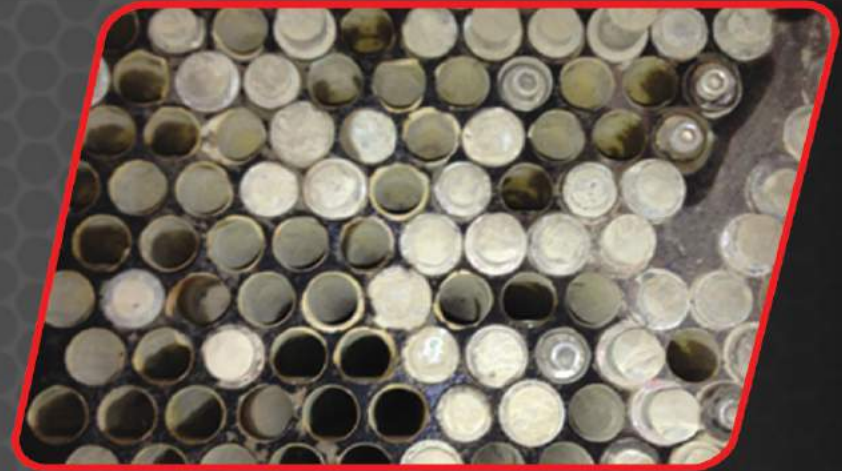
Plastic Tube Scrubbers

Our Plastic Tube Scrubbers are perfect for condenser and heat exchanger tubes with very minor debris such as mud, silt, and microbiological fouling. The Plastic Tube Scrubber is the lowest cost tube cleaner type and thus is perfect for heat exchanger cleanings on a tight budget. The Plastic Scrubber has seven hard plastic fins for scraping debris from the tube surface. It has a hollow core so that water can pass through the center and pre-flush debris ahead of the tube cleaner. The outer diameter of the Tube Scrubber is designed to perfectly match the specified tube inner diameter. The Plastic Tube Scrubber can be shot both with water only or air and water mixture.



TUBE PLUGS

Condenser and heat exchanger tube leaks can lead to costly problems such as excess back pressure, dissolved oxygen, and corrosion. Ultimately the problems associated with tube leaks impact system efficiency and the power plant's bottom line. Projectile Tube Cleaning's various tube plugs can be used in order to repair these costly tube leaks.

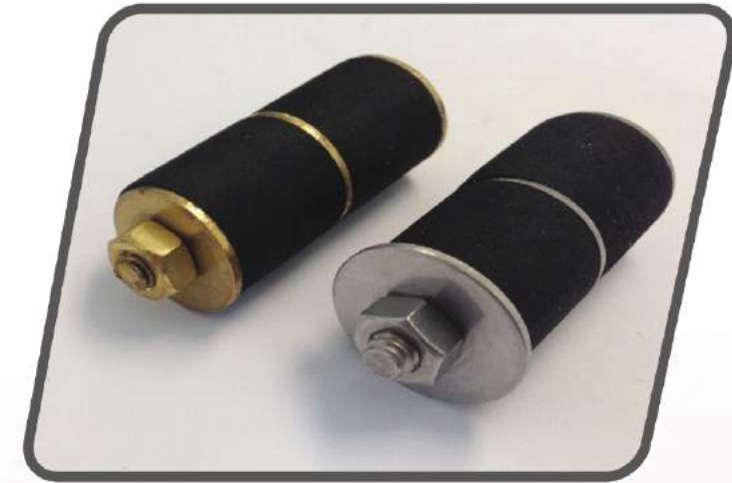


TUBE PLUGS

Expandable Tube Plugs

Our Expandable Tube Plugs utilize durable rubber bushings in order to seal up leaky tubes. The adjustable design allows these plugs to be used for permanent or temporary situations. These plugs come in two styles OD (Outer Diameter) Style and ID (Inner Diameter) Style. OD Style Tube Plugs have a larger washer that prevents them from moving down the tube and are installed flush with the tube sheet. ID Style Tube Plugs are designed with washers that are smaller than the tube ID, which allows them to be slipped down into the tube. This design is ideal for applications that have coatings on the tube sheet that extend into the tubes or when tubes are epoxy coated.

These durable tube plugs are rated to handle up to 400 psi and 220° F. The I.D. style tube plugs are available for condenser and heat exchanger tube sizes ranging from 3/4" to 1" (19.050mm to 25.400 mm) outer diameter (O.D.) and come in either brass, bronze, or stainless steel.



Projectile Tube Cleaning's Permanent Metal Tube Plugs are custom machined to fit specific tube sizes and applications. These plugs are simple to use and provide an effective and durable seal. Both the Tapered Tube Plugs and the Pin and Collar Plugs can be machined for custom sized tubes and are available in stainless steel, brass, and bronze. Projectile Tube Cleaning can also manufacture these plugs out of special materials upon request.

Permanent Metal Tube Plugs

ADDITIONAL EQUIPMENT

Inlet and Outlet Hoses

Projectile's inlet and outlet hoses are durable mine spray hoses that are rated up to 1,000 psi. The inlet hose is a 1½" diameter hose that connects the water supply to our pumping system. The ¾" outlet hose runs from the pump to the gun and is durable, but also light and user friendly. Both hoses come equipped with national pipe thread pressed fittings.



Nozzles

Projectile Tube Cleaning nozzles are perfectly designed for the mechanical tube cleaning process. The nozzles are made to fit snugly in each tube in order to make a complete seal and effectively propel projectiles. Nozzle sizes range from 1/2" to 1¼" (12.700mm to 31.750mm) and are available in brass, delrin, or stainless steel.

ADDITIONAL EQUIPMENT

Fiberglass Push Rod

Projectile Tube Cleaning's flexible fiberglass rod is used for removing blockages from obstructed tubes. The rod comes with a durable brass tip for pounding out blockages and the rod is flexible enough to be maneuvered into confined spaces, like condensers. The fiberglass rods can be cut to any length necessary.



Accumulator

Projectile Tube Cleaning's accumulator is an important piece of equipment to use in conjunction with our pumping system. While cleaning tubes, pulling and releasing the water gun trigger creates vibrations throughout a water system. These vibrations represent sharp changes in pressure levels that occur when the trigger is opened and closed. The accumulator is used in order to absorb these changes in pressure. Without this vital piece of equipment, facility water supply lines or other associated equipment such as hoses and gauges could be damaged.

Tarps

Condenser and heat exchanger tube cleaning can be messy business, but our special line of tarps help to decrease the mess and keep a job site organized. We provide both solid and mesh tarps depending on the application. The tarps come equipped with durable steel grommets in multiple locations along the edges so they can be hung effectively even when working with awkwardly configured equipment.



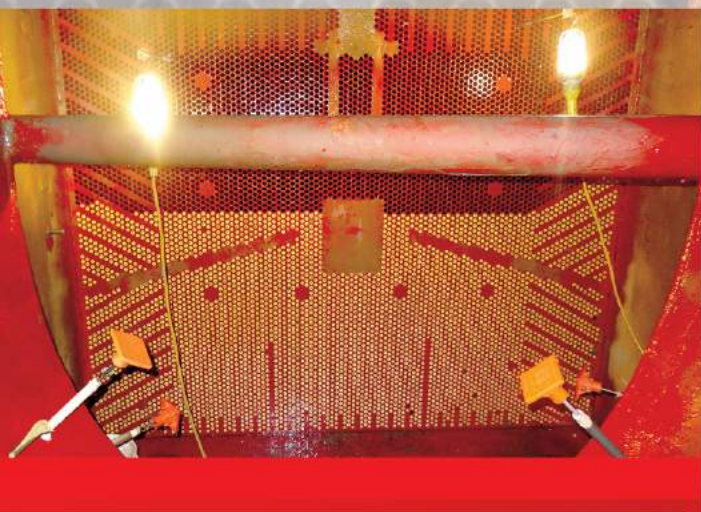
PROJECTILE SIZING CHARTS

Birmingham Wire Gauge in Inches

Tube Outer Diameter	Gauge	12	13	14	15	16	17	18	19	20	21	22	23	24	25
	Wall Thickness	0.109	0.095	0.083	0.072	0.065	0.058	0.049	0.042	0.035	0.032	0.028	0.025	0.022	0.020
1/2		0.282	0.310	0.334	0.356	0.370	0.384	0.402	0.416	0.430	0.436	0.444	0.450	0.456	0.460
5/8		0.407	0.435	0.459	0.481	0.495	0.509	0.527	0.541	0.555	0.561	0.569	0.575	0.581	0.585
3/4		0.532	0.560	0.584	0.606	0.620	0.634	0.652	0.666	0.680	0.686	0.694	0.700	0.706	0.710
7/8		0.657	0.685	0.709	0.731	0.745	0.759	0.777	0.791	0.805	0.811	0.819	0.825	0.831	0.835
1		0.782	0.810	0.834	0.856	0.870	0.884	0.902	0.916	0.930	0.936	0.944	0.950	0.956	0.960
1 1/8		0.907	0.935	0.959	0.981	0.995	1.009	1.027	1.041	1.055	1.061	1.069	1.075	1.081	1.085
1 1/4		1.032	1.060	1.084	1.106	1.120	1.134	1.152	1.166	1.180	1.186	1.194	1.200	1.206	1.210
1 3/8		1.157	1.185	1.209	1.231	1.245	1.259	1.277	1.291	1.305	1.311	1.319	1.325	1.331	1.335
1 1/2		1.282	1.310	1.334	1.356	1.370	1.384	1.402	1.416	1.430	1.436	1.444	1.450	1.456	1.460

Birmingham Wire Gauge in Millimeters

Tube Outer Diameter	Gauge	12	13	14	15	16	17	18	19	20	21	22	23	24	25
	Wall Thickness	2.769	2.413	2.108	1.829	1.651	1.473	1.245	1.067	0.889	0.813	0.711	0.635	0.559	0.508
12.700		7.163	7.874	8.484	9.042	9.398	9.754	10.211	10.566	10.922	11.074	11.278	11.430	11.582	11.684
15.875		10.338	11.049	11.659	12.217	12.573	12.929	13.386	13.741	14.097	14.249	14.453	14.605	14.757	14.859
19.050		13.513	14.224	14.834	15.392	15.748	16.104	16.561	16.916	17.272	17.424	17.628	17.780	17.932	18.034
22.225		16.688	17.399	18.009	18.567	18.923	19.279	19.736	20.091	20.447	20.599	20.803	20.955	21.107	21.209
25.400		19.863	20.574	21.184	21.742	22.098	22.454	22.911	23.266	23.622	23.774	23.978	24.130	24.282	24.384
28.575		23.038	23.749	24.359	24.917	25.273	25.629	26.086	26.441	26.797	26.949	27.153	27.305	27.454	27.559
31.750		26.213	26.924	27.534	28.092	28.448	28.804	29.261	29.616	29.972	30.124	30.328	30.480	30.632	30.734
34.925		29.388	30.099	30.709	31.267	31.623	31.979	32.436	32.791	33.147	33.299	33.503	33.655	33.807	33.909
38.100		32.563	33.274	33.884	34.442	34.798	35.154	35.611	35.966	36.322	36.474	36.678	36.830	36.982	37.084





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