



The SANDJET™ Service: In-place, Internal Pipeline Cleaning



Linde Services Inc. provides fast and economical pipeline cleaning that dries, cleans, and inerts in a single operation

Unlike any other pipe or pipeline cleaning method, the SANDJET service uses dry, inert nitrogen gas to propel cleaning particles through the line at high velocity. The high energy cleaning action of these particles quickly removes corrosion, scale and heavy tuberculation.

SANDJET Benefits **Minimizes Downtime:** takes only hours to clean miles of pipeline. Process Ingenuity: cleans, dries, and inerts your system, leaving no moisture, chemicals or deposits.

White-Metal, Blasted Finish: Can meet strict NACE #1 and SSPC SP5 requirements, industry standards for clean lines and surface preparation for coating application.

Uses a Safe, Inert Gas: eliminates the risk of chemical reactions, explosions, environmental contamination, or hazardous waste disposal.

Avoids High Pressures: Nitrogen injection pressure does not exceed 100psi and systems are thoroughly checked for obstructions prior to cleaning.

Innovative Applications The versatility of the SANDJET service allows for a large number of applications. Linde has years of experience cleaning pipelines with various products. Below is a list of lines that have been cleaned by the SANDJET service.

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|------------------|--------------------|------------------|--------------------------------------|
| → Oxygen | → Propane | → Natural Gas | → Fly Ash |
| → Nitrogen | → Propylene | → Crude Oil | → Organic Solvents |
| → Hydrogen | → Hydrogen Sulfide | → Steam | → Petroleum Distillates |
| → Ethylene | → Chlorine | → Brine | → New Pipelines Before Commissioning |
| → Ethylene Oxide | → Caustic | → Instrument Air | |

The Competitive Advantage

The SANDJET service is proven to be more efficient, and more economical overall than other internal pipeline cleaning methods such as pigging, chemical cleaning, and hydroblasting. While many of these applications take days, the SANDJET Service only takes hours so that you can keep your downtime to a minimum.

Selection Guide

SANDJET Service vs. Pipeline Cleaning Methods

	SANDJET Service	Chemical cleaning	Pigging	Hydroblasting
Cleans to white-metal, blasted finish	Yes	No	No	No
Leaves pipe moisture-free	Yes	No	No	No
Average turnaround time	Hours	Days	Days	Days
Uses hazardous chemicals	No	Yes	No	No
Creates liquid waste	No	Yes	Yes*	Yes

*If pig is liquid propelled vs. gas

How it Works

Each SANDJET service opportunity is individually planned using engineering models and company expertise to accurately predict pressure/velocity relationships throughout the system and select the appropriate cleaning material. A pressure-drop profile is generated providing Linde with key job parameters, including appropriate nitrogen flow rates and cleaning material feed rates.

Linde's mobile equipment is then brought to the site. In most cases, three types of trucks are involved at the process inlet: one carries a nitrogen pumping unit and supply of liquid nitrogen, a second carries the cleaning material hopper with a supply of cleaning material, and a third carries additional liquid nitrogen. The diagram shows the basic arrangement of equipment for the typical SANDJET service.

Prior to cleaning, the pipeline segment is flow-tested to remove residual product from the system, establish a reference pressure-drop, check for unsuspected obstructions, and dry the system.

The first cleaning run is performed by loading a calculated amount of cleaning material, usually a few hundred pounds, into the cleaning material hopper. An appropriate nitrogen flow rate is established throughout the system and cleaning material is fed into the injection head where it fluidizes with the nitrogen and enters the system. The cleaning run continues until all cleaning material and debris are out of the system. The cleaning run process is repeated every few minutes until the system back pressure and observation of the discharge indicate that cleaning is complete.

At the process outlet, customers are responsible for providing a discharge collection device, which is typically a vacuum truck or roll-away dumpster.

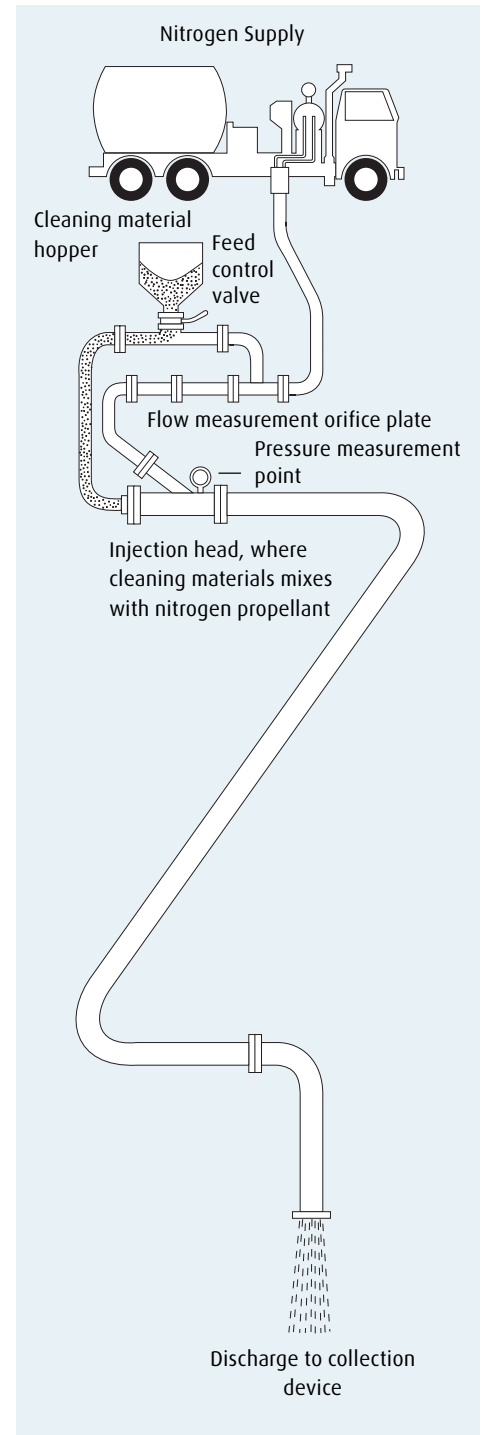
How it Works

Linde Services Inc. has the innovative applications and expertise to help you optimize your operations and reduce downtime with extensive service offerings for refineries, chemical plants, terminals and pipelines.



Our offerings include:

- Purging and Inerting
- Accelerated Cooldown
- Inert Entry Support
- Hot Nitrogen
- SANDJET™ Pipeline Cleaning SANDJET® Furnace Tube Decoking
- Pipeline Displacement
- ILLI Tool Propellant
- Drying and Purging
- Blanketing
- Pneumatic Pressure Testing
- Tracer Tight® Leak Location
- SeeperTrace® Leak Location
- HeliTec® Leak Detection
- Specialty Services
- Temporary Gas Supply
- Backup Hydrogen Supply
- Dry Ice Blasting



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