Updated with NFPA 652 facts

Combustible Dust Mythbusting:

The facts you need to stay safe

Determine what vacuum cleaner is really safe, versus just safe enough for now

Everyone is talking about combustible dust hazards and OSHA fines, but a combustible dust regulation does not exist…yet. Right now, manufacturing facilities have to match proposed OSHA regulations with existing NFPA standards to determine how to keep people, property and product safe. It's a minefield of potential misinformation and misunderstandings.

Fact vs. Fiction

- **Fiction:** There isn't an OSHA combustible dust regulation, so I don't have to worry about OSHA inspections.
- **Fact:** OSHA is fining companies every day for other housekeeping violations related to their handling of combustible dust. Understand the inspection process.

- **Fiction:** "Explosion-proof" is a buzzword that any manufacturer can use.
- **Fact:** Vacuum cleaners and other equipment must meet certain requirements to have the privilege of touting this term. Furthermore, explosion-proof certification is not available for pneumatic equipment. Make sure your equipment is certified.

- **Fiction:** Any pneumatic vacuum is safe for combustible dust.
- **Fact:** Just because it's pneumatic doesn't make it safe. NFPA recommends standards to collect combustible dust. Furthermore, you should require a higher level of protection to keep your people and property safe.

- **Fiction:** My facility is not a hazardous (classified) environment, so I don't have to have certified equipment.
- **Fact:** Your equipment doesn't have to be certified, but NFPA standards (specifically 652 and 654) do mandate specific features for your vacuum to collect combustible dust in any environment.

- **Fiction:** An NFPA-approved vacuum is just what I need.
- **Fact:** There is no such thing as an "NFPA-approved" vacuum.

Steps to Safely Collect Combustible Dust in Any Environment

Follow these steps to help select equipment that is safe to collect combustible dust in any environment.

In a World Full of Risk Choose Nilfisk Make the Safe Choice

Authored by Nilfisk, Inc., Industrial Vacuum Division, April 2016

1 Understand Your Facility and Your Responsibilities

It is ultimately your and your company's responsibility to select safe equipment. You can be held accountable by multiple authorities having jurisdiction (AHJ), including your insurance company, local officials and OSHA.

Checklist to understand your facility:

- ☐ Is your dust combustible? **NFPA 652 requires dust testing for ALL facilities** that process, handle, convey or manufacture combustible dust. The standard also requires you to keep the test on file - whether your dust is combustible or not. Have it tested through a private lab or OSHA.
- ☐ Perform a Dust Hazard Analysis (DHA), if your dust tests above a 0 Kst. NFPA 652 requires a DHA performed by **September 2018**. Learn more.
- ☐ Confirm your facility's NEC Classification, per Article 500 of NFPA 70. More Information.
- ☐ Remember, even if your environment isn't classified, you might need special vacuum equipment per NFPA 652. More information.
- ☐ Consult with your AHJ. More information.

2 Get to Know the Regulations, Standards and Recommendations

Stay up-to-date on the current state of regulations, standards and recommendations so you make informed decisions.

What is the current status of OSHA's proposal for a combustible dust standard?
OSHA's combustible dust rulemaking status currently sits at the "pre-rule" stage. Small business panel review is scheduled for 2016.

Most people believe this delay is for a good cause. It was thought that OSHA was waiting for the NFPA to finalize updates on "NFPA 652: Standard on the Fundamentals Combustible Dusts" before completing its own rule. NFPA 652 was released in September 2015.

If there is not an approved regulation, how is OSHA handing out hundreds of thousands of dollars in fines?
OSHA inspectors are trained to use the Combustible Dust NEP (CPL 03-00-008) for guidelines on citations. The NEP lists 18 different standards that can be used to cite against, ranging from ventilation to electrical to housekeeping.

Most Frequently Cited Violations During OSHA Combustible Dust NEP Inspections

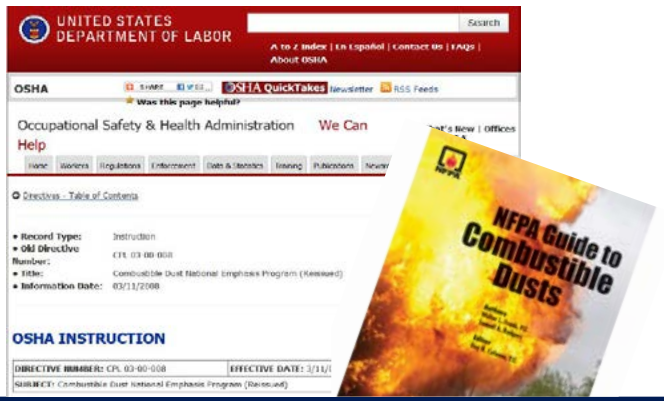
1. Hazard communication (1910.1200)
2. Respiratory protection (1910.134)
3. Housekeeping (1910.22(a))
4. Electrical safety (1910.305)
5. Lockout/Tagout (1910.147)
6. Electrical safety (1910.303)

Source: OSHALawupdate.com; 2011

In addition, when workers are exposed to hazards not currently addressed in the OSHA standards, employers are cited under the General Duty Clause (GDC) specified by Section 5(a)(1) of the Occupational Safety and Health Act of 1970 (OSH Act; see 29 U.S.C. 654). That clause specifically states, "Each employer shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees."

Therefore, if combustible dust is present, even in a non-hazardous (classified) environment, and not properly mitigated according to OSHA and NFPA recommendations, the inspector can assume risk is present and cite the employer for allowing the risk.

What is NFPA 652 and is it law?
NFPA 652 is the " Standard on the Fundamentals of Combustible Dust." It "provides the basic principles of and requirements for identifying and managing the fire and explosion hazards of combustible dusts and particulate solids."



It addresses various ways to identify and mitigate risks in the manufacturing, conveying, processing, packaging and other handling of combustible dusts.

An inspection violation may reference the NFPA standards, but that in and of itself, is not enforceable by law; it is merely a standard for an inspector to follow to assume risk is present and cite under a different OSHA standard, such as the GDC.

What does NFPA 652 say about housekeeping?
Section 8.4, "Housekeeping" addresses housekeeping procedures, frequency, methods and documentation procedures. Some general takeaways for every facility handling combustible dust:

- Vacuuming is the preferred method of cleaning. When vacuuming is impractical, sweeping or water wash-down are permitted.
- Blow-down is only permitted when other methods, mentioned above, have already been used.
- Housekeeping procedures MUST be documented.
- Vacuum cleaners must meet the requirements laid out in Section 8.4.2.2.1. See more details in the section below.
- Employee and contractor training shall include houskeeping procedures.

What does NFPA 652 say about collecting combustible dust in non-classified environments?
With the release of NFPA 652 in September, the new focus is on Dust Hazard Class more than the class of your environment. Every facility must have their dust tested to determine the dust hazard class. If your dust tests at a Kst value above zero, you must perform a Dust Hazard Analysis (DHA). The DHA will determine the type of equipment you need to keep your people and facility safe.

NFPA 652 (2015) and NFPA 654 (2013) stipulate that to collect combustible dust, even in a non-rated or non-classified environment, your electric-powered vacuum cleaner must meet certain requirements. The requirements are the same in both standards. If your vacuum does not meet the requirements, you are risking potential fines from OSHA, and worse, a potential fire or explosion.

NFPA 652 requirements for vacuums are listed in the following section, under question, "Does the NFPA approve, certify or recommend a specific vacuum?"

NFPA Resources

It's important to note, NFPA 652 is not the only standard that addresses combustible dust. Reference the following standards depending on the type of combustible material you handle.

See www.nfpa.org to view NFPA standards:

- NFPA 61, Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities
- NFPA 484, Standard for Combustible Metals
- NFPA 654, Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids
- NFPA 655, Standard for the Prevention of Sulfur Fires and Explosions
- NFPA 664, Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities

What does OSHA recommend re: housekeeping?
OSHA offers maintenance and housekeeping guidance throughout the Combustible Dust NEP, as well as in the safety and health information bulletin, "Combustible Dust in Industry: Preventing and Mitigating the Effects of Fire and Explosions." The information bulletin specifically cites NFPA 654 as the comprehensive guide to housekeeping.

OSHA-recommended housekeeping procedures include, but are not limited to:

- Clean dust residues at regular intervals;
- Use cleaning methods that do not generate dust clouds, if ignition sources are present (such as blow-down methods);
- Only use vacuum cleaners approved for dust collection;
- Regularly clean floors and horizontal surfaces, such as ducts, pipes, hoods, ledges, and beams, to minimize dust accumulations within operating areas of the facility
- Keep dust accumulation to less than 1/32 inch thick; and,
- Electrically-powered cleaning devices, such as sweepers or vacuum cleaners used in dusty areas, must be approved for the hazard classification.

For more guidance from OSHA, visit https://www.osha.gov/dsg/combustibledust/guidance.html.

Why do I have to comply with NFPA 652 and my AHJs' recommendations?
NFPA 652 is a standard, not a law, but it can be used as a safety guideline. If an AHJ feels that you are violating that safety guideline, it can prevent them from approving permits and insurance coverage. In addition, a violation of NFPA 652 can be used to enforce OSHA's GDC, which can result in a fine.

Authority Having Jurisdiction

NFPA 652 DEFINITION *noun*
An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

Examples: Insurance Company, Internal EH&S Staff, Plant Manager, Local Government Inspector, State Fire Marshal, Federal Government Agency, etc.

What is ATEX and how does it apply to me?
The ATEX directive is two European Union (EU) directives (equivalent to law in the U.S.) designed for 1) equipment manufacturers and 2) work environments to protect employees from explosion risks in hazardous environments.

In short, it does not apply to US equipment or facilities in any way. However, many equipment manufacturers are now advertising ATEX certifications to imply a certain level of safety. Even though a company's ATEX certification claim is likely legitimate, be warned that certain classes of ATEX certification can be "self-certified," and OSHA explicitly states, "In the US, under OSHA's Nationally Recognized Testing Laboratory (NRTL) requirements, the product must have the specific mark of one of the NRTLs recognized to test and certify these types of products."

Nilfisk does advertise ATEX certification on pneumatic machines because Nilfisk pneumatic EXP vacuums are third-party certified by INERIS and include a Declaration of Conformity. Our aim is to use the ATEX third-party certification to inform customers that the vacuum meets ATEX requirements and, according to a comparison of the EU and US requirements for hazardous location equipment, Nilfisk pneumatic EXP vacuums would be suitable for use in a hazardous (classified) environment. Note, Nilfisk specifically states, "suitable for use," as opposed to "certified for use."

3 Step 3: Select the Safest Industrial Vacuum for Your Application

Select equipment that will help you become safe, and stay safe–meeting all requirements set forth by your facility, AHJ, insurance company, NFPA, OSHA and, most importantly, your users.

Does the NFPA approve, certify or recommend a specific vacuum?
The NFPA does not approve or certify vacuums, but it does provide specifications for which your vacuum should comply when collecting combustible dust. NFPA 652 also specifically says vacuuming is the preferred method of cleaning.

In Section 8.4.2.2, the NFPA says vacuum cleaners used to collect combustible dust, even in non-rated or non-classified environments, must meet the following specifications in the checklist below.

NFPA 652 Vacuum Cleaner Design Requirements:

- ☐ Equipment shall be conductive, unless certain provisions outlined in 8.5.7.1.2 are applicable.
- ☐ Conductive or static-dissipative hoses, including both suction and air delivery hoses
- ☐ All conductive accessories, including wands and attachments, must be bonded and grounded
- ☐ Dust-laden air is not to pass through the fan or blower
- ☐ Electrical motors must not be in the dust laden air stream unless listed for Class II, Division 1 locations
- ☐ No paper filter elements for liquid or wet collection
- ☐ Metal dust vacuums must be listed for Class II, Division 1, Group E and meet other NFPA 484 requirements for metals

Source: NFPA 652 as summarized by Nilfisk, Inc.

What vacuum do I choose if my environment is NEC-classified?
OSHA's Combustible Dust National Emphasis Program (NEP) calls for electric vacuums used in dusty areas to be approved for the hazardous location, as required under standard 1910.307(b).

The vacuum you choose must be NRTL-approved for use in hazardous locations, more specifically approved for use in your environment. Approved equipment must be marked to show the class, group, and operating temperature or temperature range per NEC, Article 500. For example, Nilfisk's EXP vacuums are CSA-certified for use in Class I, Group D and Class II Groups E*, F, and G classified environments.

NFPA 652, Section 8.4.2.2.2 states that in a Class II environment, the vacuum must match the environment classifications with a NRTL-approval. A fixed pipe system can also be used, and the requirements reference Section 8.3, including keeping dust containers below 8 ft^3 in dirty-side volume.

Section 8.4.2.2.3 covers flammable vapors or gases. If present, then the vacuum must comply with both Class I and Class II, per NEC, Article 500.

Some vacuums are advertised as "certified." What does this mean, and is it important?
In order to be considered certified, OSHA explicitly states, "In the US, under OSHA's NRTL requirements, the product must have the specific mark of one of the NRTLs recognized to test and certify these types of products."

Therefore, a certified vacuum will carry an approval from a NRTL. A NRTL is the only body that may provide certification for electric equipment for hazardous locations in the United States and Canada.

If you are working in a classified environment, and your vacuum is not NRTL-approved, you can be fined and more importantly you are risking your facility's safety every day.

Who certifies vacuums?
A NRTL is the only body that may provide certification for electric equipment for hazardous locations in the United States. The following are recognized to certify a vacuum cleaner: Underwriter's Laboratories (UL), Canadian Standards Association (CSA), Factory Mutual (FM), Applied Research Laboratories, Inc. (ARL), Intertek Testing Services NA, Inc. (ETL).

NOTE: NRTL certifications do not exist for pneumatic vacuum equipment. If you see a pneumatic vacuum marked "certified explosion-proof" it is a mis-leading and inaccurate label.

Can equipment be certified "explosion-proof," or is it just a buzzword?
"Explosion-proof" is one of the biggest misnomers perpetuated in the vacuum industry. It is, in fact, a word that should only be applied to equipment that has been tested by a NRTL and confirmed to comply with the definition provided in Article 500 of the 2014 NEC.

If you see this term used to describe pneumatic equipment, it is a buzzword. Pneumatic equipment cannot be certified explosion-proof.

What is the difference between certified explosion-proof and certified dust-ignition proof?
First, only electrical equipment can be rated explosion-proof / dust ignition-proof. Explosion-proof means the equipment prevents ignition of a gas or vapor surrounding the enclosure. Explosion-proof equipment must be tested and confirmed by a NRTL and is permitted for use in Class I locations.

Dust Ignition-Proof means the equipment is enclosed to exclude dusts and prevents arcs from causing ignition. This equipment must also be tested and confirmed by a NRTL and is only permitted for use in Class II locations.

Nilfisk's electric vacuums are both explosion-proof and dust ignition-proof.

Can an entire vacuum unit be certified, or are just certain parts certified?
Yes, an entire vacuum cleaner can be certified and is the type of vacuum cleaner safest for use in a hazardous (classified) environment. Some vacuum manufacturers only advertise certain parts, like motors and switches, as having a classification. This means the entire vacuum was not NRTL-approved.

If you are unsure, ask your vacuum manufacturer for more information about their NRTL approvals.

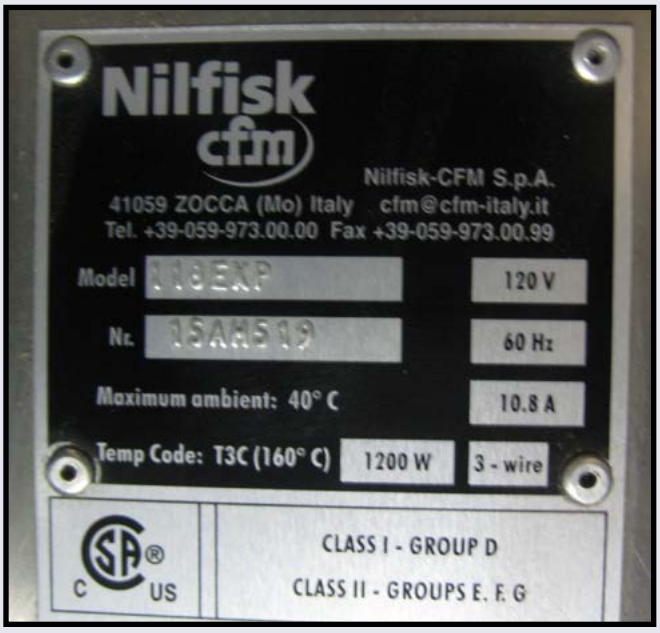
*Special modifications may be necessary for Group E environments. Nilfisk Inc. reserves the right to evaluate on a case-by-case basis.

How do I know if I need a vacuum that is "fully" certified, versus one with just a motor certification?
If you look to NFPA 652 for guidance, it states equipment "shall be listed" for use in hazardous environments. This is a bit vague, however paired with OSHA's statement, "…the product must have the specific mark of one of the NRTLs recognized to test and certify these types of products," it is our interpretation that the entire vacuum must be NRTL-approved if you are going to use it in a hazardous (classified) environment.

If your environment is not classified, you still must follow NFPA 652's other requirements for vacuum cleaners, including it be bonded and grounded, use conductive accessories, and dust should not pass through the motor.

Can any type of vacuum be submitted for NRTL certification?
Any electric-powered vacuum cleaner can be submitted for NRTL certification. There is no certification for pneumatic equipment. Only electrical equipment can be rated explosion-proof or dust-ignition proof.

If an entire vacuum is not certified, is it still safe to collect combustible dusts?



Vacuum cleaner data plate that clearly displays the NRTL approval via CSA.

Again, this topic is debatable and a bit vague based on NFPA and OSHA recommendations. The main fact to follow, is that the vacuum must meet the requirements laid out by the NFPA.

It is important to understand the risks you are taking if the entire vacuum is not NRTL-approved. For example, if the body of the vacuum is painted or powder coated, the paint can chip and abrade exposing carbon steel. Carbon steel WILL spark if exposed to metal-on-metal contact, and that spark could be hot enough and remain ignited long enough to cause air-borne dust to explode. Stainless-steel rarely sparks and when it does, that spark is not large enough to ignite other material. This is just one example of a design feature that could be present if your entire vacuum is not certified.

What features of a vacuum are designed to prevent arcing and sparking hazards?
Arcs and sparks can be created by equipment if the equipment is not specifically designed for hazardous locations. In a vacuum, there are different types of arc that can be created and subsequently prevented by following specific design guidelines:

- Electrical Arc: caused by flow of electricity. Examples include commutators in universal electric motors; and switches when opened or closed. Explosion-proof / Dust-ignition proof vacuums use a sealed motor design to prevent electrical arcs.

- Percussion Arc: caused when two materials are impacted together. Explosion-proof / Dust-ignition proof vacuums use stainless steel construction to prevent sparking by metal-to-metal contact.

- Static Discharge Arc: caused when high levels of static electricity build up on non-conductive surfaces. A discharge takes place through the air when the static buildup comes into close proximity of a grounded object. Explosion-proof / Dust-ignition proof vacuums ensure continuity through the tool, hose and all parts of the vacuum.

Totally-enclosed, fan-cooled (TEFC) explosion-proof motor in an electric explosion-proof / dust ignition proof vacuum cleaner.

NFPA 652 requires my vacuum be bonded and grounded to collect combustible dust, even if my environment isn't classified. What should I look for in the vacuum to ensure it meets this requirement?
"Bonded" means "connected together." A vacuum is bonded when there is a connection between all of its parts, whether that is through direct contact of individual parts or with braided stainless steel straps, which establishes electrical continuity and conductivity.

"Grounded" means "connecting to the Earth." A vacuum is grounded when all of its parts are connected to a conductive body that extends through its wheels to the ground.

Look for a vacuum that is manufactured with all conductive, anti-static parts down to its wheel casters.

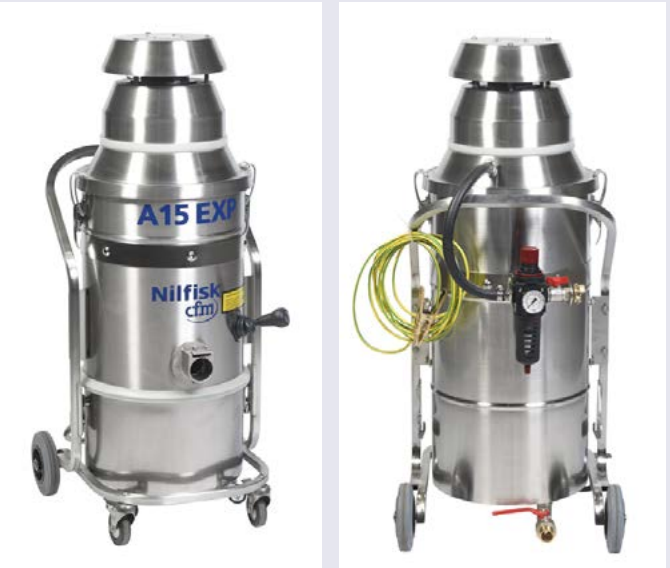
Some companies use the term "intrinsically safe" – what does this mean, and how does it apply to vacuums?
The NFPA defines "intrinsically safe equipment" as "equipment and wiring that are incapable of releasing sufficient electrical energy under normal or abnormal conditions to cause ignition of a specific hazardous atmospheric mixture in its most easily ignited concentration."

Electric explosion-proof / dust ignition proof vacuum cleaners, as available in the United States today, are not "intrinsically safe" because they are not equipped with a motor and a switch that comply with the intrinsic safety protection method. As described in section 504 of the National Electric Code, "intrinsically safe" is an accepted protection technique for hazardous location areas; however, intrinsically safe systems are not bound by the provisions of Articles 501 through 503, the very articles that NRTL-certified explosion-proof equipment, including electric explosion-proof / dust ignition proof vacuum cleaners, are bound by.

The term "intrinsically safe" is often incorrectly used to describe pneumatic equipment. The definition of intrinsic safety states that equipment and wiring are incapable of releasing sufficient electrical energy to cause ignition, but it makes no mention of pneumatically-driven equipment. Pneumatic, or air-powered, vacuums do not generate any electrical energy and are therefore not intrinsically safe.

If there is no certification for pneumatic equipment, what pneumatic vacuum is safe to collect combustible dust?
We recommend the following features for all pneumatic vacuums being used in hazardous (classified) locations:

- Fully bonded and grounded;
- A grounding strap to ensure any charge generated within the vacuum has a clear path to ground;
- Antistatic wheels and an antistatic main filter that has stainless steel weave within it to conduct any static charges to ground that could generate upon it;
- As required for ancillary equipment and components in a number of references within the NFPA standards, it should comply with a resistance rating at or below 1 M Ω ($1x10^6\Omega$);
- Constructed of low-sparking metals, such as aluminum and stainless steel; and,
- Conductive airline and conductive accessories.



Pneumatic vacuum cleaner that meets recommendations listed above. Note, the yellow grounding strap on the back of the vacuum.

Conclusion

The information in this article is really just the tip of the iceberg when it comes to completely understanding the combustible dust regulatory landscape. Follow these steps to understand your situation, the regulations, and the equipment you need to run a safe facility.

When it comes to selecting a vacuum cleaner, find an expert that can visit your facility and help you select a long-term solution.

OSHA Resources

On www.osha.gov you will find:

- Combustible Dust National Emphasis Program
- Safety and Health Information Bulletin (SHIB) (07-31-2005) Combustible Dust in Industry: Preventing and Mitigating the Effects of Fires and Explosions

NFPA Resources

On www.nfpa.org you can access free NFPA codes and standards, including NFPA 652 and NFPA 654.

Video Resources

For a quick way to understand fact vs. fiction, Nilfisk offers animated videos:

- Myth: There is no OSHA regulation on combustible dust so I don't have to worry about inspections and fines.
- Myth: Explosion-proof is a buzzword that any manufacturer can use.
- Myth: My facility is not a hazardous (classified) environment, so I don't need NFPA-compliant vacuums.

Other Resources

Safe Choice Interactive Guide: www.explosionproof-vacuum.com/interactive-tool

Combustible Dust FAQs: www.explosionproof-vacuum.com/explosion-proof-vacuum-faq.html

Important Government Regulations: www.explosionproof-vacuum.com/vacuum-government-regulations.html

About Nilfisk Industrial Vacuums

Nilfisk Industrial Vacuums (Morgantown, PA), a division of Nilfisk, Inc., is one of the largest providers of cleaning equipment in North America. Equipped with exceptionally efficient filtration systems and user-friendly features, the company's vacuums play a critical role in thousands of manufacturing facilities and industrial processes across North America. Supported by a direct sales force and an extensive dealer network, Nilfisk Industrial Vacuums helps customers solve a variety of cleaning challenges, including combustible dust, general maintenance, overhead cleaning, abatement, process integration, laboratory/cleanroom control, and more.

Nilfisk, Inc.
Industrial Vacuum Division

740 Hemlock Road, Suite 100
Morgantown, PA 19543
Phone: 1-800-645-3475
Web: www.NilfiskIndustrialVacuums.com
E-mail: questions@nilfisk.com

Authored by Nilfisk, Inc., Industrial Vacuum Division, April 2016