



# TIPS FOR MANAGING Dangerous Grain Dust

## TABLE OF CONTENTS

**Conduct a Dust Hazard Analysis**

PAGE 4

**Manage Containable Sources of Dust**

PAGE 8

**Test for Explosiveness and Flammability**

PAGE 5

**Design a System that Minimizes  
Operating Costs**

PAGE 9

**Assess Employee Exposure  
and Dust Hazards**

PAGE 6

**Consult with Peers and Your Local AHJ**

PAGE 10

**Create Air Quality Goals**

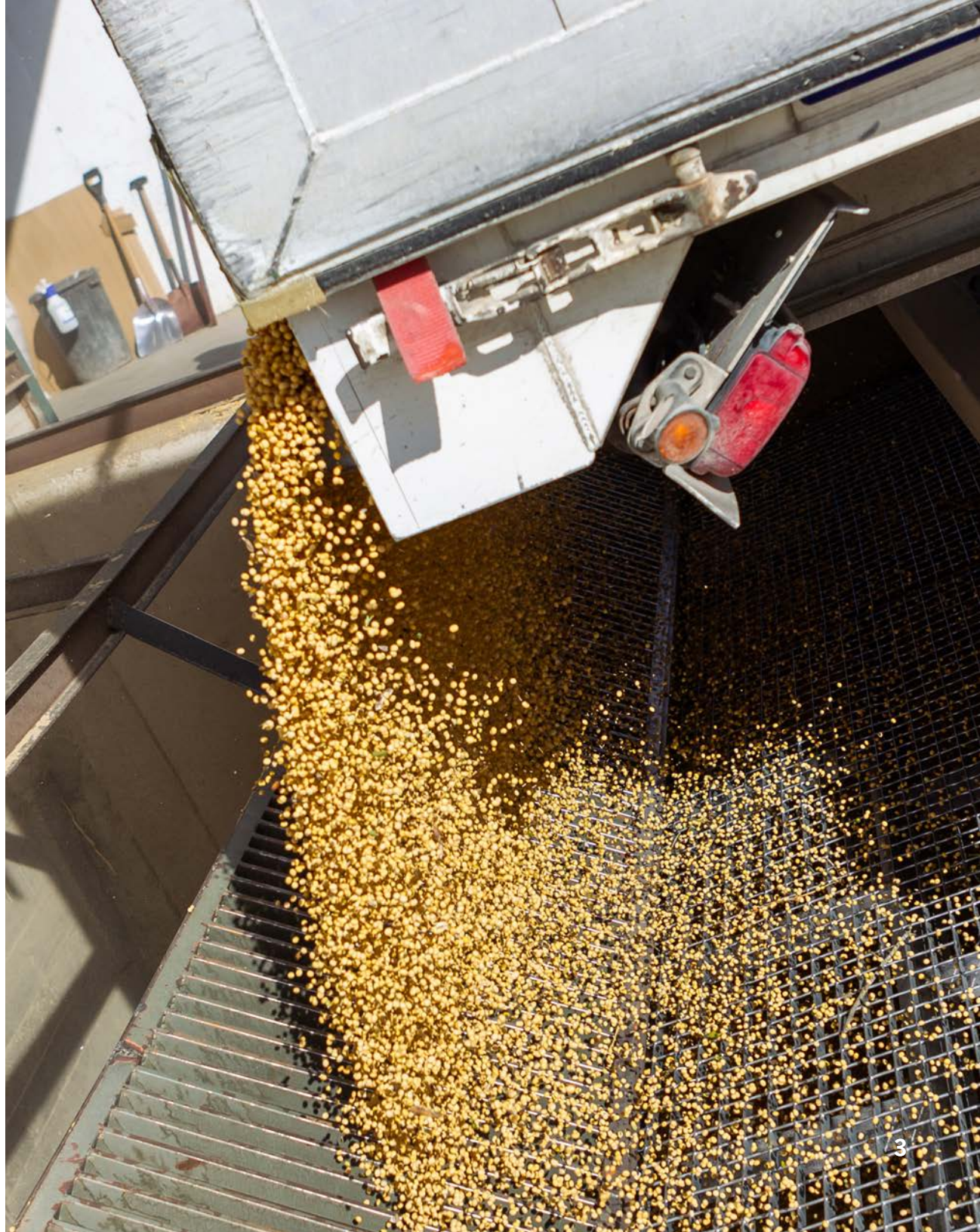
PAGE 7

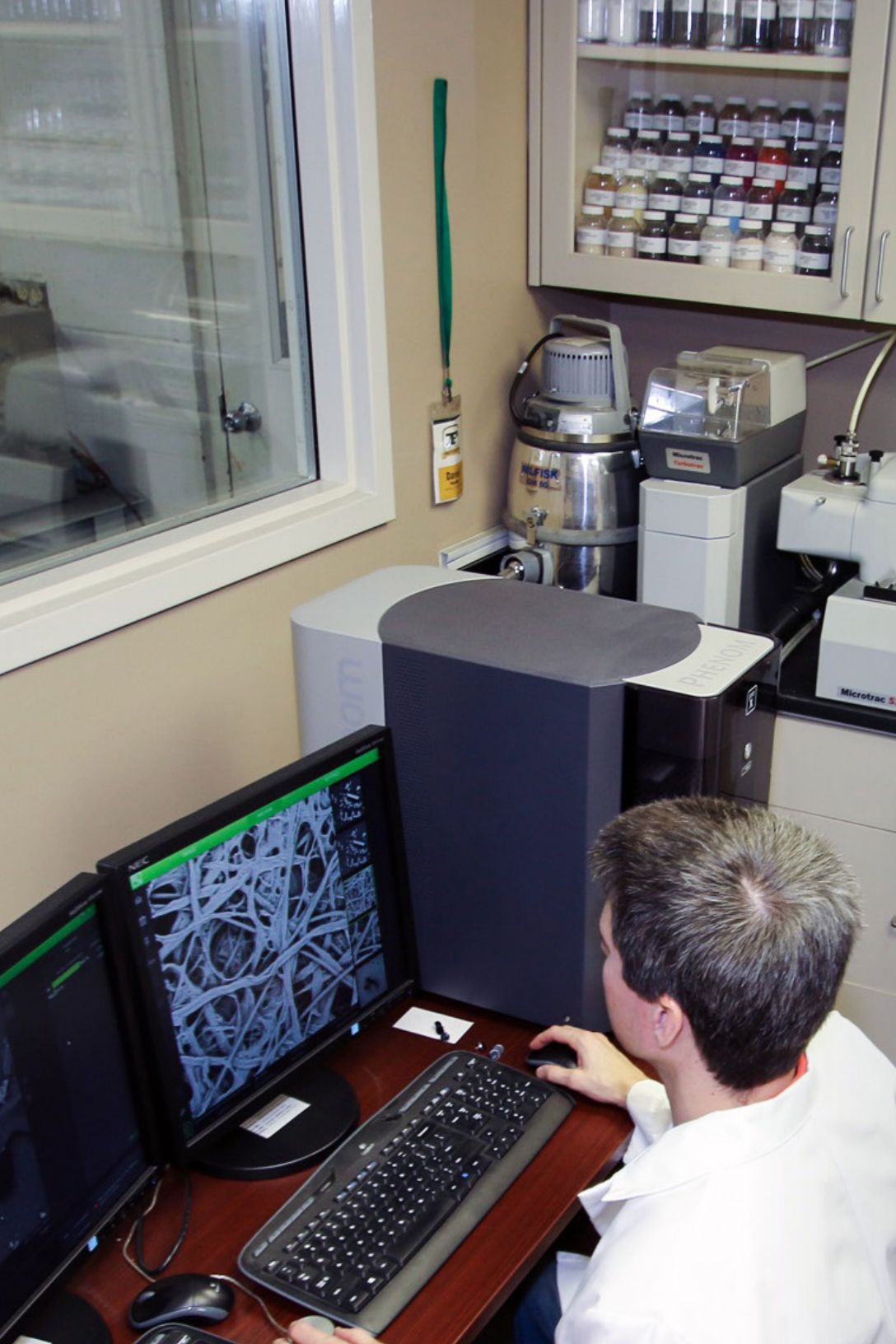
**Silos and processing facilities of grains and feeds produce dangerous airborne dusts. These facilities must be diligent in controlling these particles to ensure worker safety and regulatory compliance.**

To maintain a clean and safe work environment, airborne dusts must be captured and contained before they can be inhaled by workers or cause combustible dust explosions.

This is done by constantly circulating the dust-laden air through an industrial dust collection system to filter out the particles. After the dust is removed from the air, the clean air is safely returned indoors or exhausted outdoors.

A well-designed and -maintained dust collection system cost-effectively captures and contains all dust generated during grain and seed processing. This eBook covers important considerations for a dust management plan.





## CONDUCT A DUST HAZARD ANALYSIS

Performing a dust hazard analysis (DHA) is the best way to evaluate your facility's risk for employee exposure and is a required task per NFPA 652 if to determine if any of the dust that you are producing in your facility is combustible.

Get to know all the dust you generate by:

- Conducting a dust analysis to identify all the dust characteristics
- Completing dust explosivity testing
- Having an industrial hygiene or environmental engineering assessment performed

OSHA's General Duty Clause, Section 5(a)(1), stipulates that it's an employer's responsibility to identify and abate hazards in the workplace. OSHA also requires employers to keep records of these dusts, and it provides guidelines on [hazard identification and assessment](#).



# TEST FOR EXPLOSIVENESS AND FLAMMABILITY

National Fire Protection Association (NFPA) standards 652 and 654 require a combustible dust hazard analysis (DHA) to assess risk and determine the necessary fire and explosion protection.

Facilities producing combustible dust during their processes must complete a DHA by the fall of 2020 and demonstrate reasonable progress toward completion of the DHA each year before the deadline.

**The first step is to determine whether your dust is explosive.** The results found in your dust explosivity testing should include the Kst and Pmax, which indicate the amount of pressure an explosion can generate and how fast it can travel. NFPA classifies dusts according to explosibility in terms of their Kst values and by type—organic or metal.

Kst is the normalized maximum rate of explosion pressure rise, measured in bar m/s. A bar is a metric unit of pressure, which is slightly less than the average atmospheric pressure on earth at sea level. Your dust collection equipment supplier will need the Kst and Pmax values to correctly size explosion venting and suppression systems.

*The NFPA 652 deadline for having a DHA complete for existing processes and facilities was **September 7, 2020***

## Combustible Dust Classifications

Dust Explosion Class	Kst	Characteristic
St-0	0	Not Explosible
St-1	≤ 200	Weak to Moderately Explosible
St-2	201-300	Strongly Explosible
St-3	>300	Very Strongly Explosible

## Combustible Dust Properties

- **Kst** – Deflagration index (bar-m/s)
- **Pred** – Reduced pressure after venting (bar)
- **Pstat** – Vent static burst pressure (psi)
- **Pmax** – Max pressure for an unvented dust explosion (bar)
- **(dp/dt)** – Rate of pressure rise (bar/s or psi/s)
- **Pes** – Enclosure strength = 2/3 of yield strength of weakest part or 2/3 of ultimate strength if deformation is allowed



# ASSESS EMPLOYEE EXPOSURE AND DUST HAZARDS

An industrial hygiene assessment helps you identify and control harmful exposures to dusts. This assessment includes evaluating your facility to ensure you are meeting OSHA permissible exposure limits (PELs) for the dusts that your processes produce.

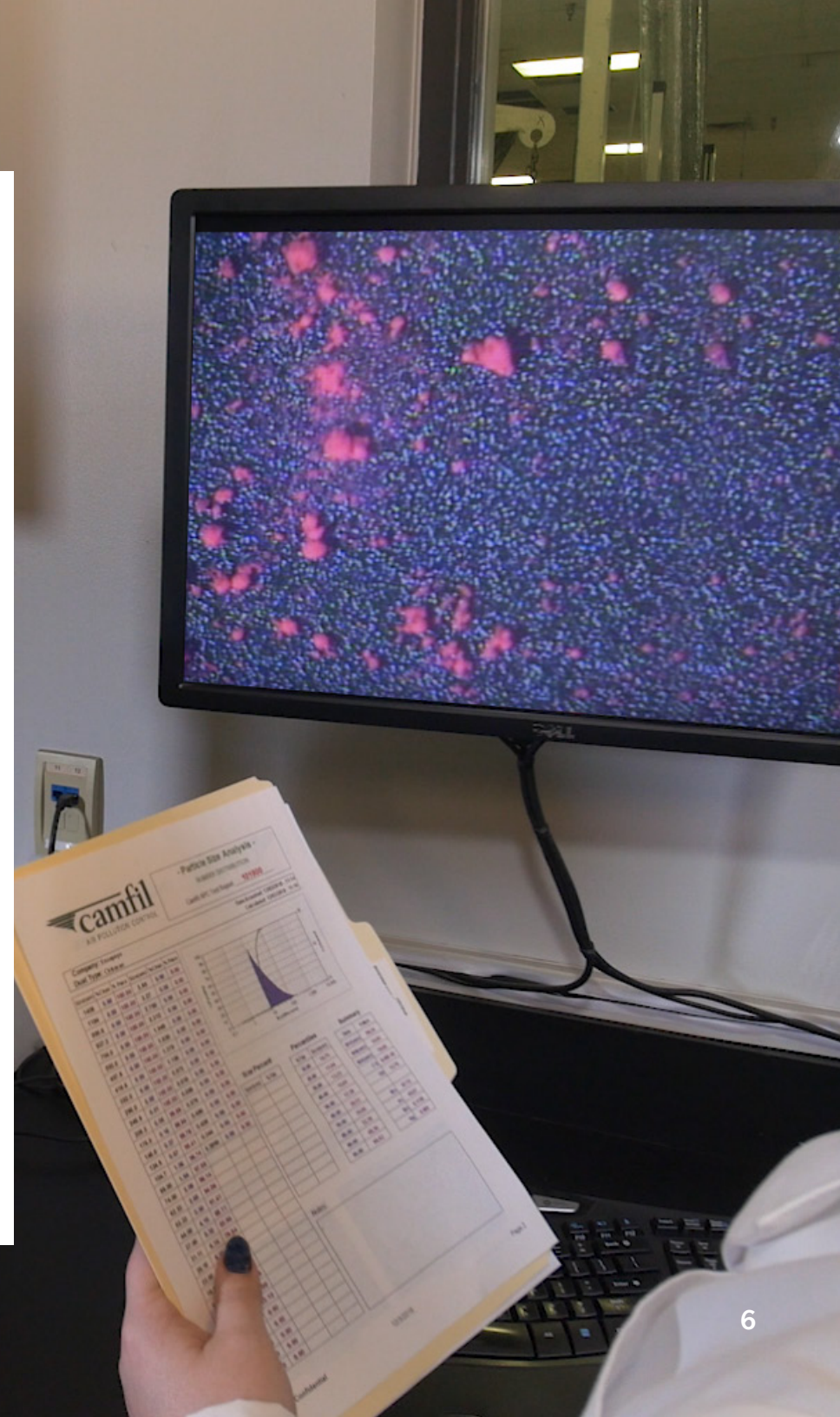
Ask your dust collection equipment supplier to recommend an industrial hygienist or environmental engineering company that is experienced in identifying dusts specific to your operation.

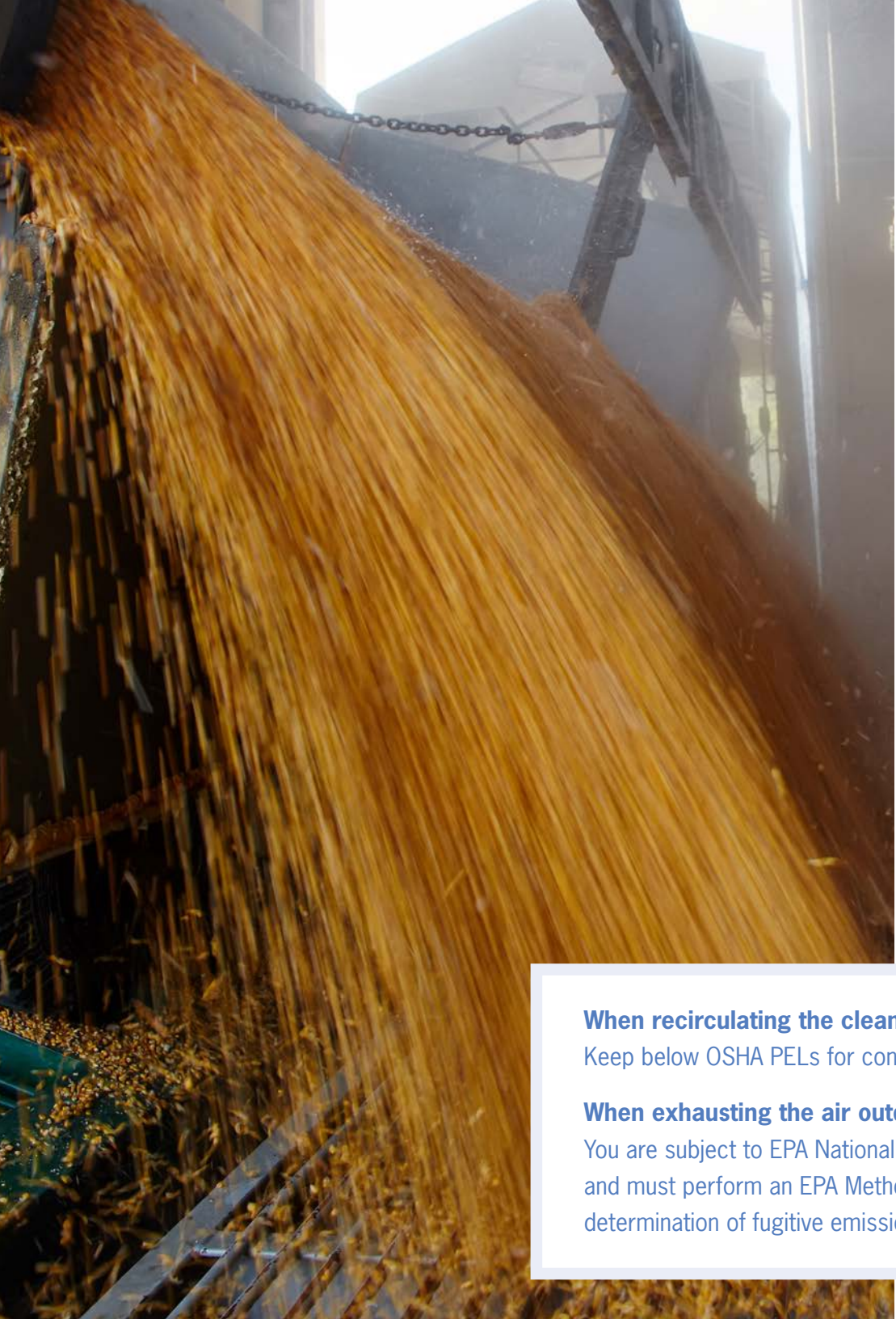
## DUST HAZARDS TESTING

It's also important to analyze dust characteristics to determine the best dust collection system design for your operation. The following dust characteristics are determined by bench testing a sample of your dust:

- Particle size
- Gravity
- Abrasiveness
- Dust shape
- Moisture level

It's also important to look at whether your dust is a type that tends to generate static electricity. Those types of dusts can be ignition sources for dust explosions. Dust collection equipment suppliers often can conduct dust testing and work with you to specify the best system and required filter media. Dust testing is an excellent tool to better understand the physical properties of your dust, which forms the basis for equipment selection. To create a complete picture of your operation, the testing laboratory should ask for detailed application data.





# CREATE AIR QUALITY GOALS

Your dust management program should include air quality goals based on both of the following sources:

- Guidelines found in *Industrial Ventilation: A Manual of Recommended Practice for Design* from the American Conference of Governmental Industrial Hygienists (ACGIH)
- OSHA regulations regarding the PELs for applicable dusts, particularly where workers are at risk for long-term health effects

Review the results from your industrial hygiene assessment, OSHA guidelines, explosive dust testing and dust analysis. As you explore solutions to capture and contain dusts, evaluate these methods in order:

- 1** Source capture (dust arms, bench hoods and hoods)
- 2** Enclosures
- 3** Overhead hoods
- 4** Ambient ventilation

Addressing employee concerns by listening to, observing and questioning your workers is an important part of your assessment. They can let you know if current engineering controls are effectively managing dusts at the facility and suggest areas for improving processes and equipment.

## **When recirculating the cleaned air**

Keep below OSHA PELs for contaminants.

## **When exhausting the air outdoors**

You are subject to EPA National Emission Standards for Hazardous Air Pollutants (NESHAP) Rule 6X and must perform an EPA Method 22 Fugitive Emissions test. The test is conducted using a visual determination of fugitive emissions from exhaust sources and is performed by a trained observer.

# MANAGE CONTAINABLE SOURCES OF DUST

An industrial dust collector designed specifically for your operation is a proven engineering control for hazardous airborne contaminants. There are three general types of cartridge dust collection systems:

- **SOURCE CAPTURE**

These systems typically use flexible source capture arms, slotted dust hoods or smaller slotted hoods with side shields on a workbench operation.

- **ENCLOSURES AND CANOPIES**

Hoods are often used if the footprint area is less than 12 feet by 20 feet. Curtains or walls may be added to the sides of a hood to create an enclosure, as long as they don't interfere with workspace. Some applications use a full enclosure over and around the process area.

- **AMBIENT SYSTEMS**

You can filter all the air in a facility using one central system or multiple smaller collectors. Ambient systems are often favored for larger work areas involved in multiple operations, but they may require a bank of HEPA safety monitoring filters (also called secondary or after-filters). Secondary filters provide backup protection, particularly where air is returned indoors downstream of the collector. Since ambient systems don't remove dust particles from the breathing zone, personal protection equipment may also be required.







## DESIGN A SYSTEM THAT MINIMIZES OPERATING COSTS

A safe dust collection system can also be very cost-effective. A properly designed system will **minimize energy usage and operating costs**. For example, system zoning allows you to operate the collection system where it is needed, while other areas can be turned down or shut off.

Incorporating variable speed drives for fans on dust collectors saves energy. The variable speed drive produces a steady airflow, because the system only runs the motor as needed to maintain the static pressure setpoint. Also, it automatically reacts to filter loading or movable applications. Having this feature increases reliability, extends filter life, reduces maintenance and saves energy.

***Recirculating the filtered air is an ideal way to save energy and maximize return on investment.***

Recirculating heated or air-conditioned air back through the facility instead of venting it outdoors eliminates the cost of replacing that air. Facilities in all regions of the United States report five- to six-figure annual energy savings, with the greatest savings seen in northern climates that experience longer, colder winters. In addition, you can eliminate the complex EPA paperwork and monitoring procedures involved when dusts are exhausted outdoors.

It is a good idea to use a secondary safety filter when recirculating into your facility to obtain the required OSHA PEL levels.



## CONSULT WITH PEERS AND YOUR LOCAL AHJ

Networking with peers is another way to discover processes, equipment and vendors to help you manage airborne dust. Also, consult with professional associations and certification groups. Ask your authority having jurisdiction (AHJ), such as Factory Mutual or local fire marshals, for their safety guidelines.

When selecting a dust collection system supplier, look for one that is experienced with seed and grain processes as well as knowledgeable about OSHA, NFPA and EPA requirements. The supplier also needs to have the technical resources to develop an engineered solution. They should offer a full range of equipment in order to give unbiased advice on the right type of system for your facility. ***The most experienced suppliers also provide testing services and training.***

---

### KEY QUALITIES OF A DUST COLLECTION EQUIPMENT SUPPLIER:

- Experience with seed and grain processes
- Knowledge about OSHA, NFPA and EPA requirements
- Access to technical resources
- Ability to offer a full range of equipment
- Testing services
- Training

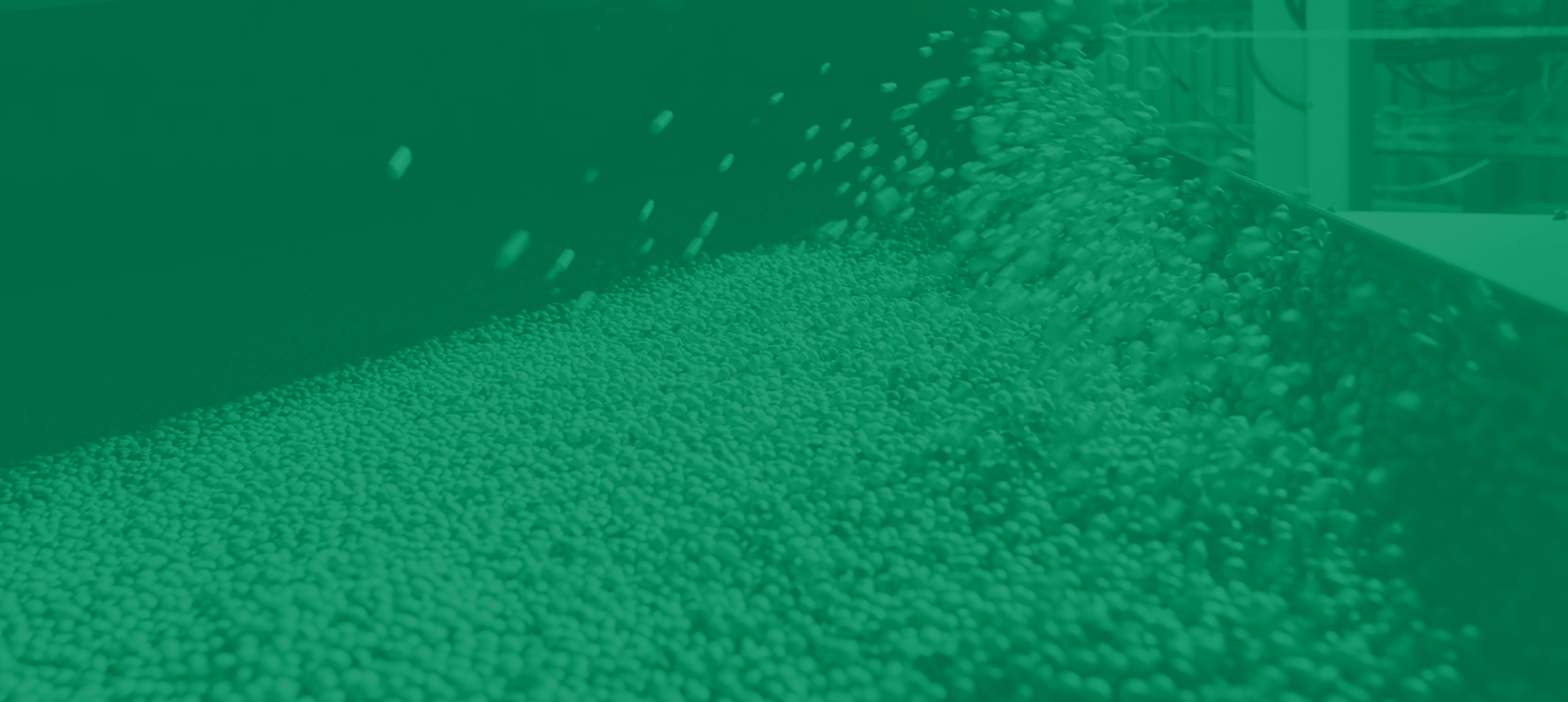
**Managing dusts in grain and seed processing facilities is necessary for the safety and well-being of employees and to achieve regulatory compliance.**

Conducting proper dust hazard analysis with industrial hygiene assessment, explosive dust testing and dust analysis will help you to develop your dust management plan. Incorporate components that provide flexibility, increase reliability, reduce maintenance and maximize energy savings.

A dust collector system designed specifically for your operation and containing high-efficiency cartridge and secondary filters is an accepted and proven engineering control that filters hazardous respirable particulates and makes indoor environments safer and healthier.

**For further information, contact  
800-479-6801 or 870-933-8048,  
email [filterman@camfil.com](mailto:filterman@camfil.com) or visit  
[camfilapc.com](http://camfilapc.com).**





3505 South Airport Rd. Jonesboro, AR 72401 • 800-479-6801 • [filterman@camfil.com](mailto:filterman@camfil.com) • [camfilapc.com](http://camfilapc.com)

