



# CARBON DIOXIDE APPLICATION PROFILE

## DUST COLLECTION SYSTEM

Typical Industries Served	Petrochemical Chemical	Food/Agricultural Pharmaceutical	Wood Processing Paint/Coatings
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### INTRODUCTION

Dust collection is the process of removing or collecting solid particles from airflow to comply with stringent air pollution standards. Large filters trap airborne particles before they are released into the outside air. Bag Type collectors are one of the most common air pollution control technologies that removes particulate matter from the air waste stream being emitted from a broad range of industrial processes. The particulate-laden air stream passes through a woven or felted fabric that filters out the particulate matter and allows the air to pass through.

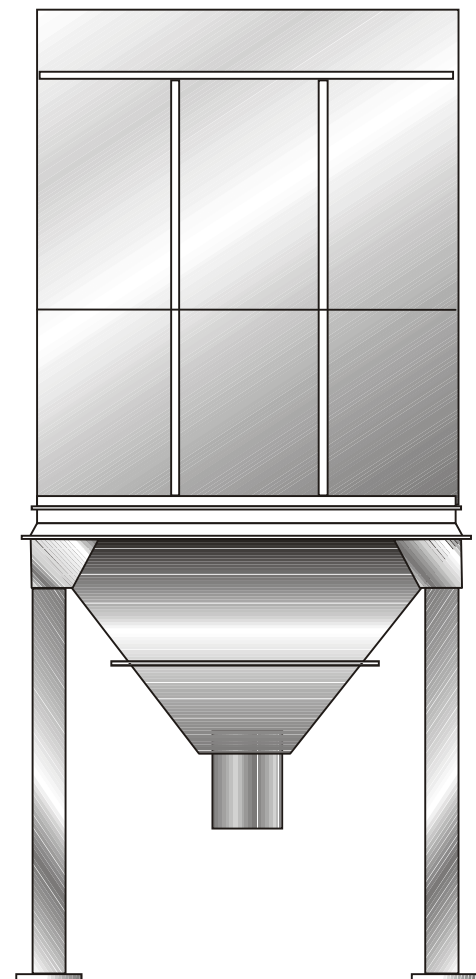
A dust fire can be a devastating occurrence to an industrial facility. Damage to plant facilities, lost production time, increased insurance premiums, and injury to plant personnel are some of the costs associated with an incident of this type.

There are many different types of dust collection systems in the industry using various methods to separate the dust from the air stream. Some Dust Collectors examples are:

- Bag Type Collectors
- Cyclone Collectors
- Electrostatic Precipitators
- Wet Collectors

The purpose of this application profile is to provide an understanding of the possible hazards associated with dust collection systems and protection strategies utilizing Fike Carbon Dioxide Ex-

tinguishing Systems. This document is intended to be a guideline and is not applicable to all situations. Fike's Carbon Dioxide Design, Installation, and Maintenance Manual and NFPA 12 should be referred to when designing systems. If you have any questions, please contact the Fike Protection Systems group, or our regional sales manager in your area.



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## **THE PROBLEM: IGNITION OF BAG FILTERS**

Dust fires are relatively common occurrences in a variety of industries. Plants equipped with pneumatic handling and air filtration systems have an inherent risk associated with the operation of these systems. Bag Type Collectors used for the collection of fine dusts present a special problem because of the use of combustible fabric even where the dust is noncombustible. Even bags of low combustibility will not withstand temperatures normally encountered under fire conditions. Because of the combustibility of the bags, ductwork, or of the material being transferred through them, the installation of an automatic carbon dioxide extinguishing system is justified.

Bags in collectors are considered combustible when cotton, wool, nylon, polypropylene, or acrylic materials are used. Non-combustible bags consist of Nomex, Teflon, or fiberglass materials. Carbon dioxide extinguishing systems are implemented when lower temperature collectors are filtering combustible dusts and utilizing combustible bags.

Bag fires generate from normal manufacturing process sparks or embers being drawn into the collector and attaching to the bags. Collector maintenance and repairs have also lead to a fire condition.

Dust Collectors are also susceptible to explosions. Explosion Venting, Isolation and Suppression are also protection strategies implemented by Fike Corporation. A carbon dioxide system will not prevent explosions in Dust Collector systems. Fike's Explosion Protection application guides provide an excellent overview to decrease the severity of an explosion to safe levels and prevent catastrophic destruction. NFPA 68 focuses on Venting Systems and NFPA 69 on Explosion Suppression and Isolation Systems. These standards, in addition to Fike's Application Guides, should be referred to when employing explosion protection.

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## **THE SOLUTION: TOTAL FLOOD / DEEP-SEATED FIRE**

Deep-Seated hazards are those in which the materials involved are subject to smoldering fire conditions. The materials in Dust Collectors are subject to deep-seated burning. Deep-Seated fires are best extinguished when a three-dimensional extinguishing agent is utilized. Carbon dioxide agent will easily penetrate all parts of the Collector and quickly extinguish fires to restore operation as soon as possible without damaging internal components.

Automatic sprinkler protection will protect the Collector framework, but may not prevent loss of the bags, which can be a costly replacement. Sprinkler systems do not provide three-dimensional fire fighting characteristics, making them ineffective. Another drawback associated with sprinkler systems is if the water discharge continues for an extended period of time, damage to the Collector framework is likely due to excessive weight from the water.

Dust Collector carbon dioxide systems are designed to provide a concentration of 75 percent by volume. Thirty-percent concentration is reached within the first two minutes of the discharge. The designed percentage (75%) is achieved in less than seven minutes. After the 75 percent concentration is achieved, it shall be maintained for a substantial period of time, but not less than twenty minutes.

In accordance with NFPA 12, it is recommended to shutdown and or damper the ventilation system prior to the carbon dioxide system discharge. When a ventilation system cannot be shutdown prior to the carbon

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dioxide system discharge, additional agent must be added to compensate for the volume leaving the enclosure. Special design must also be applied when there is potential for over pressurization. If the dust collector has an airtight enclosure, the internal pressure from the carbon dioxide discharge could increase and require venting to prevent damage to the enclosure or vent panel activation.

Ductwork or other equipment that can lead to fire propagation should be assessed to determine if fire protection is necessary. It is good fire protection practice to provide protection in every potential hazard of Dust Collector units.

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## **NOZZLE AND DETECTION REQUIREMENTS**

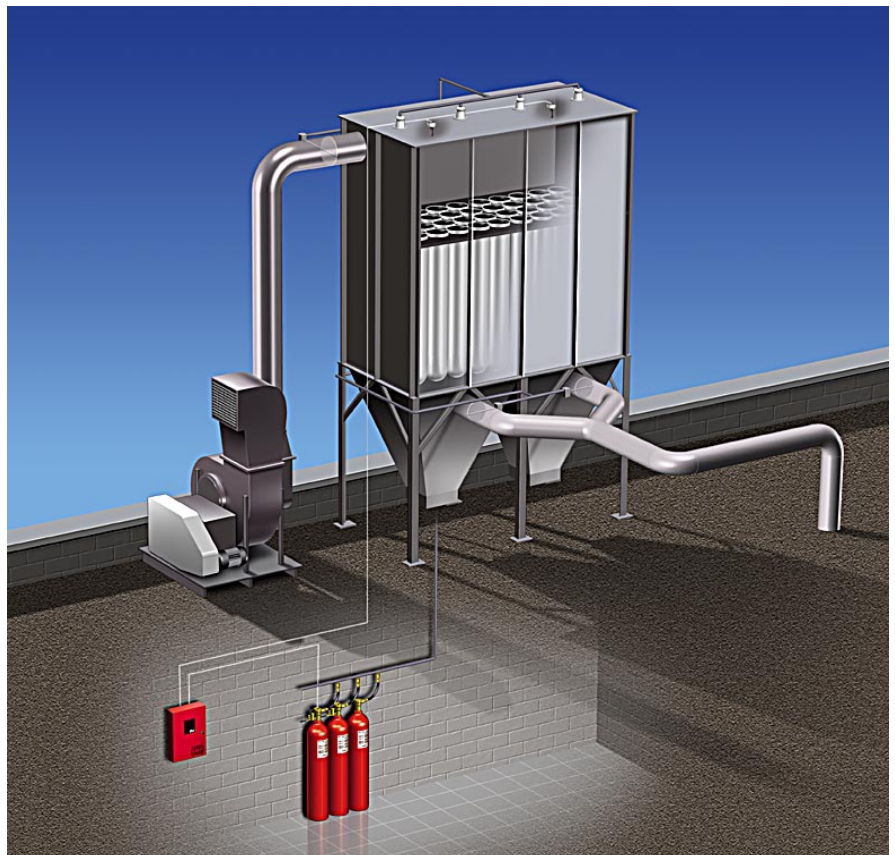
The “S” Nozzle is best suited for a dust collector application. The “S” Nozzle design provides a soft agent discharge and helps decrease the potential for turbulence. High turbulence near each nozzle will stir up dust and could lead to an explosion. Installing more nozzles will help minimize the overall flow rate and decrease the potential for an explosion.

Rate-compensated heat detectors, installed in the ductwork and at the top of the collector, are recommended to detect a fire and release the carbon dioxide system. High-speed infrared detectors are also an adequate means of detection. Detectors are to be installed between the process and the collector and be interlocked to actuate a carbon dioxide system in the duct or in the collector. The detection system should also shut down the rotary if one is present. This will prevent transferring burning material out of the collector.

In addition to the detectors releasing the carbon dioxide system, a manual release station should be conveniently located to electrically activate the discharge. Audible devices are also installed to warn and notify personnel of the carbon dioxide discharge.

There are many different types of Dust Collector designs filtering various different kinds of materials. The following example depicts a Bag Type Dust Collector, which dislodges dust from the bags by way of reverse airflow.

**“Baghouse Dust Collector”  
Protected by a Fike Carbon  
Dioxide Suppression System**



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## **Fike Corporation**

In addition to Fike's CO<sub>2</sub> System, Fike has an extensive product offering for facility and process protection for commercial and industrial applications.

**Rupture Disc** – A pressure relief device, typically applied to a closed chemical process, will open at a predetermined pressure and temperature to prevent the bursting or explosion of the process.

**Explosion Venting/Isolation/Suppression** - Total Concept Explosion Protection, including explosion testing, explosion venting, explosion isolation, and explosion suppression systems to mitigate the effects of industrial explosions.

**Fire Detection Systems** – Fike offers a full line of detection products from single hazard to multi zone analog addressable systems. These controls are suited for fire alarm, agent suppression systems, or sprinkler/pre-action fire detection and control systems. The Cheetah analog addressable control panel can be configured to communicate directly with one or more VESDA® LaserPLUS detectors via a High Level Interface (HLI).

**Fire Suppression Systems** – Fike offers a full range of suppression systems to protect your equipment and/or process. Because Fike offers more than one choice of extinguishing agents you are certain to get the right agent for your hazard. Fike systems incorporate the following agents:

- HFC-227ea
- Carbon Dioxide
- Water Mist



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