

Dryflo® Mist Collectors

Product Overview

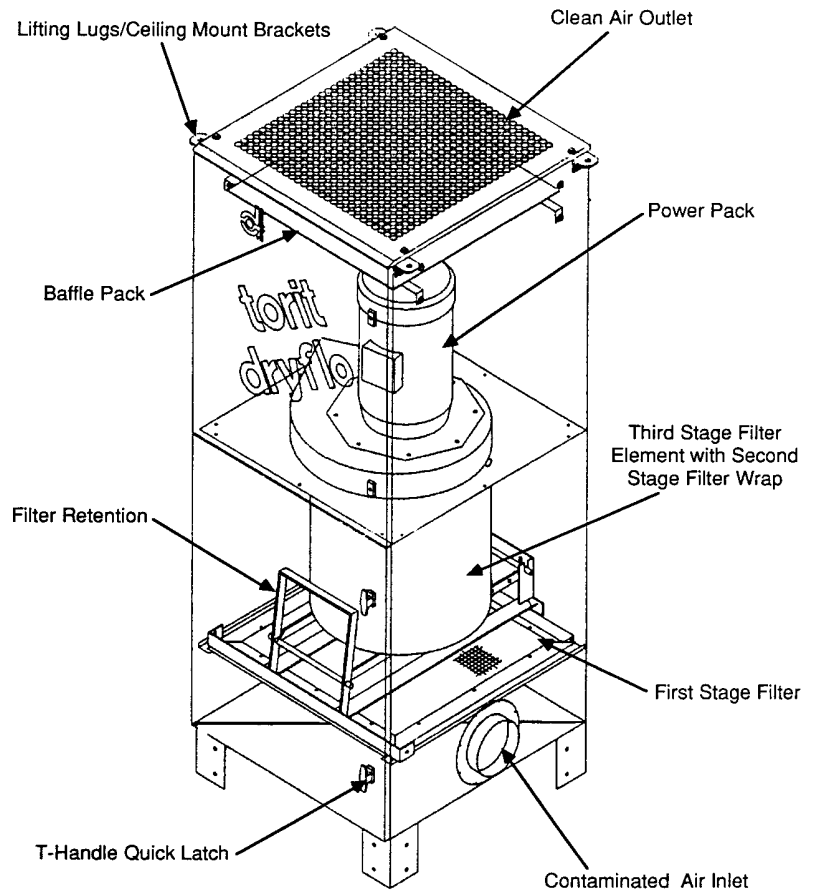
The Torit® Dryflo mist collector is used for collection of airborne mists. The Dryflo is often used to collect coolant mist resulting from machining operations. The unit was designed in 1994 to collect oil, water-soluble and synthetic coolant mists from a variety of machining operations and other industrial processes. The unit will also collect a small amount of dust from machining operations. With the optional HEPA (High Efficiency Particulate Arrestance) filter, smoke from machining operations can also be collected. Standard sizes handle airflows from 1,070 to 22,000 cfm (1,818 to 37,378 m³/h).

The Dryflo model names DMC-C, and -D1, correlate to increasing capacity and greater cartridge and collector size. These models have integral fan packages and optional standard HEPA filters. The DMC-D2 through DMC-D10 models all contain the same D1-size filter cartridge. The number after the -D indicates the quantity of D1-size filters. For example, the Dryflo model DMC-D8 has eight D1-size filters. These models do not have integral fan packages.

Proper installation and use of the Dryflo mist collector will greatly improve the quality of factory air. The Dryflo is a key component to meeting industrial and government air quality standards. The filter elements in this mist collector are the key to the efficient, long-life operation. With the high-efficiency filtration from the Dryflo, exhaust air can often be recirculated to the factory.

Operation Explanation

Normal Operation: During normal operation, contaminated air enters the Dryflo mist collector through one or both of the inlet openings located toward the bottom of each side of the unit. The incoming air slows and turns upward, causing large mist droplets and particles to fall out of the airstream and into the hopper. The air passes through the first stage filter, which is designed to collect and coalesce large droplets and particles. This first stage filter is reusable and may be cleaned periodically.

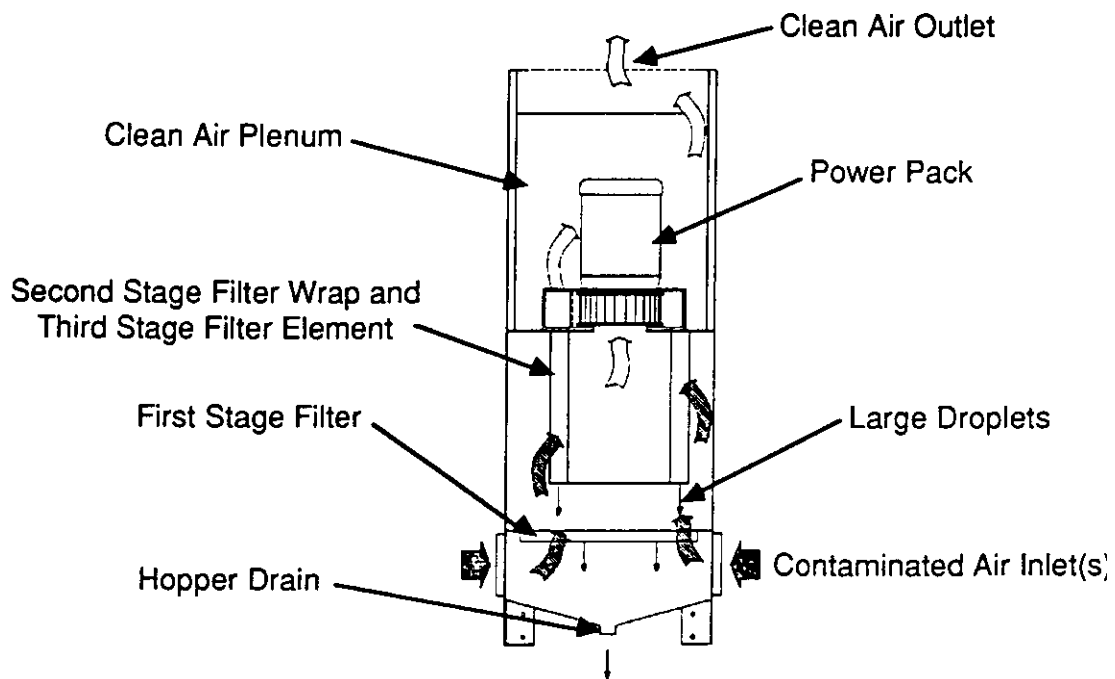


The air that passes through the first stage filter still contains smaller mist droplets. A second stage filter element wrap provides the next level of filtration. This wrap collects and coalesces mist into larger droplets. The vertical orientation of the wrap promotes drainage of the droplets.

The air then passes through the Dryflo filter element, the third and most efficient stage of filtration. This filter element is the heart of the Dryflo system. It features a pleated filter media that has been specifically designed to collect, coalesce, and drain fine mists. As mist particles coalesce and form larger droplets, the droplets become large enough to run down the element and drain back into the collector. During normal operation, the droplets will drain on both the inside and outside of the filter element. Liquid that collects on the inside of the element drains back into the collector due to the specifically sloped design of the bottom filter pan.

Clean, mist-free air exits the filter element and enters the fan. The fan and motor are closed in an acoustically-lined, clean air chamber for quiet, vibration-free operation. Clean air exhausts through the top of the collector.

The collected liquid drains from the hopper via the P-trap or collection bottle.



Application Summary

Defining Mist: Mist is defined as small droplets of materials that are ordinarily liquid at normal temperature and pressure and are suspended in the air. For use with the Dryflo mist collector, this is further defined as metalworking fluids used in machine tool operations. Typical metalworking fluids include oil and/or mineral oil, coolant (oil and water), and cutting fluids or agents. These metalworking fluids can perform numerous functions, including: lubricating the part and tool, cooling the part and tool, flushing chips away from the part and tool, and suppressing dust and smoke. Oils and coolants enable machines to operate faster, tools to last longer, and high quality parts to be produced.

Mist particles are created by two basic means: mechanical action and thermal effects. Mechanical action refers to the aerosol used for light lubrication directly from the oil or coolant nozzle; mechanical action creates a mist greater than one micron in size. Thermal effects occur when localized heat vaporizes the coolant, and then the vapor cools, recondensing into a mist; thermal effects create mist from 0.01 to 1 micron in size. Other contaminants, such as dust coming off the part or the tool and smoke from the combustion of the oil or coolant, are also generated in the use of metalworking fluids in machine tool operations.

Mist collection is done for numerous reasons, including: reducing health effects such as sore throats, respiratory problems, and even cancer; reducing maintenance problems like slippery floors and dirty lights and walls; and increasing worker productivity with a cleaner, healthier work environment.

Types of machining fluids and their applications:

- **Straight oil** provides the best lubrication qualities but only average cooling. Specific examples of machining operations using straight oils are cold heading, cold forming, hobbing, and gear cutting.
- **Water-soluble coolants** consist partly of water and they provide the best cooling properties, thus the name coolant. There are numerous applications using water-soluble coolants or soluble oil, primarily for lubrication and somewhat for cooling because the tool moves slowly, generating less heat. Examples include broaching, punching, roll forming, stamping, and toothed cut-off sawing.
- **Soluble oil or semi-synthetic coolant** is used for equal qualities of cooling and lubricating because the tool is moving at a faster speed on close tolerances. Examples include boring, drilling, milling and turning centers/lathes. Milling is the most common.
- **Synthetic coolant** is used for its cooling properties as the part is moving at a high speed generating a lot of heat. The two main applications using synthetic coolant are abrasive cut-off sawing and wet grinding. There are numerous types of wet grinding, including: centerless, cylindrical, profile, rotary table and surface.

The Dryflo can collect some dust along with the mist; however, it should not be operated without mist. The collector is not designed to handle water mist alone. There should be some type of material to allow coalescing, otherwise water vapor will pass through the filters. The extremes of very heavy oils and very light, thin oils should be avoided. The very heavy oils (similar to tar consistency) will not drain. The very light, thin oils (similar to gasoline consistency) may evaporate.

Sizing and Selecting Criteria

The Sizing and Selecting Criteria is provided on pages DMC-8 through DMC-10, incorporated with the following Machine-Mountable Dryflo Mist Collector section.

Note: The same principles and airflow chart provided in the machine-mountable section apply to open machines by adding the flow from the open enclosures and the rotating chuck to give the flow rate for the Dryflo. For example, a 12” chuck turning at 3,000 rpm would generate about 1,500 cfm (2,549 m³/h) and a DMC-D1 could be used.

Features and Benefits

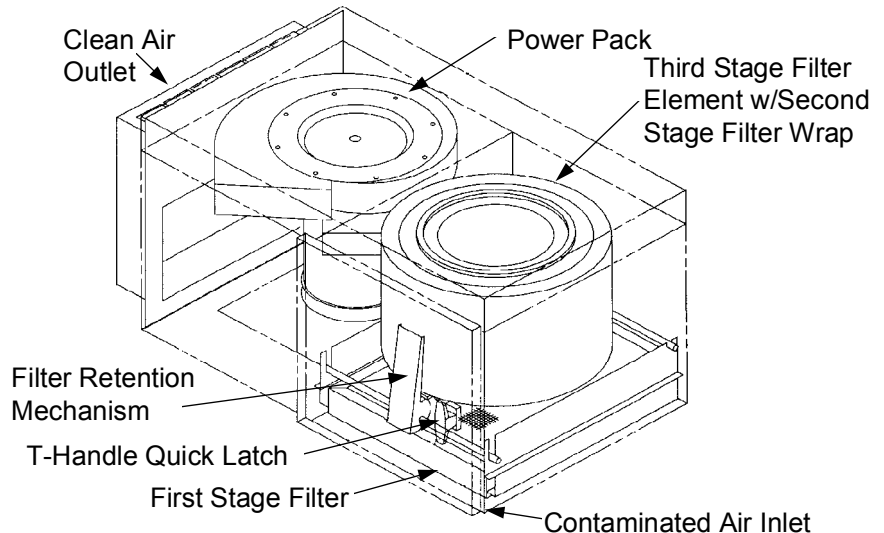
Features	Benefits
Exclusive Dryflo filtration system	<ul style="list-style-type: none">• User is guaranteed high efficiency throughout filter life
Dryflo filter cartridge	<ul style="list-style-type: none">• Easy filter changeout reduces maintenance time and worker contact is minimized
Special gauge with red and green zones	<ul style="list-style-type: none">• No maintenance guesswork is required
First stage filter options	<ul style="list-style-type: none">• Cartridge and wrap filter life are maximized with proper first stage filter
Hinged doors and tool-free cartridge access	<ul style="list-style-type: none">• Quick and simple access to filter makes collector maintenance easy
Optional HEPA	<ul style="list-style-type: none">• Final “safety” filter protects workers and, on models DMC-C, is easily added later
Compact unit footprint	<ul style="list-style-type: none">• Conserves limited or expensive floor space

Machine-Mountable Dryflo® Mist Collectors

Product Overview

The Torit® Dryflo mist collector is used for collection of airborne mists. The Dryflo is often used to collect coolant mists resulting from machining operations. The machine-mountable unit was designed in 1995 to collect oil, water soluble and synthetic coolant mists from a variety of machining operations and other industrial processes. The unit will also collect a small amount of dust from machining operations. With the optional HEPA (High Efficiency Particulate Arrestance) filter, smoke from machining operations can also be collected.

Standard sizes can handle airflows from 390 - 800 cfm (663 - 1,359 m³/h). The model names, DMC-MMA and -MMB, correlate to the size of filter cartridge and the fan capacity. For example, the machine-mountable A, DMC-MMA, is smaller in cartridge and physical size, as well as in capacity than the -MMB.



Proper installation and use of the machine-mountable Dryflo mist collector will greatly improve the quality of factory air. This Dryflo mist collector is a key component to meeting industrial and government air quality standards. The filter elements in the machine-mountable Dryflo mist collector are the key to the efficient long-life operation. With the high efficiency filtration from the Dryflo, exhaust air can often be recirculated to the factory.

Operation Explanation

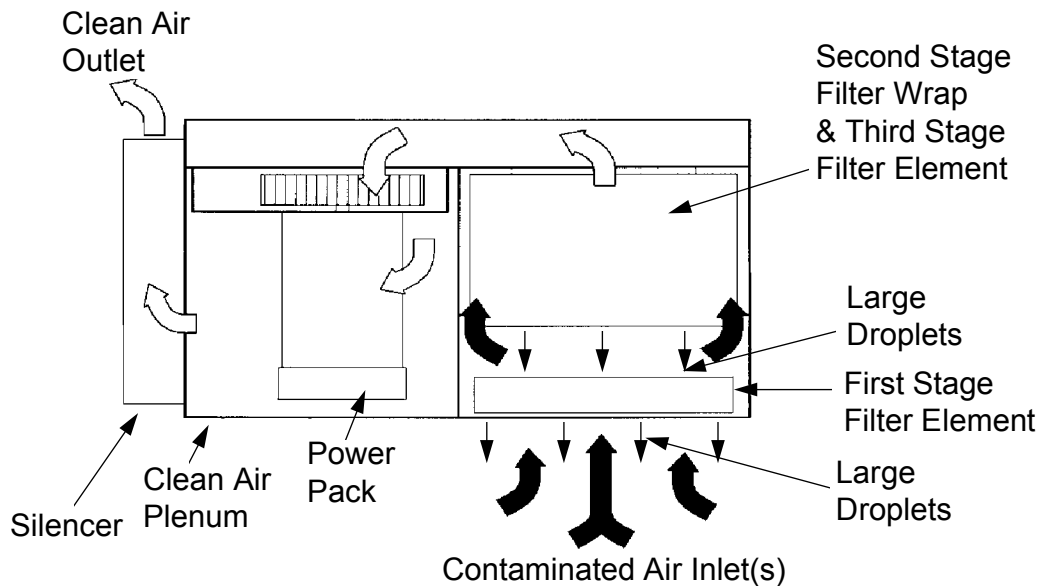
Normal Operation: During normal operation, contaminated air enters the Dryflo mist collector through the inlet opening located on the bottom of the unit.

The air passes through the first stage filter which is designed to collect and coalesce large droplets and particles. The first stage filter is reusable and may be cleaned periodically.

The air that passes through the first stage filter still contains smaller mist droplets. A second stage filter element wrap provides the next level of filtration. This wrap collects and coalesces mist into larger droplets. The vertical orientation of the wrap promotes drainage of the droplets.

The air then passes through the Dryflo filter element, the third and most efficient stage of filtration. This filter element is the heart of the Dryflo system. It features a pleated filter media that has been specifically designed to collect, coalesce, and drain fine mists. As mist particles coalesce and form larger droplets, the droplets become large enough to run down the element and drain back into the collector. During normal operation, the droplets will drain on both the inside and outside of the filter element. Liquid that collects on the inside of the element drains back into the machine enclosure.

Clean, mist-free air exits the filter element and enters the fan. The fan and motor are enclosed in an acoustically-lined clean air chamber for quiet operation. Clean air exhausts through the top of the collector.



Application Summary

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Mist particles are created by two basic means: mechanical action and thermal effects. Mechanical action refers to the aerosol used for light lubrication directly from the oil or coolant nozzle; mechanical action creates a mist greater than one micron in size. Thermal effects occur when localized heat vaporizes the coolant, and then the vapor cools, recondensing into a mist; thermal effects create mist from 0.01 to 1 micron in size. Other contaminants, such as dust coming off the part or the tool and smoke from the combustion of the oil or coolant, are also generated in the use of metalworking fluids in machine tool operations.

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- **Soluble oil or semi-synthetic coolant** is used for equal qualities of cooling and lubricating because the tool is moving at a faster speed on close tolerances. Examples include boring, drilling, milling and turning centers/lathes. Milling is the most common.
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The general guidelines that are key for applying a machine-mountable Dryflo mist collector are provided here. Updates to this information will be found in future product announcements.

Air-to-Media Ratio: Applications with mineral or straight oil should be operated at a maximum air-to-media ratio of 7:1. The maximum recommended ratio for all other applications is 10:1.

Proper Hooding: Hooding for a mist collection application is different from hooding for an application to collect dry dust. With most dust collection applications, one tries to capture as much of the dust created by the application as possible. However, in a mist collection application, the liquid collected is usually reused in the same operation. For example, in most machining tool applications, the liquid drains to the bottom of the machine tool sump. There it is filtered and then recirculated for reuse in the machine tool.

This makes collecting and hooding a mist collector application much like hooding a dust collector application in a packaging line where one wants to collect only nuisance dust and not the product itself. Therefore, do not place the hood too close to the application and try to minimize the amount of airflow so that:

- the operation will not be deprived of coolant or oil, and
- the mist collector will not receive a heavier loading than is necessary, resulting in longer filter life.

Inlets: The machine-mountable Dryflo is designed so the inlet of the collector is also the drain for the collected metalworking fluid. If the collected fluid does not drain back to the machining center, it can be re-entrained onto the cartridge resulting in reduced filter life. To ensure proper drainage of the collected metalworking fluid, the guidelines below should be followed:

1. Use duct conveying velocities of 2,000 - 3,000 fpm (10-15 m/sec).
2. Position the collector to avoid horizontal ductwork where metalworking fluid can accumulate. Inlet ducting should be as short as possible. Ducting should have a minimum slope of 60°.
3. Avoid bends or loops in flexible ducting. Cut the flex hose, if necessary, to provide a straight, vertical inlet and drain.
4. Inlet boxes should have a sloped bottom to promote good drainage. Avoid flat bottom inlet boxes where metalworking fluid can accumulate.

Proper Placement: Mounting the collector on an enclosed machine creates a negative pressure within the enclosure. Position the machine-mountable Dryflo so the airflow through the machine enclosure is across the chuck and then into the collector. This concept of collection at the source is the key to proper collector placement.

HEPA Option: Smoke is quite common in applications where a straight or mineral oil is used. In applications where a great amount of smoke is created, the HEPA filter option is recommended.

Sizing and Selecting Criteria

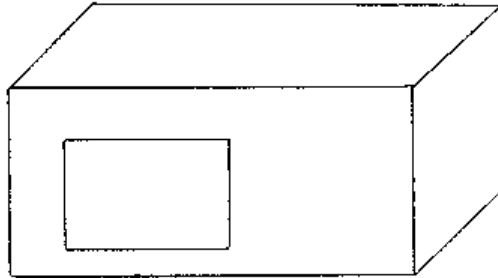
There are three different methods for calculating the required airflow from an enclosed machining center. Each of these methods should be evaluated, and then use the one that requires the most airflow. As a rule of thumb, air volume requirements will typically be greater than 200 cfm.

1. Opening Area Method: First, calculate the area of all constant openings in the machining center. These may include chip conveyor openings and cracks. Next determine the opening of the enclosure door and the type of door enclosure. There are three general enclosure door types, and each one requires different indraft velocities. This sizing method assumes that the enclosure door will be normally closed during machining operation. Then use the following equation to determine required airflow.

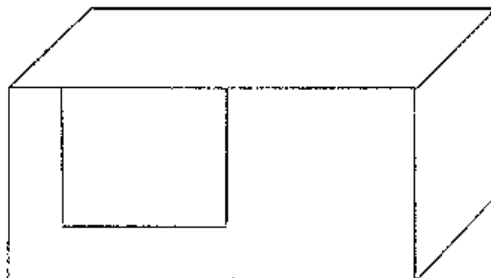
Total Air volume in cfm = (Constant Opening Area in ft² x 125 fpm Inlet Velocity) + (Door Opening Area in ft² x Door Type Inlet Velocity from next page)

General Door Configurations

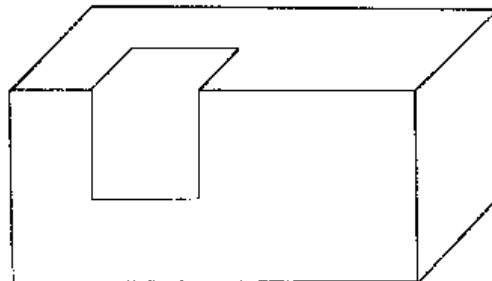
Type 1: Door opening in front with lip. Inlet velocity = 25 fpm.



Type 2: Door opening in front to top of enclosure. Inlet velocity = 50 fpm.



Type 3: Door opening in front and extending into top of enclosure. Inlet velocity = 100 fpm

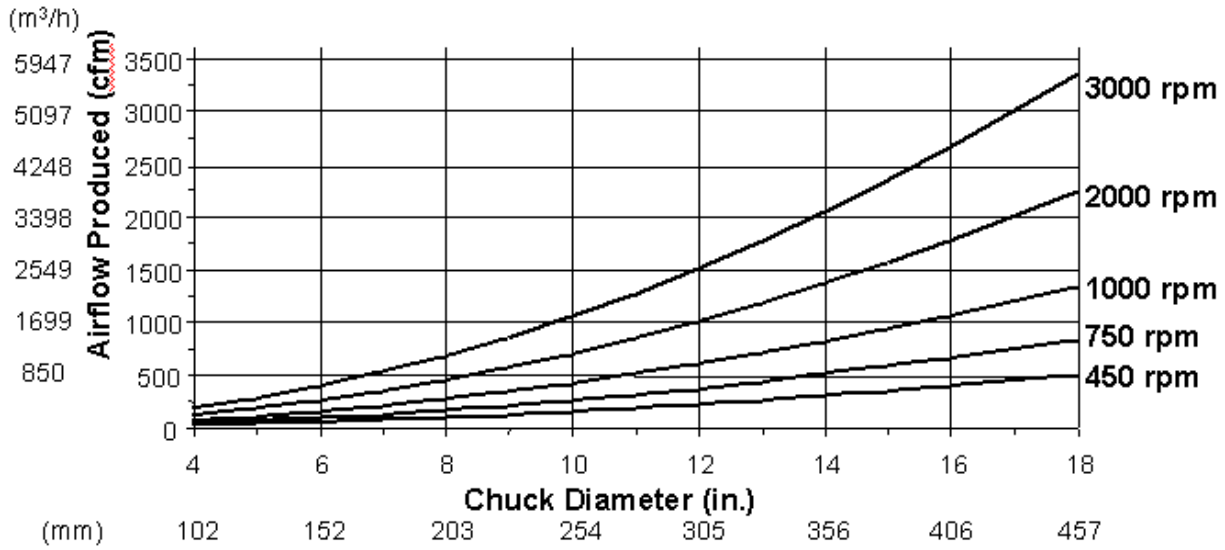


2. Air Exchange Method: Determine the machining center's enclosure volume. This may be done from the machining center manufacturer's literature or by measuring the enclosure's physical dimensions. Use the following equation to determine required airflow.

Total Air volume in cfm = Enclosure Volume in ft³ x 4 air changes per minute

- 1. Fan Effect Method:** Calculate cfm requirement to compensate for chuck/part rotation "fan effect" by referring to the following chart. (An example of that is a rotating finned brake drum). Note that this method may also be used for open machining operations.

Airflow vs. Chuck Diameter



Required Air-to-Media Ratios (AMR)

Type of Metalworking Fluid	Intermittent Duty (AMR)	Continuous duty (AMR)
Cutting Oils	7:1	5:1
Soluble oils	10:1	7:1
Semi-soluble Oils	10:1	7:1
Synthetic Oils	10:1	7:1

Features and Benefits

Features	Benefits
Machine-mountable configuration	<ul style="list-style-type: none"> Unit mounts directly to the machining center for easy and inexpensive installation and changes to plant layout
Dryflo cartridge	<ul style="list-style-type: none"> Cartridge filter specifically engineered for mist collection, with increased efficiency as the unit operates
Built-in silencer	<ul style="list-style-type: none"> Quiet operation, with a sound rating of 69 dB(A)
Special gauge with red and green zones	<ul style="list-style-type: none"> No maintenance guesswork is required.
Filter retention mechanism	<ul style="list-style-type: none"> Filter changeout is quick and easy with minimal worker contact with the collected fluid and reduced maintenance time and costs
Optional junction box	<ul style="list-style-type: none"> Quick and easy wiring without the need to remove collector panels to access the motor, reducing installation cost
Bolt-on HEPA assembly	<ul style="list-style-type: none"> Final safety filter is very easy to add later in the field
First stage filter options	<ul style="list-style-type: none"> Based on the application options are available to maximize cartridge and filter wrap life with the proper first stage filter

Advanced Dryflo® Mist Collectors

Product Overview

The Torit® Advanced Dryflo mist collector is used for collection of airborne mists. The Advanced Dryflo is often used to collect coolant mist resulting from machining operations. The unit was designed in 1999 to collect oil, water-soluble and synthetic coolant mists from a variety of machining operations and other industrial processes. The unit will also collect a small amount of dust from machining operations. With the integral HEPA (High Efficiency Particulate Arrestance) filter, smoke from machining operations is also collected.

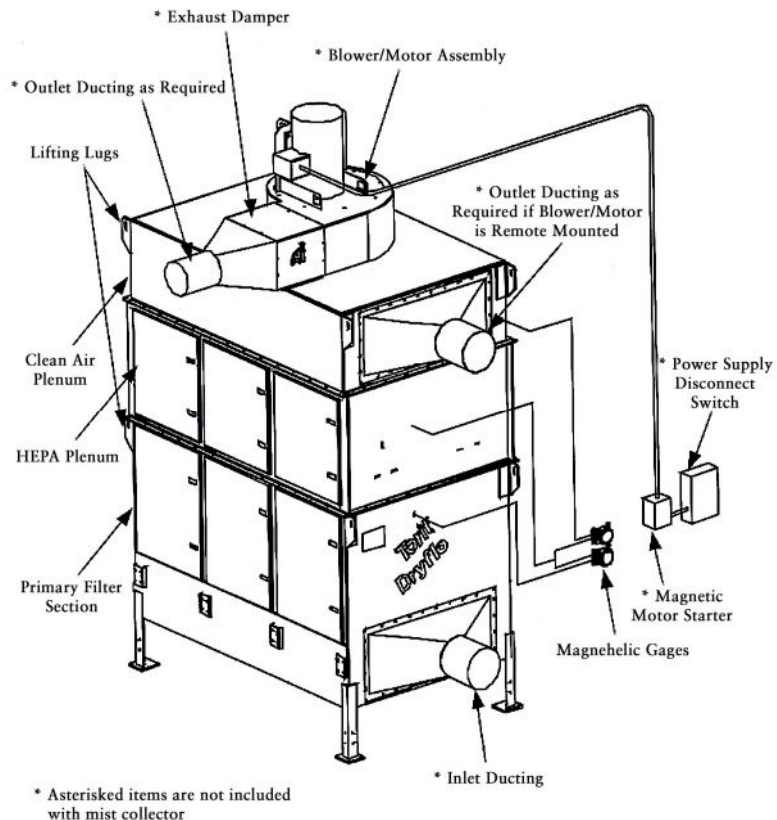
The Advanced Dryflo model names ADMC-AD6, AD8, and AD10 correlate to increasing capacity and collector size.

Standard sizes handle airflows from 12,000 to 22,000 cfm (20,388 to 37,378 m³/h) similar to the DMC-D6, D8, and D10 Dryflo Mist Collectors. The Advanced Dryflo models provide superior mist collection performance in an industrial package specifically designed to meet the applications and maintenance needs of large machining manufacturers. The Advanced Dryflo product enhancements over the standard DMC units include high-efficiency first stage filters, enhanced cabinet features, and integral fourth stage HEPA section.

Proper installation and use of the Advanced Dryflo mist collector will greatly improve the quality of factory air. The Advanced Dryflo is a key component to meeting industrial and government air quality standards. The increased efficiency of the first stage filter elements in the Advanced Dryflo increase the life of downstream filters by 2 to 3 times. With the high-efficiency filtration from the Advanced Dryflo, exhaust air can often be recirculated to the factory. To ensure high efficiency operation, genuine Torit-Built® replacement filter elements should be used in the Advanced Dryflo mist collector.

Operation Explanation

Normal Operation: During normal operation, contaminated air enters the Advanced Dryflo mist collector through one or both of the inlet openings located toward the bottom of each side of the unit. The incoming air slows and turns upward, causing large mist droplets and particles to fall out of the airstream and into the hopper.



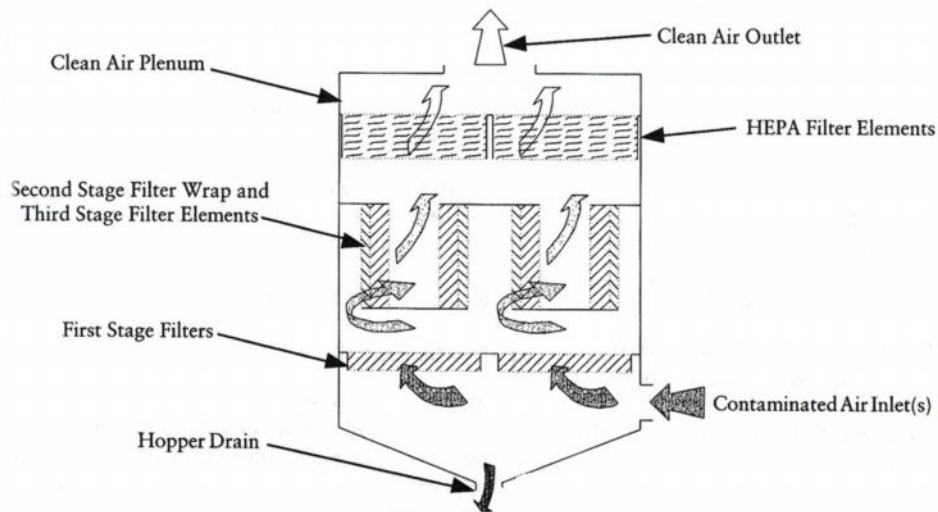
The air passes through the first stage filter, which is designed to collect and coalesce large droplets and particles. This first stage filter is reusable and may be cleaned periodically.

The air that passes through the first stage filter still contains smaller mist droplets. A second stage filter element wrap provides the next level of filtration. This wrap collects and coalesces mist into larger droplets. The vertical orientation of the wrap promotes drainage of the droplets.

The air then passes through the Advanced Dryflo filter element, the third stage of filtration. This filter element is the heart of the Advanced Dryflo system. It features a pleated filter media that has been specifically designed to collect, coalesce, and drain fine mists. As mist particles coalesce and form larger droplets, the droplets become large enough to run down the element and drain back into the collector. During normal operation, the droplets will drain on both the inside and outside of the filter element. Liquid that collects on the inside of the element drains back into the collector due to the specifically sloped design of the bottom filter pan.

The air then passes through the fourth and final filtration stage, the HEPA filter. Clean, mist-free air exits the HEPA filter and enters the clean air plenum, exhausting out the clean air plenum outlet.

The collected liquid drains from the hopper via an optional P-trap.



Application Summary

Defining Mist: Mist is defined as small droplets of materials that are ordinarily liquid at normal temperature and pressure and are suspended in the air. This mist is typically generated from metalworking fluids used in machine tool operations. Typical metalworking fluids include oil and/or mineral oil, coolant (oil and water), and cutting fluids or agents. These metalworking fluids can perform numerous functions, including: lubricating the part and tool, cooling the part and tool, flushing chips away from the part and tool, and suppressing dust and smoke. Oils and coolants enable machines to operate faster, tools to last longer, and high quality parts to be produced.

Mist particles are created by two basic means: mechanical action and thermal effects. Mechanical action refers to the aerosol used for light lubrication directly from the oil or coolant nozzle; mechanical action creates a mist greater than one micron in size. Thermal effects occur when localized heat vaporizes the coolant, and then the vapor cools, recondensing into a mist; thermal effects create mist from 0.01 to 1 micron in size. Other contaminants, such as dust coming off the part or the tool and smoke from the combustion of the oil or coolant, are also generated in the use of metalworking fluids in machine tool operations.

Mist collection is done for numerous reasons, including: minimize health effects such as sore throats, respiratory problems, and potentially cancer; reducing maintenance problems like slippery floors and dirty lights and walls; and increasing worker productivity with a cleaner, healthier work environment.

Types of machining fluids and their applications:

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- **Soluble oil or semi-synthetic coolant** is used for equal qualities of cooling and lubricating because the tool is moving at a faster speed on close tolerances. Examples include boring, drilling, milling and turning centers/lathers. Milling is the most common.
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The Advanced Dryflo can collect some dust along with the mist; however, it should not be operated without mist. The collector also is not designed to handle water mist alone. There should be some type of material to allow coalescing, otherwise water vapor will pass through the filters. The extremes of very heavy oils and very light, thin oils should be avoided. The very heavy oils (similar to tar consistency) will not drain. The very light, thin oils (similar to gasoline consistency) may evaporate.

Sizing and Selecting Criteria

The Sizing and Selecting Criteria is provided on pages DMC-8 through DMC-10, incorporated with the subsequent machine-mountable Dryflo Mist Collector section.

Note: The same principles and airflow chart provided in the machine-mountable section apply to open machines by adding the flow from the open enclosures and the rotating chuck to give the flow rate for the Advanced Dryflo.

Features and Benefits

Features	Benefits
<p>High-Efficiency First Stage Filter</p> <ul style="list-style-type: none"> • 4-inch stainless steel section with dual wire mesh screen • Riveted gaskets on filter banks 	<ul style="list-style-type: none"> • Superior filtration • Extended second, third and fourth stage filter life • Sealed off airflow to prevent bypass between the 24-inch square HEPA filters
<p>Enhanced Cabinet</p> <ul style="list-style-type: none"> • Access doors with flush handle latches and mechanically retained gaskets • Wheel-assisted retention levers for cartridge section • Pull rods for easier filter access on first stage filters, third stage cartridges, and fourth stage HEPA filters 	<ul style="list-style-type: none"> • Simplified maintenance • Minimized potential for cabinet damage in industrial environments • Tool-free filter access and replacement eliminates need to enter the dirty air plenum for maintenance
<p>Integral Fourth Stage HEPA Section</p> <ul style="list-style-type: none"> • Includes a second Magnehelic[®] gauge 	<ul style="list-style-type: none"> • Monitored pressure drop across the fourth stage of filtration • Total system efficiencies up to 99.97% DOP (dioctylphthalate particles are 0.3 micron size)
<p>Appropriate Clean Air Outlet Holes</p> <ul style="list-style-type: none"> • Round clean air outlet hole with bolted cover on the top of AD6 units for direct mounting of the appropriate size Torit backward included (TBI) fan or customer-supplied fan • Optional rectangular clean air outlet hole with bolted cover on the side and back of the AD6 to duct to a remote fan • Rectangular clean air outlet hole with bolted cover on the top, back and sides of the AD8 and AD10 units to duct to a remote fan 	<ul style="list-style-type: none"> • Ease of installation
<p>Standard Magnehelic[®] gauge</p> <ul style="list-style-type: none"> • For second stage filter wrap and third stage filter cartridge 	<ul style="list-style-type: none"> • Positive indication of when maintenance is required

* Magnehelic gauge is a registered trademark of Dwyer Instruments, Inc.