

# DYNACOM

Designing Clean Air Solutions

## Application Review: CNC Machining

### What is CNC Machining?

The term CNC stands for 'computer numerical control'. Machining is a subtractive manufacturing process that removes material in layers from a stock piece such as a bar or slug resulting in a custom part. This process is suitable for a wide range of materials but for this discussion the focus will be on the machining of steel and other metals and alloys. To cut the stock piece a cutting tool is used. To keep the cutting tool lubricated and cooled and to flush away debris a coolant is utilized. This coolant can be a straight oil, a water soluble or synthetic fluid.

### What contaminants does this process produce?

In the machining process either the part or the tool moves at very high speeds which create an airborne mist from impaction or a smoke from the heat which is generated from metal on metal.

### Capture:

For the capture of the mist/smoke from a CNC operation you need to consider the following parameters:

- Manual versus automatic feed of pre-machined stock. With automatic feed the door may never open during operation and therefore is not relevant.
- Cycle time. If the cycle time is short and the parts are manually loaded maintaining a 50-100 fpm velocity across the door opening is critical.
- Square footage of the door opening. Maintain a 50-100 fpm containment velocity across the door if manually loading parts. This is a major sizing parameter with manually loaded parts and short cycle times.
- Open area in the enclosure during operation. A 100-200 fpm containment velocity should be maintained across all open areas during the machining process and active generation of mist and smoke.
- Cubic feet of the enclosure. Ideally, it is beneficial (but not necessary) to evacuate the chamber prior to the door opening for part change over. This becomes a more relevant number with longer cycle times.

16711 Hilltop Park Place  
Chagrin Falls, OH 44023  
(P) 440.543.1900 (F) 440.543.9390  
[www.dynacomonline.com](http://www.dynacomonline.com)

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## Convey:

- Per the Industrial Ventilation Manual “fumes” should be conveyed at a minimum of 2000-2500 fpm.
- For systems ducting multiple machines to a central collector the duct should be oil tight. Oil tight duct systems include welded with flanged fittings, lock seam pipe with flanged fittings and clamp together duct with “sealed” elbows with gasketed connections.
- For machine mount collectors they are either direct mounted (no duct required) or connected via a short piece of flex duct.

## Collect:

- Electrostatic precipitators (ESP’s) are very efficient on particulate as small as 0.01 microns which makes them good for filtration of both mist and smoke.
- Disposable media systems require a HEPA post filter to filter smokes.
- Centrifugal systems require a HEPA post filter to filter smokes.

## Clean:

- ESP’s require periodic water washing of the aluminum collection components. Typically, every 1-3 months.
- Media systems have filters which require changing. Filter life has a very large range (1-12 months) dependent upon the specifics of the application.
- Centrifugal units have an interior filter pad which requires cleaning. If a HEPA filter is necessary, it will require changing. Centrifugal units may also require periodic balancing.

## Combustibility:

- Machining mist applications typically do not present any type of explosion or fire issue. However, when using a straight oil there is a potential for “flare ups” or fires. Some companies may choose to install a fire suppression system or utilize a fire damper in these instances.

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