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Application Review: Wet Grinding of Metals

What is wet grinding?

Metal grinding is a finishing process done to smooth out metal parts and components. There is typically a grinding wheel when metal grinding is performed. Grinding can be done both dry and wet. For this discussion we are looking at wet grinding that uses a coolant to keep the grinding wheels cool and to wash away debris.

Types of wet grinders include:

- Wet surface grinders (can also be dry)
- ID (inside dimension)
- OD (outside dimension)
- Rotary surface grinders (Blanchard or Mattison)
- Centerless (Cincinnati)
- Cutter tool grinders (Rollomatic grinders)

What contaminants does this process produce?

The large majority of wet grinders use a synthetic coolant that is typically mixed between 10:1 and 40:1 with water. The grinding wheel is a composite wheel made of abrasives and then bonded together via pressure and an adhesive. The speed of the wheel making contact with the flooded metal surface creates an airborne mist. The higher the speed of the wheel and the more surface area in contact with the metal, the greater the amount of mist.

The contaminants are the synthetic coolant mist containing both metal (from the part) and composite (from the wheel) solid particulates.

Capture:

Most grinding machines have some form of shielding to protect the operator in the event the grinding wheel breaks apart. However, that shielding is seldom sufficient to act as an enclosure for mist containment. Therefore, it is common for the need to create more of an enclosure or to utilize a hood over the source of the mist for capture. Containment velocities of 100-200 fpm are necessary for the containment of grinding mist.

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Convey:

- Recommended duct velocities for grinding mist should be 2500-3000 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.

Collect:

While electrostatic precipitators (ESP's) and centrifugal devices have been used for this application they are not recommended. ESP's tend to short out due to the high water content and the metal particles contained in the mist.

Centrifugal devices can go out of balance if the solids generated in this process accumulate on the fins/blades of the unit. This is not a good application for centrifugal units.

The best available technology for this application is a disposable media filter with a fiberglass bag filter and mist impingement filters. This is a low-level filtration technology and therefore typically an economical approach.

Clean:

- Disposable media systems have a metal mesh prefilter which requires cleaning 1-2 times per year. The bag or cartridge main filter require replacement 1-2 times per year.
- The duct should be cleaned periodically as a thick greasy material can accumulate over time.

Combustibility:

- Grinding mist applications typically do not present any type of explosion or fire issue.

NOTE: Cutting tool grinding (Rollomatic) is an automatic grinding which is in a full enclosure and often times uses a straight oil. Machine mount ESP's are an extremely effective option for Rollomatics.

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