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Application Review: Plastic Extrusion

What is Plastic Extrusion?

Plastics extrusion is a high-volume manufacturing process in which raw plastic is melted and formed into a continuous profile. Extrusion produces items such as pipe/tubing, weatherstripping, fencing, deck railings, window frames, plastic films and sheeting, thermoplastic coatings, and wire insulation.

This process starts by feeding plastic material (pellets, granules, flakes, or powders) from a hopper into the barrel of the extruder. The material is gradually melted by the mechanical energy generated by turning screws and by heaters arranged along the barrel. The molten polymer is then forced into a die, which shapes the polymer into a shape that hardens during cooling.[1]

1.The European Plastic Pipes and Fittings Association.

What contaminants does this process produce?

Dependent upon the plastic used the characteristics of the smoke may change. Since plastic has a petroleum hydrocarbon it creates an oil contaminant. However, some of these contaminants go from a smoke to a solid particulate when the temperature drops below 125-130 degrees F. In some instances (i.e., nylon) this results in a snow-like substance. When this flaky snow-like material is pinched between your fingertips it will once again turn to oil

Capture:

Most often the smoke is captured at the die where the material is extruded and first is exposed to air. Either a permanent hood or a source extraction arm can be used to capture the smoke (see pictures below). Typically, capture of the smoke is simple and will take no more than 1000 cfm.

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Convey:

- Per the Industrial Ventilation Manual "fumes" such as welding smoke should be conveyed at a minimum of 2000-2500 fpm. Higher duct velocities for this application are recommended as the particulate can adhere to the walls of the duct and even potentially completely fill and block the duct. Velocities of 3000-3500 fpm are recommended.

Collect:

- The best available control technology for plastic smoke applications is an electrostatic precipitator. These applications have the potential to be very high maintenance items. In some cases, they will require cell cleaning on a weekly basis.
- The alternatives are media-type filters with a HEPA post filter to capture the smoke. The issue with these is that filter medias can potentially blind in hours resulting in constant and costly filter replacement.
- If the collected contaminant (aka smoke) remains in a flowable form (oily), it is an exceptional application for ESP's. If not, the ESP is still the best technology despite the high maintenance. It becomes the lesser of two evils.
- In some instances, heat can be used to keep the smoke in a liquid form. This can be accomplished by introducing heated air into the duct. Heat can also be used on the bottom of the cabinet to allow it to remain in a liquid form for draining purposes. NOTE: these additional heat sources can lead to potential fire issues which may require their own attention prior to operation and start-up.

Clean:

- ESP's require periodic water washing of the aluminum collection components. The time between required cleanings can range from weekly to several months. Factors will include type of plastic extruded, material additives to the product, hours of operation, and volume of smoke

Combustibility:

- Plastic smokes do not present an explosion hazard.
- Plastic smokes can present a fire hazard. Since they are an oily material, they make a great fuel. The potential for fire is typically limited to when external sources of heat are used to keep the material in a liquid form.

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