Safety Note 74

Use of Polymer Filament Desktop 3D Printers

1. Purpose

Affordable desktop 3D printers are being widely used in businesses, schools and colleges. Some of these printers use filaments to deposit polymer through a heated nozzle to build three dimensional objects. This type of desktop printer is generally unenclosed, and some published studies have raised concerns that they may release potentially harmful fumes and particles. The scientific evidence base on exposures and potential health endpoints is being developed internationally.

There are various 3D printing technologies. Health and Safety Executive commissioned report RR1146 and CLEAPSS document on managing risks associated with desktop 3D printers focusses on Fused Filament Fabrication, which is the most commonly used technology used in schools, colleges and universities. FFF printing is a process of laying down melted plastic filament in a series of layers. The adjacent layers cool and bond together before the next layer is deposited. Two common filament materials that are used are: polylactic acid (PLA) which is generally used in schools, colleges and universities and acrylonitrile butadiene styrene (ABS).

This safety note will list potential hazards associated with using Polymer Filament Desktop 3D printers and guidance on what needs to be considered for the safe use of these printers

2. Hazards Associated with Polymer Filament 3D Printers

The following hazards need to be considered when conducting a risk assessment:

- Moving components
- Heated components
- Ultrafine particle emissions
- Chemical emissions
- Electricity
- Heavy equipment
- Hazardous waste
- Cleaning chemicals

3. Guidance on the safe use of Polymer Filament 3D Printers

- Move to using the lowest nozzle temperature practicable for the application
- Use PLA in preference to ABS for the filament material
- If the printer is fitted with an enclosure, that the enclosure should be left in place once printing has finished for a minimum of 20 minutes to allow enough clearance time for contaminants. A well-designed exposure control cabinet should include a fan to draw the air through a suitable filter for ultrafine particulates e.g. HEPA filter, and a carbon filter for capturing volatile organic chemicals (termed VOC).
- General/Task risk assessments and COSHH risk assessments must be conducted to comply with health and safety legislation – refer to manufactures information and component Safety Data Sheets (SDS)
- Contact local Health and Safety Coordinator (HSC) for guidance in completing risk assessments
- If bought or you are thinking of purchasing 3D printers, laser cutters and bag sealers, contact your local HSC

Further information can be found via the references listed at the end of this safety note.

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References:

1. Health and Safety Executive: Managing and controlling emissions from polymer filament desktop 3D printers, Samantha Hall, Ian Pengelly, James Staff, Neil Plant and Gareth Evans. http://www.hse.gov.uk/research/rrhtm/rr1146.htm

2. CLEAPSS Design and Technology: 3D Printing in Schools and Colleges: Managing the Risks. http://science.cleapss.org.uk/Resource/3D-printing-in-schools-and-colleges-managing-the-risks.pdf

University of Reading