

Introduction

Techne Industrial Fluidised Baths are widely used as thermal cleaning tool by polymer manufacturers. The Industrial Fluidised Bath removes plastic residues from extrusion tooling components, systems and parts quickly, safely and without damage to the tooling. Industrial Fluidised Baths contain dry, inert aluminium oxide particles called alundum. This has a coarse, brown powder appearance. In a fluidised state the alundum becomes mobile, with similar physical properties to a liquid, although freezing, boiling and evaporation is eliminated.

Fluidisation evenly distributes heat for excellent high thermal stability. Industrial Fluidised Baths are an effective, safe and clean alternative to oil, salt, ultrasonic and molten-metal baths. Industrial Fluidised Baths are also more effective at cleaning residues from stainless-steel polymer extrusion tooling than ovens, furnaces and blow-torches with none of the associated risks of warping and damaging the expensive tools. Techne Industrial Fluidised Baths are widely used for cleaning dies, breaker plates, spinnerets, nozzles, extruder screws, tools, manifolds, tips and more. Techne have supplied Industrial Fluidised Baths to companies who extrude plastic tubes, rods, sheets, films, electrical cables and wires. There are 6 sizes of Industrial Fluidised Bath ranging from 5 litre to 64 litre working volume at temperatures up to 600°C.

Reference site

Smithers Rapra Technology is a UK company based in Shrewsbury, Shropshire recognised for industry-leading independent rubber, plastic and composite expertise. Smithers Rapra Technology provides a wide range of practical consultancy services covering, testing, analysis, processing and research for polymer industries that use plastics and rubber in product or production processes. Figure 1 illustrates the Techne thermal cleaning equipment in use at Smithers Rapra Technology.

Fig.1 Smithers Rapra Technology IFB-51 test equipment



IFB-51 (FIFB51D) with extraction collar (F6157)

Sample basket (FA625)

Cyclone/collection bin (FSCN1)

Extraction fan (F5243)

Sample cleaning

For any plastic extrusion company or polymer manufacturer considering the purchase of a Techne Industrial Fluidised Bath, a trial tool cleaning service is available. To test the outcome of cleaning particular steel tooling in an Industrial Fluidised Bath, please contact the Techne Product Manager jim.bratherton@bibby-scientific.com.

When samples are received, the Smithers Rapra Technology test equipment is used to clean the tooling. Before and after photos are provided. There are no fees charged and tooling can be returned if required.

Case study

Introduction

In August 2013, a used breaker plate and steel extrusion nozzle were received by Kunbird Industry & Trade Shanghai, a Chinese polymer manufacturer interested to purchase a new Techne Industrial Fluidised Bath for thermal cleaning purposes. As shown in figure 2, the breaker plate contained particularly heavy contamination.

Fig.2 Pre-cleaning tool images. Left: breaker plate. Right: extrusion nozzle



The IFB-51 was switched on and the temperature set to 500°C. The fluidising airflow was set to 25-psi and the unit was allowed to heat for 4 hours. When the temperature was reached and stabilised, both tools were loaded into the wire sample basket and lowered into the fluidised alundum. The extraction fan was switched on to ensure all burnt polymer fumes were safely extracted to the outside. The test equipment setup can be seen in figure 3.

Fig.3 Cleaning commences in the Smithers Rapra Technology test equipment



Cleaning steel extrusion tooling in an Industrial Fluidised Bath typically takes between 30 minutes and 2 hours depending on polymer type, temperature and level of cleaning required. In this case, such a large amount of polymer surrounded the breaker plate that the Industrial Fluidised Bath was left to clean for several hours.

Results

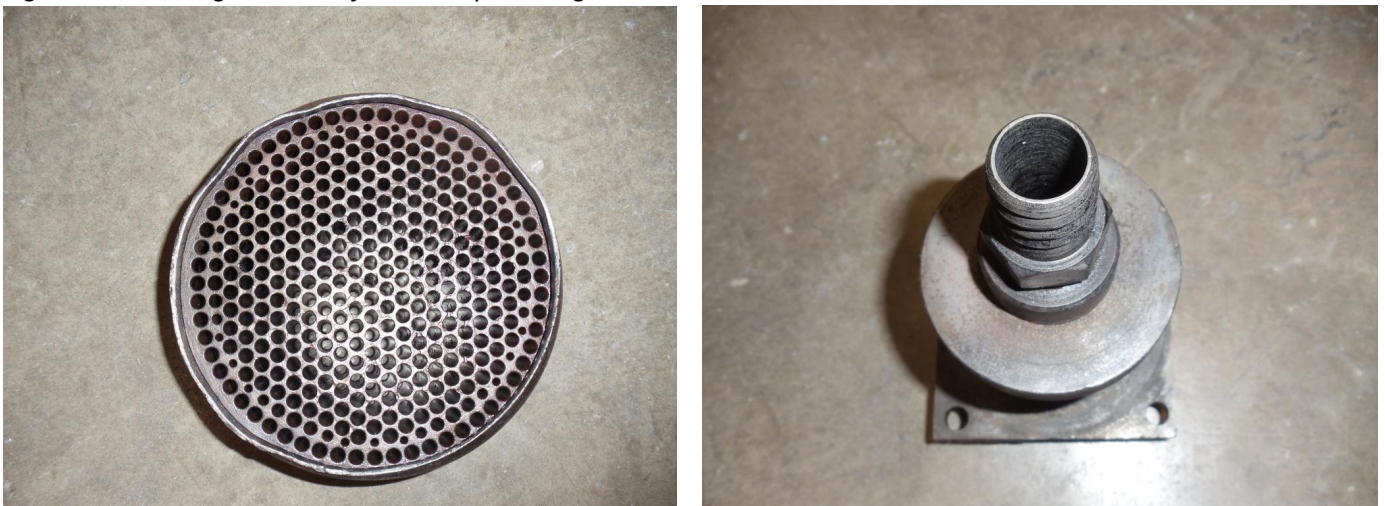
After a few hours at 500°C all polymer had completely burnt off and the basket was extracted from the Industrial Fluidised Bath as seen in figure 4.

Fig.4 Cleaning finishes in the Smithers Rapra Technology test equipment



Due to the large amount of polymer surrounding the breaker plate, the identity of this sample was unknown until retrieval from the Industrial Fluidised Bath after cleaning. Under normal circumstances, all polymer is removed during cleaning. However in this case some small holes of the breaker plate still contained traces of burnt polymer residue. This was easily removed when poked by a short length of copper wire. After cleaning, steel tools are normally given a light coating of spray oil to prevent rusting. The results of cleaning can be seen in figure 5.

Fig.5 Post-cleaning results. Left: breaker plate. Right: extrusion nozzle



Conclusion

Using a Techne Industrial Fluidised Bath for thermal cleaning of stainless-steel plastic extrusion tooling is a safer and cleaner alternative to using traditional oil, salt, ultrasonic or molten-metal baths. There are no harmful or unpleasant vapours produced by hot fluidised aluminium oxide – unlike salt and oil mediums. In addition, hot aluminium oxide does not projectile out of the Industrial Fluidised Bath as is the case with hot salt. Finally, Industrial Fluidised Baths are more effective at cleaning than ovens and furnaces whilst removing any associated risk of warping and damaging the expensive steel tooling.

Techne Industrial Fluidised Baths are significantly more efficient than the traditional cleaning method of a technician heating the tool directly with a blow-torch. Industrial Fluidised Baths clean quicker and more effectively than this manual method, due to the mildly abrasive effect of the fluidised alundum moving around the tooling, ideally suspended in the mesh sample basket. Typically when tools are removed, they are blown with a canister of compressed air to remove any remaining traces of alundum or ash and when cooled are given a light coating of liquid spray oil and are immediately ready for use.

The images in figure 6 below show additional, recent examples of how Techne Industrial Fluidised Baths are being used to clean polymer residues from steel tools. For more information, please go to www.techne-calibration.com.

Fig.6 Before and after images of additional recent customer tool cleaning



Please note: the IFB-51 maximum working volume is 26cm diameter and 30cm depth