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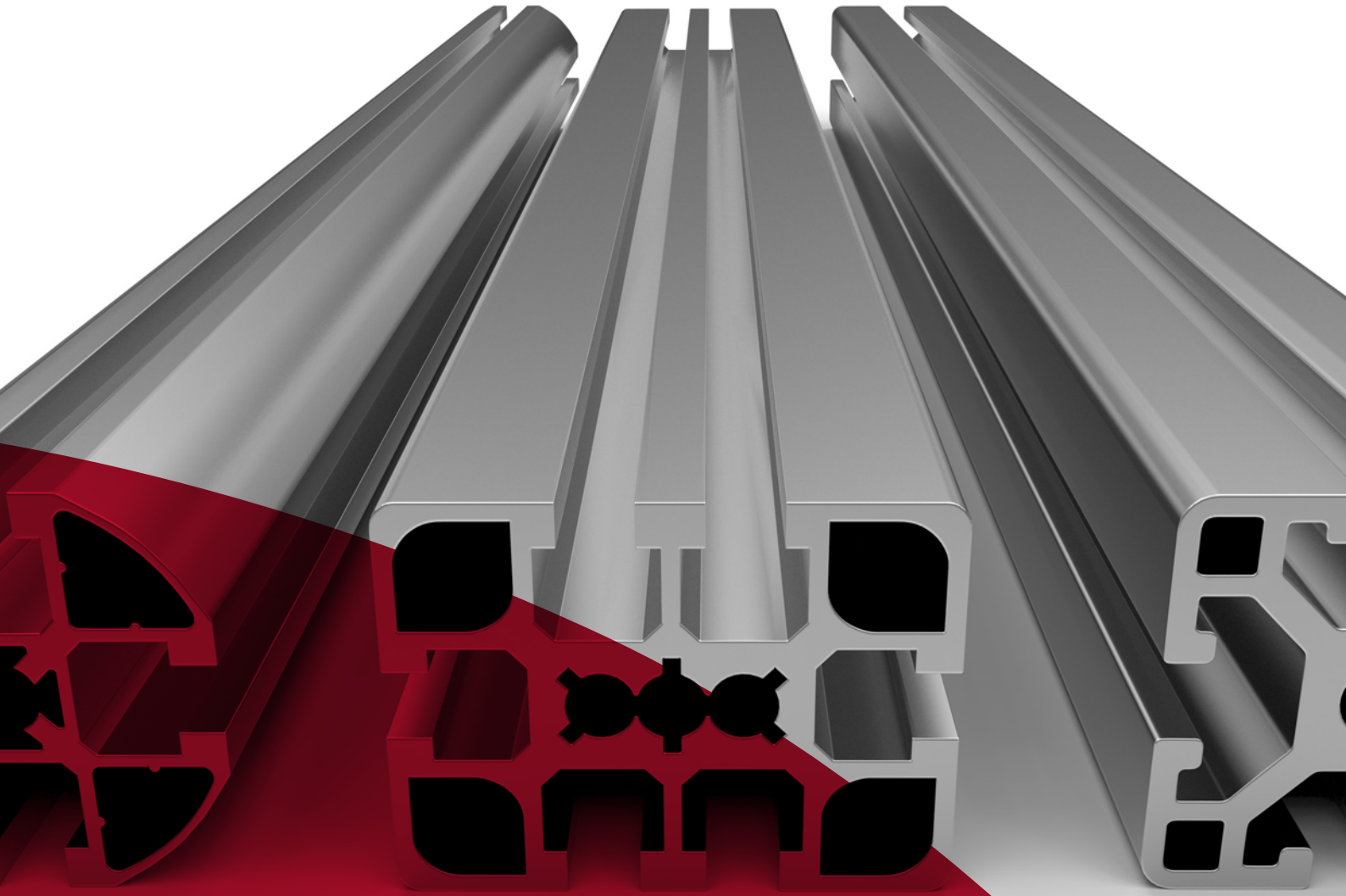


White paper

The benefits of wet blasting for die shop managers

As part of the extrusion process there is a vital requirement for the on-going cleaning and polishing of dies. This is a critical operation for the continual production within an extrusion plant but one that is often considered time consuming and full of repetitive processes.

However, without proper care and attention given to the preparation of dies, extruders risk high extrusion scrap rates and low die success rates. Previously, many extruders attempted to tackle this problem by adopting a dry blasting system; these bulky and typically dusty machines utilise steel shot to reduce the amount of manual filing involved at the die correction stage, but are often cumbersome to use and hard to maintain. As technologies and processes have improved there is a need for die shop managers to assess new alternatives; processes that have proven to be extremely viable in that they are both time saving and cost effective.

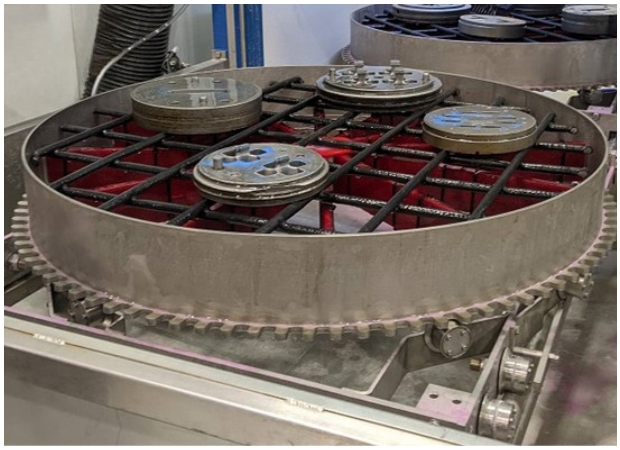
Consequently, this paper looks to explain the benefits of adopting wet blast technology for use in extrusion die shops. By explaining the benefits that the process offers to extruders and the science behind wet blasting, the aim of this paper is for it to be used as a source of information for those managers and buyers looking to purchase new die cleaning systems.

Before **After**

With wet blast technology extruders can achieve a quicker, more effective and consistent polishing action that can improve the die success rate when compared with conventional systems.

Application advantages

With wet blast technology extruders can achieve a quicker, more effective and consistent polishing action that can improve the die success rate when compared with conventional systems. Wet blasting can remove deep-seated contamination without impinging on or damaging the underlying substrate. The process also removes the time-consuming drying stage, prior to polishing, that is often required after caustic cleaning.



The primary benefits gained from using a wet blast system are that dies are polished to a much higher standard and the wet blast process can save extruders several minutes of manual polishing per die. With an industry average of 100-150 dies cleaned per day one extruder has experienced a payback on their wet blasting machine within 6 months. Being far more intensive than dry blasting, wet blasting allows particles to flow across the surface leading to increased contact with the surface and therefore a higher rate of polishing.

The improved die success rate is also a major advantage of the wet blast process which also benefits the complete operation. The ability of the wet blast process to provide uniform polishing means the die profiles can be precisely maintained. This is a technological advantage for extruders as the dry blast process has been known to abrade critical surfaces at different rates due to the flow, or lack of, in the particles. The intensity of some dry blasting machines can damage a die causing the extruded profiles to perform poorly - with wet blasting, this is no longer an issue.

The ability to constantly achieve consistent and uniform polishes allows extruders to improve their die success rate. From working with various extruders, who use wet blasting, it has been found that die success rates can be increased significantly.

Wet blasting can also provide a better working environment. By adding water to the process there is an elimination of all airborne particles and a reduction in the amount of abrasive surrounding the machines that can cause floors to become slippery. These higher levels of industrial hygiene mean the requirement for housekeeping is reduced within the die shop. Wet blasting also has the advantage of eliminating the drying stage that is often required after the caustic rinse.

The wet blasting process

Originally pioneered by Norman Ashworth in the 1940's, wet or vapour blasting has grown to fit a wide range of applications with its main purpose to provide a highly precise surface finish.

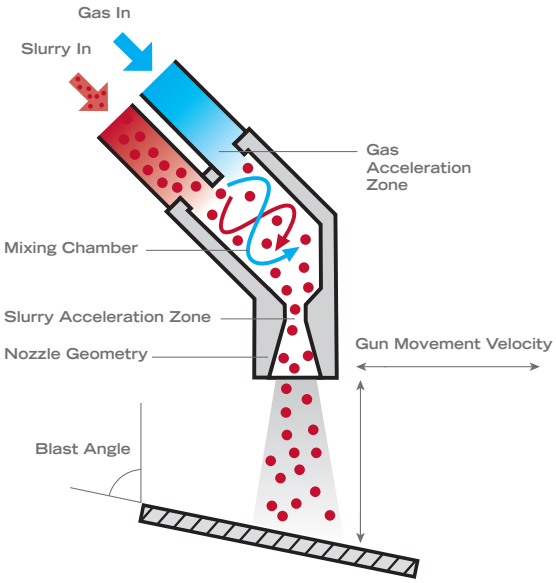
Wet blasting uses water and an abrasive medium to form slurry in the sump tank of the installed system. As the slurry is pumped through the system towards the gun heads compressed air is introduced; by allowing the slurry and air to synthesise within the mixing chamber of the gun a highly powerful blast stream is created which in turn accelerates through the boron carbide nozzles. Having impacted upon the bearing surfaces the slurry is then recirculated through the same system for continuous use.

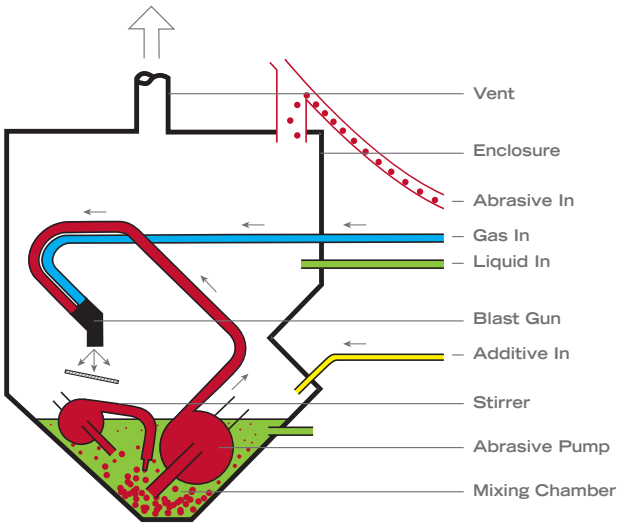
Similar to dry blasting, it is the abrasive content that plays an essential role in achieving the desired surface and this is very controllable as the form, hardness and mesh size of abrasive particles can be changed to suit the application. The recommended abrasive used for the die cleaning application is a pre-mixed compound of both aluminium oxide and glass beads and this mix yields two key benefits.

The abrasive action of the aluminium oxide particles easily removes all traces of surface contaminants on the bearing surfaces and die faces whilst the glass bead particles work to polish and peen the die face and bearing surfaces to remove traces of carbonisation. This intensive process ensures that the surfaces are left extremely clean when compared with alternatives; this makes a wet blasted die very easy to nitride. Having been wet blasted, nitrogen can easily diffuse into the die due to the reactiveness of the bearing surfaces.

Controllable factors

Gas - Type, Pressure, Flow Speed and Temperature
Slurry - Solid/Liquid Ratio
Liquid - Type, Pressure, Flow Speed and Temperature
Solid - Type, Size, Hardness and Shape
Gun/part kinematics - Velocity, Distance and Angle





From the extensive development of the process, it has been found that users of a wet blast system should keep their abrasive concentration levels at 20% to achieve optimum results. To maintain this, sight glasses can be installed to make measuring this a simple task. The rate at which abrasive is used up is largely dependent on a range of factors such as air pressure, the number of blast guns being employed and cycle duration and frequency of use.

As a guide, most systems have an attrition rate of 500g (1lb) per gun per machine hour, and this is far lower than the rate found in dry blasting machines. As mentioned earlier, the fluid dynamics involved with the process allow particles to be buffered by lubricating them in water and this creates a far less aggressive action than dry blasting. The water allows the abrasive media to flow consistently over the bearing surfaces so the die profiles can remain unchanged in their geometries. It is the flow of water that gives wet blasting a distinct advantage over traditional means as the slurry can easily navigate and permeate the often complex paths found in intricate die designs whilst achieving a uniform polish.

Conclusion

With the uptake of wet blasting technology by the extrusion industry, extruders have gained access to a technology that is not only far more effective than traditional methods, but can also yield great savings in both the polishing operations and the extrusion department as a whole.

Vapormatt Cougar + wet blasting machine

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