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MICROBLASTING TECHNOLOGY

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iepco Microblasting Technology for Mould Making and Tool Manufacture:

The right method to achieve improved surfaces

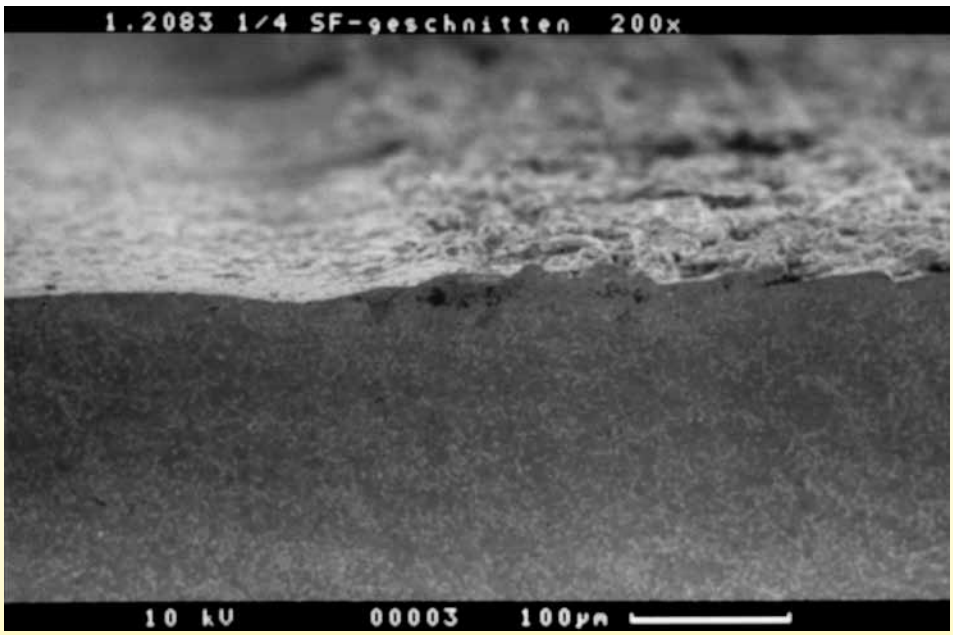
On applying by spark erosion a so-called white zone is created, whose thickness varies according to the method and the adjustment or fine-tuning employed. However, in the fields of tool manufacture and mould making, the mentioned white zone is undesired in most cases. Very often, the removal of these carbonized layers still takes place by using conventional manual tools. But today, there is a more expedient way, as shown below.

ANDRÉ FAUDE

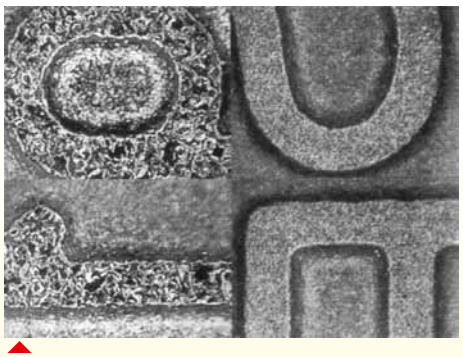
The microblasting technology corresponds to a dry, ultrafine blasting process, whereby various blasting agents with accurately defined nominal grain sizes and grain geometries are shot onto the surface of the workpiece by means of a propelling gas (compressed air). In this way, the micro topography of the surface is modified. By means of the accurately targeted microblasting technology, workpieces - especially hard materials - can be processed exactly at the desired spot, without the risk of provoking tensions or excessive heating. In this way, it is possible to improve the properties of a wide variety of processing materials, i.e. their hardness, resistance to wear and tear, anticorrosion properties, gliding behaviour and wettability. Step by step, the surfaces are subjected to a highly fine-tuned treatment in order to achieve precisely defined degrees of surface roughness up to ultrafine surfaces. The microblasting technology reduces frictional resistance, optimizes pairing characteristics and prolongs the serviceable life of materials used.

PEENMATIC 770S
Standard microblasting equipment for tool manufacture and mould making

PEENMATIC 850 ZDA-2
Automatic microblasting equipment with two rotary cages



1 White layer of varying thickness on mould surface (right), and mould surface cleaned by microblasting, provided with bright metallic appearance and improved surface properties (left)



2 Die produced by cavity-sinking EDM prior to (left) and after microblasting treatment (right); 200fold magnification

Treatment of Eroded Surfaces

Due to the high temperatures (approx. 3'500° C) during spark erosion both in case of wire-EDM as well as cavity-sinking by EDM, a so-called white zone (martensite/cementite) is created. This is molten mass which has again solidified in crystallized form, depending on the heat dissipation into the workpiece and the dielectric. The molten mass has a high carbon content. Metallographic analyses confirm the fact that this zone varies in thickness (0 to 0.2 mm) depending on the layers removed (discharge energy). The structure is irregular and fissured, with overlappings of meltings *(picture 1)*.

It is a fact, that every spark-erosion process creates such a white zone (also called «melting zone» if hard alloys are involved) and that such a layer is only provided with negative characteristics. It is thus absolutely unusable for engraving and/or etching (structural etching), for nitriding (gas and bath nitriding) and also for coating (electroplating, PVD or CVD process). Hence the conclusion: **It is necessary to remove the white or melting zone from the mould's surface.**

The microblasting technique aims at a neat removal of the white zone while simultaneously improving the surface roughness according to VDI norm 3400 prescriptions, for example from class 21 to class 18. It is possible to achieve surface roughness values of less than 0,5 µm hrms *(picture 2)*. The ensuing advantage is a shorter smoothing time required by the spark-erosion machine as well as an impeccable further surface treatment without the use of conventional tools (diamond files and pastes).

Using **IEPCO's** microblasting equipments, it is possible to remove in an optimal manner any surface impurities caused by spark erosion. Depending on the size of surfaces to be treated, it is possible to blast away the white zone of various thicknesses within minutes, without removing the corners and edges, while entirely preserving the tolerances in respect of dimensions and form. Especially with respect to mould making, it is possible to achieve an excellent rationalization effect by applying this method.

Important note: **Every tool manufacturer should always calculate / measure the effectively eroded dimension exclusive of the white zone.**

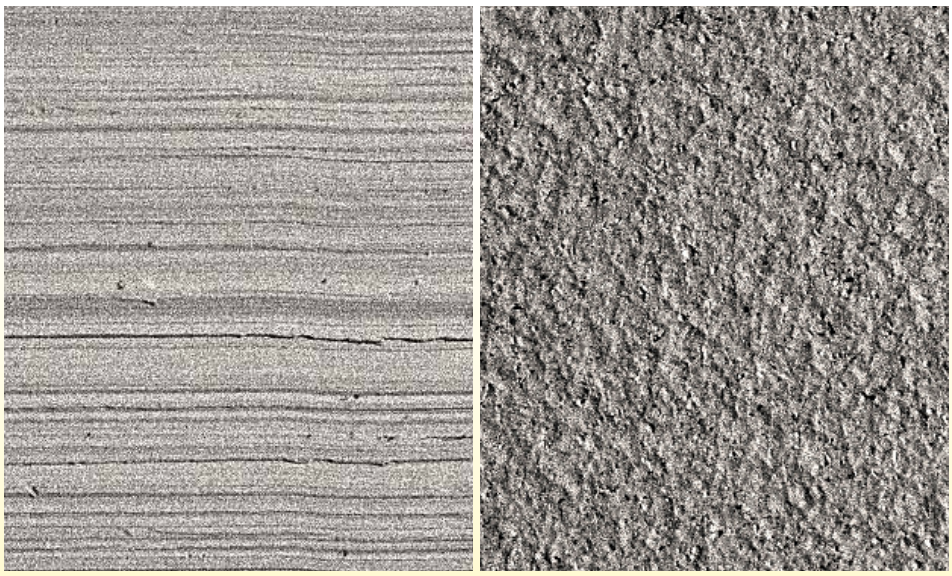
Treatment of Ground Surfaces *(picture 3)*

There are two causes negatively affecting the surface of form tools in case of grinding: On the one hand, this processing entails grooves due to grinding with related injection problems as well as ejection and removal difficulties; on the other hand, there is the so-called overheating on grinding, meaning that the grinding wheel is not correctly prepared and operated (the grindstone and the bond are situated on the same level), which provokes more friction than grinding. The result consists in many carbide-natured deposits and/or insertions (grinding-wheel residues) on the surface. In this respect, too, the microblasting process, used as a subsequent operation, helps to solve surface-related problems. Surfaces having been soiled during machining, grinding, polishing and brightening can thus be cleaned without any problems. All particles not firmly incorporated in the material's structure and consequently negatively affecting any production process are removed by the jet of accurately defined minuscule blasting grains.

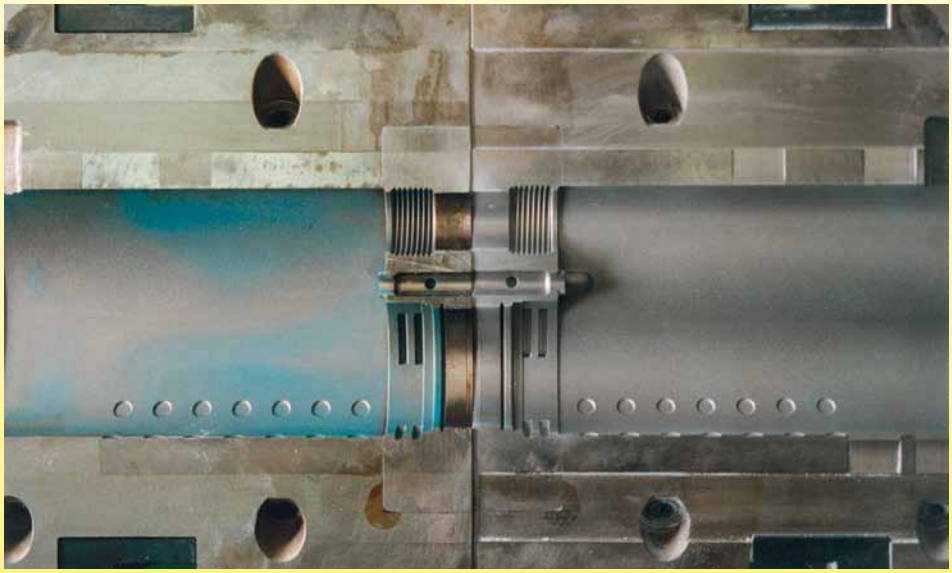
Surfaces having been fissured by grinding and which are oriented toward a specific direction - mostly not in the injection direction - are planed, levelled and compacted by the microblasting process (shot peening). These uniform, planed and compacted surfaces are perfectly suited to the manufacture of form tools. Providing such a surface finish often is accomplished in just a few minutes.

Reprocessing of Mould Surfaces *(picture 4)*

Once surfaces of moulds and forms have been provided by the microblasting process with optimal characteristics ensuring smooth production operations, then reprocessing for regeneration of such characteristics can be repeated at any time. Especially during the manufacture of elastomers (injection moulding and pressing technologies) and of tiny plastic parts (thermoplastics), residues on the surface of moulds and forms can not be avoided. It is noteworthy that with every reprocessing and regenerating of the form tool its service life can actually be prolonged, as surfaces become ever more suitable for ejection and removing purposes. Less deposits and/or layers on surfaces do occur thereafter, while the smooth low-friction surfaces of moulds allow an undelayed flow of the molten mass which favourably influences the quality of moulded parts.



3 By grinding in one direction fissured surface (left) as well as cleaned and levelled surface by microblasting (right)



4 Pore-deep soiled mould surface of a form tool (left) and mould surface optimally cleaned by microblasting (right)

Industrial Benefits

Surface treatment by microblasting substantially lowers manufacturing costs. An excellent performance is ensured for a wide variety of applications:

– **Punching:** The coefficient of friction and the occurrence of cold bonding get very much reduced. The surface is planed into smoothness. That's why the formation of burrs on workpieces is greatly reduced.

– **Remoulding/reshaping:** Wear and tear as well as the highly undesired cold bonding are greatly reduced. A smaller number of faulty or defective spots develop during this procedure in the highly stressed reshaping zones (micro tension cracks).

– **Elastomer processing:** Surfaces of form tools can be cleaned to the depth of pores in order to be subsequently planed and levelled. Undesired deposits and layers on moulds are kept to a minimum. The smooth low-friction surfaces allow an undelayed flow of the molten mass or mouldings. Advantages include a reduced occurrence of moulded parts being glued together and an easier ejection or removing from the mould.

– **Plastics processing:** Surfaces soiled by machining are cleaned down to the micron area; grooves and processing traces may partly be planed. Thereby, a far better ejection capability is achieved, along with a reduction or even elimination of parting agents used (anti-adhesive properties of mould surfaces). Moreover, uniform thermal conditions by distribution of heat do prevail in the moulding area.

– **Pressure diecasting:** Both the occurrence of adhesion and of melting together as well as the premature occurrence of hot cracks are substantially reduced.

– **Tool manufacture:** Shorter operating time of spark-erosion machines during the smoothing mode; no problems in removing the white zone; time saved on grinding and polishing operations, especially with respect to shaping areas with very bad access (cavities), such as corners, grooves, holes and hollows; diminishing of surface roughness down to < 0,5 µm.

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