

### Mould and moulding process

Moulding process is the only process that gives shape in whole MIM process. Therefore, our accumulated  $\mu$ -MIM technology know-how or intellectual properties are applied most intensively for the mould design and moulding process.

#### Mould determines not only product design but mechanical properties

Micro MIM Japan manufactures gears, nozzles and many types of components, thus, mould tooling is done by mould manufacturers who have the world-class technology for each component type.

Similar to plastic moulding, the green parts have, 1) parting line (PL) that appears along the interface where the mould opens, 2) material gate marks where we inject the material into each cavity, 3) ejection pin marks, where the product is removed from the mould. However, the products we handle are often in shapes and sizes that make it difficult to do post processing such as machining, thus it is required to make these traces as small as possible and not to affect the component properties. We design mould together with mould partners based on  $\mu$ -MIM technology which has been developed in our plastic moulding experiences.

The figure shows an example of a helical gear. This part's mould is divided into multiple pieces to eject the green part. Multiple mould divisions realise more complex design production, however, the PL increases accordingly. Although there is a PL, it has achieved a level that cannot be confirmed visually by  $\mu$ -MIM technology. PL is at the arrow in the figure, magnified 2.5 times. In addition, our PL is not distinguished even by electron microscope (SEM) observation.

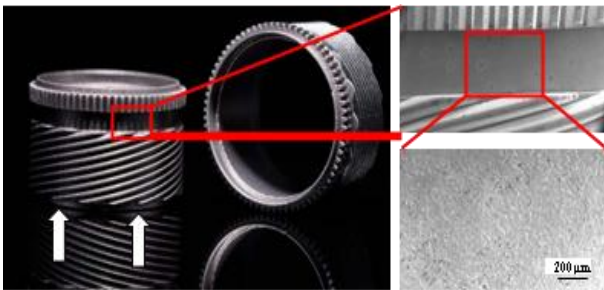


Fig. (Left) Helical and spur integrated gear using multi-part mould (Right) SEM observation image of the integrated gear at the PL

The surface roughness of the product greatly depends on the surface roughness of the mould in addition to the selection of the material powder, introduced previously in our newsletter. The smaller the parts are the more difficult post-processing becomes, thus, it is necessary to achieve the required surface roughness using only the mould and right material. Also, the feedstock fluidity affects the mechanical properties of the final component. Manufacturing moulds with properly controlled surface roughness leads to improve quality of MIM parts without sacrificing productivity. It is one of the important key factors to cooperate with the world's top-class mould manufacturers that can respond to our demands in order to realise the complicated design small MIM mass production.

#### Unique moulding experiences in the MIM industry

We were founded as a plastic injection moulding manufacture. During high economic growth in 1970s, we have experienced most of plastic materials and methods to meet the demands. Therefore, we are absolutely confident in mould technique unlike many other MIM manufacture, founded based on metal-related businesses.

Compared with plastic injection moulding, MIM green parts are brittle so there are more restrictions in injection process. However, we believe "MIM can do if plastic injection moulding can do", thus, we are constantly working hard on development of new moulding technology.

#### Exhibition



We will exhibit in MD&M West 2020 in California, USA as a part of Micro Manufacturing Association

Date: 11-13 February, 2020

Venue: Anaheim Conventional Center

Booth: 2899

#### Column

I am Junya Ishida from moulding section in manufacturing department. I have been working here since December 2018 and before that I was in Mie prefecture working as a maintenance engineer of manufacturing machine. Currently, I am responsible of injection moulding in mass-production section thus I work accordingly both in usual and in trouble occasion. It is quite different from previous work thus every day I found new things and I am enjoying that. On my days off, I take a walk with my dog or ride my motorcycle out in long distance to discover a delicious restaurants.

