High temperature sintering - main cost drivers in MIM process

In addition to the high cost of raw materials procurement (such as fine-grained metal powder, polymer binder and ready-made injection materials), high temperature sintering is one of the main cost drivers in MIM process. The investment and operation cost of degreasing sintering furnace is the key to the competitiveness of MIM parts manufacturer. In addition, selecting the most suitable furnace type according to specific production conditions is the prerequisite for success in MIM industry.

II. Applicability of Different Furnaces

Regardless of customized and highly specialized systems, most sintering furnaces on the market can be divided into periodic vacuum furnaces and continuous atmosphere furnaces. The Brown parts after injection moulding

and catalytic/degreasing contain residual polymers. Both types of furnaces can thermally remove polymers.

On the one hand, if the production quantity is the same or the parts shape is relatively large, it is more appropriate to make full use of continuous atmosphere furnace. In this case, short cycle, high sintering capacity, can get a favorable cost return rate. However, in small and medium-sized production lines, this continuous atmosphere furnace with minimum annual output of 150-200 t, high input cost and large volume is not economical. Moreover, the continuous atmosphere furnace needs longer downtime in maintenance, which reduces the production flexibility.

On the other hand, periodic vacuum furnace has outstanding degreasing sintering process control technology. Previous limitations, including geometric deformation and chemical decomposition of MIM parts, can be effectively addressed. One solution is to flush the volatile bonding material away by laminar process gas through a precise gas control system. In addition, by reducing the capacity of the hot zone, the temperature uniformity of the vacuum furnace is very good, reaching 1K. Generally speaking, the vacuum furnace has a good atmosphere cleanliness, adjustable process parameters and smaller parts vibration, which make it a technical choice for producing high-quality parts (e.g. medical devices). Many companies are facing fluctuating orders and need to produce parts in different shapes and materials. Low investment and high cycle flexibility of vacuum furnace will create favorable conditions. Running a group of vacuum furnaces can not only provide redundant production lines, but also operate different process procedures at the same time.

However, some professional vacuum furnaces with the above technical advantages are limited by small available capacity. Their disadvantage in input-output ratio and low energy utilization may offset the cost savings in other MIM process steps.

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