

# Powder Metal Press

## *Application Note*

**Powder metallurgy -P/M-** is a highly developed method of manufacturing reliable ferrous and nonferrous parts. Made by mixing elemental or alloy powders and compacting the mixture in a die, the resultant shapes are then sintered or heated in a controlled-atmosphere furnace to bond the particles metallurgically. P/M typically uses more than 97% of the starting raw material in the finished part, making it an energy- and materials-conserving process. The three basic steps for producing conventional density parts by the powder metallurgy process are mixing, compacting, and sintering.

**Mixing** - Elemental or pre-alloyed powders are first mixed with lubricants or other alloy additions to produce a homogeneous mixture of ingredients. The initial mixing may be done by either the metal powder producer or the P/M parts manufacturer.

**Compacting** - A controlled amount of mixed powder is automatically gravity-fed into a precision die and is compacted, usually at room temperature, at pressures as low as 10 tons per sq. in. or as high as 60 or more tons per sq. in., depending on the density requirements of the part. This compacting or press function is generally performed with Servo/Proportional hydraulics. Delta Computer Systems motion control modules are an ideal solution for this type of hydraulic system. These modules provide closed loop control of both position and pressure sequences. Delta's 256 event step table can also be an excellent tool for high speed recipe driven programs. Compacting the loose powder produces a "green compact" which, with conventional pressing techniques, has the size and shape of the finished part when ejected from the die, and sufficient strength for in-process handling and transport to a sintering furnace.

**Sintering** - In the typical sintering step, the green compact, placed on a wide-mesh belt, slowly moves through a controlled-atmosphere furnace. The parts are heated to below the melting point of the base metal, held at the sintering temperature, and then cooled.

*A well planned PLC program can control queuing, mold position and pick and place positioning of the “green compact” pieces.*

***Result: Higher throughput.***

**Important considerations:**

Hydraulic: Sufficient hydraulic oil, adequate accumulator pressure, proper valving and accumulator location, plus fast linear response valves with zero overlap, will ensure better control of machinery.

Controller: Fast PLC scan times and I/O update times of 40ms scans or less reduces time spent waiting for set states. Result: Increased throughput.

**Since most moves are short, minimum settling times on the motion control tuning are more important than high travel speeds.**

Benefits using Delta’s motion control modules include

- High density modules: a Powder metal press can use 3 to 44 axes of control
- Fast 1 or 2ms loop time: quicker sets for higher throughput
- Error handling capabilities: the modules react to errors and report to the PLC quickly via bus communications
- Fully tested: Third Party Vendor module

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Delta Computer Systems, Inc. manufactures motion controllers, color scanners, and other industrial controls providing high performance automation solutions to a wide range of industries.

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