

**A MANAGEMENT AND PLANNING TOOL APPROACH TO  
CLASSIFYING AND RANKING KEY PARAMETERS FOR THE  
PRACTICE OF MACHINING OF POWDER METAL (PM) STEELS**

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**Abstract:**

The machinability of Powder Metal (PM) steels is often considered a difficult topic of discussion, and an even more difficult problem to unravel. Professionals with different opinions, perspectives, and experiences tend to tackle machining issues from different starting points, direction, and expectations. The magnitude of variables cannot be studied in exhaustive fashion during one's lifetime, and certainly not within a typical manufacturing deadline. Classification and ranking of parameters, and the relationships among parameters, provides guidance and the potential to streamline activities and reduce project duration.

Starting with a fishbone diagram summary of variables, a team of professionals with extensive and diverse machining experience assembled to classify and rank key parameters, offering a hierarchy to consider when addressing PM machining activities. The Interrelationship Digraph and Prioritization Matrix (ID/PM) techniques were used to obtain each team member's opinion of machining parameter relationship and importance weighting. Subsequent analysis illustrates the key "causal" factors and the key "effect" factors. Weighting of factors provides a relative importance or prioritization of machining parameters, giving some guidance toward attacking a PM machining project.

A description of the ID/PM process, its advantages and limitations are discussed, including specifically within the context of machining PM steels. Through this effort, the top factors *influencing others* were identified as Workpiece Alloy, Workpiece Microstructure, and Workpiece Density. The top factors *being influenced by others* were identified as Tool Geometry/Design, Cutting Feed Rate, and Tool Edge Preparation. The highest strength factors, regardless of cause/effect relationship were identified as Tool Grade, Cutting Speed, and Cutting Feed Rate.