

# Optimizing MAG Welding Input Variables to Maximize Penetration Depth Using Particle Swarm Optimization Algorithm

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**Abstract :** Systems based on artificial intelligence, such as particle swarm optimization and genetic algorithm have received increased attention in many research areas. One of the main objectives in the gas metal arc welding (GMAW) process is to achieve maximum depth of penetration (DP) as a characteristic of quality and stiffness. This article has examined the application of particle swarm optimization algorithm to obtain a better DP in a GMAW and compare the results obtained with the technique of genetic algorithms. The effect of four main welding variables in GMAW process which are the welding voltage, the welding speed, the wire feed speed and the nozzle-to-plate distance on the DP have been studied. For the implementation of optimization, a source code has been developed in MATLAB 8.3. The results showed that, in order to obtain the upper penetration depth, it is necessary that: the welding voltage, the welding speed and the nozzle-to-plate distance must be at their lowest levels; the wire feed speed at its highest level

**Keywords :** Artificial intelligence, Particle Swarm Optimization, Genetic algorithm, GMAW, penetration depth, optimization, Matlab