

**Title:****Optimization of process parameters in thermal spraying****Subject:**

Surface treatment includes a series of techniques that can modify the mechanical, physical and chemical properties of the substrate by forming a layer of materials. It is able to comply the wear resistance, decoration or other functional requirements of the product. For instance, methods like Chemical Vapour Deposition (CVD) or Physical Vapour Deposition (PVD) can improve hardness resistance by offering thin films less than 20  $\mu\text{m}$ . However, terms such as deposition rate, coating thickness and cost limited the further applications.

Based on a specific technique principle and feedstock material, thermal spraying is able to elaborate a coating from several micrometres to a few millimetres in thickness. In this process, powders feedstocks are accelerated through a spray nozzle or torch by a fast fluid flow. When consolidating upon impact on the substrate, the coating can be formed by material deposition.

In thermal spraying, the process parameters must be carefully selected in order to produce the microstructure resulting in optimal coating performance. The main spray parameters that should be controlled during the process can be listed into four categories as operating parameters, feedstock characteristics, substrate features and spray torch movement. In order to achieve the desired coating quality, a repetitive procedure is required in the conventional spraying process, which includes spray parameter determination, spray experiments, coating quality evaluation and spray parameter correction. These steps will be repeated until the desired experimental result is obtained.

The purpose of this study is to provide a systematic approach that optimizes the process parameters based on coating deposition, coating properties, environmental limits, and thermal spray technologies.

**Background needed:**

Mechanical engineering, material engineering, automation, process engineering