A MAJOR PROJECT REPORT ON

"SIMULATION OF COLD SPRAY PROCESS BY FLUENT-6"

Submitted in partial fulfillment of the requirements

For the award of the degree of

MASTER OF TECHNOLOGY

IN

PRODUCTION ENGINEERING

By

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CERTIFICATE

This is to certify that Major project entitled **"SIMULATION OF COLD SPRAY PROCESS BY FLUENT-6"** submitted by **SAMEER KUMAR (2K12/PIE/19)** in partial requirement for the award Degree of Master Of Technology (Production Engineering) at the Delhi Technological University, Delhi is an authentic record of the student own work carried out by them under our guidance and supervision.

To the best of our knowledge, the matter embodied in the thesis has not been submitted to any other University/ Institute for the award of any Degree or Diploma.

Dr. Qasim Murtaza
Associate Professor

Mr. M. Zunaid
Asst. Professor

CANDIDATE'S DECLARATION

I hereby declare that the work which is being presented in this project report entitled **"SIMULATION OF COLD SPRAY PROCESS BY FLUENT-6"** submitted as Major project towards the fulfillment of the requirements for the award of the degree of Master of Technology with specialization in Production Engineering, Delhi Technological University, Delhi, is an authentic record of my own work carried out under the supervision of ***Dr. Qasim Murtaza***(Associate Professor) ***and Mr. M. Zunaid*** (Assistant Professor) Mechanical Engineering Department, at Delhi technological University, Delhi.

The matter embodied in this dissertation report has not submitted by me for the award of any other degree.

Sameer Kumar
2K12/PIE/19

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It is a great pleasure to have the opportunity to extend my heartiest felt gratitude to everybody who helped me throughout the course of this major project.

The major project on **"SIMULATION OF COLD SPRAY PROCESS BY FLUENT-6"** was carried out by us under the venerable guidance of my supervisors **Dr. Qasim Murtaza** (Associate Professor) and **Mr. M. Zunaid** (Assistant Professor) in the Department of Mechanical Engineering**.** It is our great privilege to express gratitude to him for his efforts, with helping attitude, critical and valuable comments and constant inspiration with a keen interest in progress of present study on this topic.

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ABSTRACT

The cold spray process is a modern coating process using high velocity and low process temperature particles for surface modification to improve the surface properties of the substrate, such as adhesion, wettability, corrosion resistance, or wear resistance. Coating may be applied as liquid, gases, or solid. In this process spray particles are accelerated the high velocity by a supersonic gas flow that is generated through only by convergent-divergent (CD) nozzle. Convergent-divergent nozzle could achieve the super-sonic velocity through the divergent section, but there is also some problem if the velocity is greater than the Mach number at the throat then the nozzle would be chocked and no flow of air and particles through the nozzle.

In this study, simulation and optimization of the cold spray nozzle and spray process has been done with the help of Modelling software. Cold spray nozzle geometry of (CD) nozzle drawn in GAMBIT and solved by the FLUENT solver. To solved the cold spray nozzle, pressure based solver is used because it is more relevant for the problem, for turbulence model Realizable k-ε flow model has used in this problem because this model is relatively new and differ from the standard k-ε model by two ways firstly it contain a new formulation for turbulence viscosity and secondly it has new transport equation for the dissipation rate. After that providing the operating and boundary condition at the inlet and outlet section of the (CD) nozzle, the discrete phase model is activated. Optimizations of CD nozzle is done at the group injection for the length 10mm, 20mm and 30mm after giving the all parameters and then validate the respective work.

The temperature of the particle is highest for the injector length 10mm and lowest for the injector length 30mm. The result also shows that the temperature slightly decreases with increase the length of the injector. This is also found that the optimum result would be getting at the 20 mm length of injection.

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