INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

Name of the Student	:	**Ashish Kumar Rajak**
Roll Number	:	**136103016**
Programme of Study	:	**Ph.D.**

Thesis Title: **Electromagnetic Crimping of Terminal-Wire Interconnections**

Name of Thesis Supervisor(s)	:	**Dr. Sachin D. Kore**
Thesis Submitted to the Department/ Center	:	**Mechanical**
Date of completion of Thesis Viva-Voce Exam	:	**28/03/2018**
Key words for description of Thesis Work	:	**Electromagnetic crimping, Terminal wire interconnections**

SHORT ABSTRACT

Crimping of the terminal to wire strand is a crucial process for electrical power transmission connections. The poor crimping technique increases the resistance of current flow through terminal causing problems like power losses, spark, and heating in the joint. To overcome these problems caused by conventional crimping process a new method has been proposed using Electro-Magnetic (EM) forming process. The EM crimping process is a high-velocity metal crimping technique suitable for aluminum material as it increases its formability. EM crimping makes use of current pulse discharged from the capacitor, which passes through the coil generating very high EM force for the workpiece deformation. Initial experiments were carried out on finding the feasibility of EM terminal-wire crimping process and compared it with conventional terminal-wire crimping process. Work was extended to numerical and experimental approach. Numerical simulations were carried out on aluminum terminal over aluminum wire strands using three different types of helical coil cross-sections (CS) like circular, rectangular and trapezoidal, consisting of five number of turns. For the comparison CS area of the coil, and total coil length was kept constant. Experiments were carried out using optimised discharge voltages to find the most suitable coil among the three coils for an effective crimping. Besides directly acting compression coils, field shapers are suitable tools for the manufacturing of electromagnetically crimped connections. A field-shaper is typically an axisymmetric component machined of an electrically conductive material in which the current density and the resulting field strength increases. Overall, the coil lifetime can be increased by a field-shaper since the mechanical loading of the coil can be significantly reduced. Also, forces between the field-shaper and the workpiece are considerably higher than the forces acting between field-shaper and the tool coil. So, numerical and experiments were carried out on three different types of field-shapers namely single step, double step, and tapered geometry to find the most efficient field-shaper by varying discharge voltage. Tests like radial deformation, pull out, hardness over the CS and terminal surface, the contact resistance were carried over the crimped samples. Post-processing reveals that in a helical coil, trapezoidal CS geometry provided the maximum deformation as compared to rectangular and circular CS coil. While in field shapers, single step field-shaper was found to be more optimal design over double step and tapered field shaper, giving a uniform and higher deformation on the same discharge energy.