DELHI TECHNOLOGICAL UNIVERSITY
DELHI

CANDIDATE'S DECLARATION

I hereby certify that the work which is being presented in this thesis entitled **" INTROSPECTING THE THERMAL EFFECTS OF RADIOGRAPHIC WELD IMAGES"** in partial fulfilment of the requirements for the award of the Degree of Master of Technology in Thermal Engineering and submitted in the Department of Mechanical, Production & Industrial and Automobile Engineering of Delhi Technological University, Delhi is an authentic record of my own work carried out during a period from July, 2012 to July, 2015 under the supervision of Dr. Pushpendra Singh, Associate Professor, and Dr. R. S. Mishra, Professor & Head, Department of Mechanical, Production & Industrial and Automobile Engineering, Delhi Technological University, Delhi

The matter presented in this thesis has not been submitted by me for the award of any other degree of this or any other Institution.

(SUPRIYA VATS)

DEPARTMENT OF MECHANICAL, PRODUCTION & INDUSTRIAL AND AUTOMOBILE ENGINEERING

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(Formerly Delhi College of Engineering)

CERTIFICATE

This is to certify that the thesis entitled, "**INTROSPECTING THE THERMAL EFFECTS OF RADIOGRAPHICS WELD IMAGES**", submitted by Ms. **SUPRIYA VATS**, Roll No. 2K12/THR/20, student of Master of Technology (Thermal Engineering) in Mechanical, Production & Industrial and Automobile Engineering department from Delhi Technological University (Formerly Delhi College of Engineering), is a dissertation work carried out by her under my guidance during session 2014-2015 towards the partial fulfilment of the requirements for the award of degree of Master of Technology in Thermal Engineering.

The uniqueness of the thesis pertains to Weld Images Classification, which has not been reported elsewhere.

I wish her all the best in her endeavours.

(Dr. Pushpendra Singh)
Associate Professor, MED, DTU
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(Dr. R. S. Mishra)
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ABSTRACT

Welding is the experienced way of joining metals together. It is an efficient and economical process. It is an assembling process where materials are joined. It is achieved by adding some additional molten joining material on melting part of the materials to be joined. It forms strong bond when the molten material is cooled. It plays a major role in industries for the purpose of construction, joining and repairing of steel beams, reinforcing rods in buildings, bridges, spacecraft, pipe lines, nuclear containers etc. During the process of welding a number of different types of discontinuities can be produced, which may arise due to material inconsistencies of the material, error produced by the operator, or other factors that are beyond the operators control. Irrespective of the source of error, detection of discontinuities is critical. An unacceptable weld extremely reduces the bond between two materials and may cause failure. Various flaws occur in weld images. The flaws are as follows: gas cavity, Lack of Penetration, Porosity, Slag, cracks, lack of fusion,. Worm Hole, Under Cut.

In the present work, in total 79 images have been considered. The image has been collected from Bharat Heavy Electricals Limited (BHEL), Haridwar and Indian Institute of Technology Roorkee. An attempt has been made to collect the feature of these images using wavelet transform. The extracted feature are thus subjected to Artificial Neural Network (ANN) and almost 89.88% of the images are classified. An algorithm has been developed and the results obtained are promising.

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Table 4.1 Image Database

LIST OF ABBREVIATIONS

NDT	Non – Destructive Testing
ANN	Artificial Neural Network
WT	Wavelet Transform