DISSERTATION REPORT

on

HEAT TRANSFER AUGMENTATION IN TUBE IN TUBE TYPE HEAT EXCHANGER USING WIRE COIL INSERT

Submitted by

Mr. AMIT SURESH WAGHODE

PG Student

Under the Guidance of

Prof. M. D. SHENDE

in partial fulfilment for the award of

Master Degree in Mechanical Engineering

of

Dr. Babasaheb Ambedkar Marathwada University

Aurangabad (M.S.)

SHREEYASH PRATISHTHAN

MISSION EDUCATION

Department of Mechanical Engineering

Shreeyash College of Engineering and Technology, Aurangabad

Maharashtra state, India

(2017)

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This is to certify that, the dissertation entitled **"Heat Transfer Augmentation In Tube In Tube Type Heat Exchanger Using Wire Coil Insert"**, which is being submitted herewith for the award of the **'Master of Engineering'** in **'Mechanical Engineering'** of Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, Maharashtra State. This is the result of the original research work and contribution by **'Mr. Amit Suresh Waghode'** under my supervision and guidance. The work embodied in this dissertation has not formed earlier for the basis of the award of any degree or compatible certificate or similar title of this any other diploma/examination body or university to the best of knowledge and belief.

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Date: 20/7/17

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DISSERTATION REPORT

on

"Experimental Investigation of Heat Transfer Enhancement through Elliptical Dimples for Divergent Channel"

Submitted by

Mr. Awez Kadarkhan Pathan

PG Student

Under the Guidance of

Dr. R.S Pawar

Co- Guide:- Prof. D.A. Deshmukh

In partial fulfillment for the award of

Master Degree in Mechanical Engineering (Heat Power)

of

Dr. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD (M.S.)

Department of Mechanical Engineering

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CERTIFICATE

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"Experimental Investigation of Heat Transfer Enhancement through Elliptical Dimples for Divergent Channel"

Submitted by

Mr. AWEZ KADARKHAN PATHAN

Has completed as per the requirement of Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, Maharashtra State in partial fulfillment for the award of **'Master of Engineering'** in **'Mechanical Engineering'.** The work embodied in the dissertation has not formed earlier for the basis of the award of any degree or compatible certificate or similar title of this any other diploma/examination body or university to the best of knowledge and belief.

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AIT/Mech/HTC04 Date : 08/04/2017

1. Student Name : Awez Pathan
2. College Name: Shreeyash College of Engineering and Technology, Aurangabad.
3. A project titles "Experimental investigation of Heat transfer Enhancement through dimples for divergent channel", is successfully completed experimental work in Heat Transfer laboratory, Department of Mechanical Engineering, AIT Pune.

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10th January, 2017

TO WHOM IT MAY CONCERN

This is to certify that *Mr. Awez. K. Pathan* a student of Shreeyash college of Engineering and Technology Aurangabad had successfully completed his Project machining work of aluminium plates at our Workshop premises.

Project Title:- "Experimental Investigation of Heat Transfer Enhancement through Elliptical Dimples for Divergent Channel".

All necessary details were provided from our side for the establishment of this project.

We wish him the very best for his future endeavors.

Thanking You

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Warm regards

Managing Director

Dr. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,

AURANGABAD (M.S.)

Dissertation Report

on

"Experimental Investigation of Heat transfer enhancement through Curved Delta Wing Vortex Generator"

Submitted by

JUMED KHAN SAMAD KHAN

Under the guidance of

Dr. R.S. Pawar

In partial fulfillment of the award of

Master of Engineering (Mechanical Engineering)

Department of Mechanical Engineering

Shreeyash College of Engineering Technology,

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CERTIFICATE

This is to certify that the dissertation report Entitled

"Experimental Investigation of Heat transfer enhancement through Curved Delta Wing Vortex Generator"

Submitted by

JUMED KHAN SAMAD KHAN

has completed as per the requirement of Dr. Babasaheb Ambedkar Marathwada University in partial fulfillment for the award of **Master of Engineering** (Mechanical Engineering) of Dr. Babasaheb Ambedkar Marathwada university Aurangabad (M.S).

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In recognition of publication of the paper entitled

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DISSERTATION REPORT

on

EFFECT OF TIG AND SMAW FOR STRENGTH ANALYSIS

Submitted by

Mr. KAILAS ANNASAHEB GITE

PG Student

Under the Guidance of

Prof. DR.R.S.PAWAR

in partial fulfilment for the award of

Master Degree in Mechanical Engineering

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Department of Mechanical Engineering

Shreeyash College of Engineering and Technology, Aurangabad

Maharashtra state, India

(2017)

CERTIFICATE

This is to certify that, the dissertation entitled **"Effect Of TIG and SMAW For Strength Analysis"**, which is being submitted herewith for the award of the **'Master of Engineering'** in **'Mechanical Engineering'** of Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, Maharashtra State. This is the result of the original research work and contribution by **'Mr. Kailas Annasaheb Gite** under my supervision and guidance. The work embodied in this dissertation has not formed earlier for the basis of the award of any degree or compatible certificate or similar title of this any other diploma/examination body or university to the best of knowledge and belief.

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Review on Thermal Performance Analysis &Experimental Study of Heat Sink used for Electronics Application

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ABSTRACT

This paper reviews the previous work on thermal performance analysis of heat sink in order to determine the enhancement in the heat transfer rate. Many engineering systems during their operation generate heat. If this generated heat is not dissipated rapidly to its surrounding atmosphere, this may cause rise in temperature of the system components. This by-product cause serious overheating problems in system and leads to system failure, so the generated heat within the system must be rejected to its surrounding to maintain the system at recommended temperature for its efficient working. The techniques used in the cooling of high power density electronic devices vary widely, depending on the application and the required cooling capacity. The heat generated by the electronic components has to pass through a complex network of thermal resistances to the environment.The thermal resistance and pressure drop are considered as multiple thermal performance characteristics. The effects of geometric parameters, fin height, fin diameter, fin material, base to surrounding temperature difference on heat transfer performance of fin arrays& fin separation value has been determined. Heat transfer rate increases with the increase in approach velocity, pin diameter & number of pins. The effect of fin density on heat transfer performance is examined. Heat transfer rate also increases with the increase in thermal conductivity of the material & with the pin height. In-line arrangement gives higher heat sink resistance and lower pressure drop than the staggered arrangement. Heat transfer models for In-line & Staggered arrangements are suitable in designing pin fin heat sinks. The effects of Reynolds No & Nusselts No on the behaviour of channel are also studied.

Keyword: - *Heat sink1, Thermal performance2, Electronics Cooling3, Heat transfer4*

1. INTRODUCTION

Extended surfaces are well known as fins and are commonly used to enhance heat transfer in many industries. Heat transfer rate is increased by using natural, forced or mixed convection. In the present scenario of electronic systems must be self-indulge to improve its reliability & from its premature failure. Thus efficient cooling of electronic devices becomes a challenging task in the thermal area. Innovation in technology has made a large leap towards compact. So equipment size variation has changed to miniature size. For optimum working condition of electronic system self-efficient heat sink is needed. There are various options available for cooling of electronic devices such as heat sink, heat pipe, thermoelectric coolers but heat sink is mostly used in the electronics cooling due to its heat transfer capacity & ease of use. Heat sinks are the most common thermal hardware used in electronics. They are employed in microelectronic devices as well as high power electrical components. They improve the thermal control of electronic components, assemblies and modules by enhancing their surface area through the use of pin fins. Applications utilizing pin fin heat sink for cooling of electronics have increased significantly during last few decades due to increase in heat flux densities and product miniaturization. In current scenario electronic circuits dissipates substantially heavier loads of heat than ever before. At the same time the premium associated with miniaturized applications has never been greater, and space allocated for cooling purposes is on decline. One of the most powerful cooling technologies that have been emerged in recent years is pin fin technology. The unique pin fin design generates significant cooling power & is highly suitable for hot devices & applications that have limited space for cooling. Pin fin heat sinks for surface mount devices are available in variety of configurations, sizes & materials. Pin fin heat sinks which

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Volume 3 Issue 1

Experimental Investigation of Heat Sink Used for Power Electronic Application

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Abstract

Now a days number of chips on transistor are increasing also size of devices becomes compact i.e. amount of heat dissipation from available surface are increasing i.e. Power density increasing. Cooling of electronics devices become major issue. So, to increase the reliability of electronic product we have to use the heat sink.

Keywords: *Effectiveness, Efficiency, Heat sink, Heat transfer rate.*

I. INTRODUCTION

There are various options for cooling of electronic devices such as heat sink, heat pipe, thermoelectric coolers but heat sink is mostly used in the electronics cooling due to its heat transfer capability and ease of use. In this project, various factors affecting on thermal performance of fin are studied.

Factors to be considered while designing of pin fin array are investigated. By changing parameters its performance on array such as maximum temperature, heat transfer rate, efficiency, and effectiveness are comparatively studied.

2. ORGANIZATION OF PROJECT

From the validation of past research data it is found that if inline and staggered arrangement is applied for circular cross section of fin, then circular fin with inline arrangement is found to be more optimistic. And when same arrangements are given for elliptical cross section then elliptical fin with staggered arrangement is more reliable.

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Journal of Research in Mechanical Engineering and Applied Mechanics
Volume3 Issue 2

Enhancement of Mechanical Properties of Composite Materials in Brake Pad Application: A Review

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Abstract

Metallic matrix composites are combinations of two are more different metals inter metallic compounds are seconds phases in which dispersed phases are embedded within the metallic matrix. They are produced by controlling the morphologies of the constituents to achieve optimum combination of properties. Properties of the composites depend on the properties of constituent phases, their relative amount, and dispersed phase geometry including particle size, shape and orientation in the matrix. Non asbestos materials have found wide application in our daily life. There are some advantages in using particles reinforced AMCs materials than unreinforced materials such as- greater strength and high specific modulus, improved stiffness, light weight, low thermal expansion coefficient, high thermal conductivity, tailored electrical properties, increased wear resistance and improved damping capabilities. Reinforcing constituents can be incorporated within the matrix in the form of particles, short fibers, continuous fibers or mono filaments. Now it is used in aerospace, thermal management areas, industrial products, automotive applications such as engine piston, brake pads, liners etc. AMCs can be manufactured by liquid state processing (stir casting, infiltration, squeeze casting etc.), semisolid processing and powder metallurgical route.

ENHANCEMENT OF MECHANICAL PROPERTIES OF COMPOSITE MATERIALS IN BRAKE PAD APPLICATION

[1]M. R. Lendgule,[2]Dr. R. S. Pawar, [3]D. D. Pawar
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*Abstract:*Metallicmatrixcompositesarecombinationsoftwoaremoredifferentmetalsinter metallic compounds are seconds phases in which dispersed phases are embedded within the metallicmatrix.MMC's can be produced by controlling the internal structure of the constituents to get optimum combination of properties. Properties of the MMC's depend on the properties of constituent phases, their relative amount, and dispersed phase geometry including particle size, shape and orientation in thematrix.

In this work, comparative studies of Mechanical behavior of aluminum metal matrix metallic composites fabricated under powder metallurgy process to understand their process-structure-property relations. The optimized percentage of Sic reinforcement material has been found out. The variation in the percentage of Sic gives the different mechanical properties.

Keywords **-Al-Sic MMC, Al-Sic in brake pad application, Mechanical properties of Al-Sic MMC, Fabrication processes for Al-Sic MMC**

I. INTRODUCTION

In the past few years the global need for low cost, high performance and good quality materials has cause a shift in the research from monolithic to composite materials. In case of MMC's, aluminum matrix composite due to their strength to weight ratio, high wear resistance and low cost are widely manufactured and used in structural applications along with aerospace, hightemperatureapplications,circuitbreakersandbrakepads,linersinautomobileindustry. Also cost effective and a simple method for manufacturing of the composites arevery essential for expandingtheirapplication.This work presents mechanical properties of aluminum matrixcompositescontainingsingleandmultiplereinforcement. Addition of Sictoaluminum has shown an increase in its mechanical properties. Organic reinforcement materials like coconut ash, fly ash also improved the mechanical properties. Self-lubricating property of graphite improved the machinability.

II. LITERATURE REVIEW

Tamer Ozben, Erol killickap, Orphan Cakir reported in an investigation of mechanical and machinability properties of Sic particle reinforced Al-MMC article, the influence of reinforced ratios of 5, 10 and 15 wt. % if Sic particles on mechanical properties was examined. This works represents that increase of reinforcement element addition produced better mechanical properties such as impact toughness and hardness, but tensile strength showed different trend; increased up to 10 wt.% of Sic-p reinforced and then decreased when 15 wt.% of Sic-p reinforcement addition.Mr. Prasanna, Mr. Devraj, Mr. Rakeshkummar studied on mechanical properties of silicon carbide, E-glass and red mud rain forced aluminum (LM25) composite. In this paper results of an experimental investigation of the mechanical properties of Sic, E-glass and red mud reinforce aluminum alloy (LM25) composite samples, processed by stir casting route are reported and analyzed. The main mechanical properties studied were the tensile strength, ductility impact strength and hardness. Pure LM25 samples were also tested for the same properties. In this work, I varied the reinforcing material in smaller quantity to avoid the mixing problem. And from the results what we got shows the addition of reinforcing materials like red mus, e-glass and Sic improves tensile strength, impact strength and reduces % elongation. But addition of E-glass minimizes the hardness. If the density is more, the metal matrix reinforcement particles will settle down early when we stop stirring. If low density reinforcing materials are added they may float over the surface instead of distributing themselves in the metal matrix phase. But in this work I varied the reinforcing material in smaller quantity to avoid the mixing problem.

III. SCOPE AND OBJECTIVE OF RESEARCH

Scope -

Currently,to search waystodevelopnewstructuralmaterialswithhigherstrengthtoweight ratios is one of the biggest challenges in the automobile and aerospace industry. Properties like high specific strength, stiffness, better wear resistance and

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Optimization of Process Parameters Affecting on Spring-Back in V-Bending Process for Deep Draw Steel using FEA and Taguchi Technique HSLA 420 and S12 Materials

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[2]*Principal, Shreyash College of Engineering & Technology, Aurangabad, M.S., India*

Abstract— **In this study, process parameters like punch angle, die opening, grain direction and pre bend condition of the strip for deep draw steel are investigated. The finite element method (FEM) in association with the Taguchi and the analysis of variance (ANOVA) techniques are carried out to investigate the degree of importance of process parameters in V-bending process. From results it is observed that punch angle had major influence on the spring-back. Die opening also showed very significant role on springback. On other hand, it is revealed that grain direction had least impact on springback however if strip from flat sheet is taken then it is less prone to springback as compared to the strip from sheet metal coil. Hyper Form software is used for FEM simulation and experiments are designed using Taguchi method. Percentage contribution of the parameters is obtained through the ANOVA technique.**

Keywords— **Bending, V-bending, FEM, Spring-back, Taguchi, Hyperform, Profile projector, HSLA 420 & St12 Materials.**

I. INTRODUCTION

Manufacturing industries are very much concerned about the manufacturing of high-precision sheet metal. Sheet metals are used in automotive industries, housing-utensil industries and electronics industries. Every industry is trying to reduce the trial time to deliver the good quality product on time. Sheet metal bending is the most widely used process in sheet metal industries. Spring-back is a very common and critical phenomenon in sheet metal forming operations, which is caused by the elastic redistribution of the internal stresses after the removal of deforming forces. Spring-back compensation is absolutely essential for the accurate geometry of sheet metal components.

However, the spring-back is studied in most of these researches. For examples, H K Yi, [1] studied a model based on differential strains after relief from the maximum bending stress , derived for six different deformation patterns in order to predict spring back analytically.

Thaweepat Buranathiti and Jian Cao [2] studied an effective analytical model for spring back prediction in straight flanging processes. The effect of punch height on V bending angle is examined by SutasnThipprakmas [3] using finite element model and results are validated through experiments. Effects of process variables on V-die bending process of steel sheet are discussed by You-Min Huang [4]. The investigation deals with a model which predicts the correct punch load for bending and the precise final shape of products after unloading, in relation to the tensile properties of the material and the geometry of tools. Ján SLOTA and Miroslav JURČIŠIN [5] analyzed TRIP, AHSS and mild steel considering normal anisotropic behavior of the materials for prediction of Springback in v-bending for automotive industry using experimental and numerical approaches. Himanshu V. Gajjar [6] focused on application of Hyperform, LS-DYNA for Finite Element Analysis of Sheet Metal Air – bending. Wang et al. [7] studied the spring-back control of sheet metal air bending process. W.M. Chan [8] also focused on Finite element analysis of spring-back of V-bending sheet metal forming processes where he investigated spring-back in the V-bending metal forming process with one clamped end and one free end. Different die punch parameters such as punch radius, punch angle and die-lip radius are varied to study their effect on spring-back. High-accuracy V-bending system by real time identifying material property is examined in by Kazunarilmaia [9] in which a bending system is proposed in order to realize high precision V-bending. Leu and Hsieh [10] investigated the influence of the coining force on spring-back reduction in V-die bending process the simulation model of the V bending process of sheet metals is elaborated by Florica Mioara Groze [11] where ABACUS is used for finite element simulation for springback prediction of the v bendingprocess. Sutasn Thipprakmas and Wiriyakorn Phanitwong [12] used Taguchi technique for Process parameter design of spring-back and spring-go in V-bending process where three process parameters of bending angle, material thickness and punch radius are investigated.

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IJETAE Team wishes all the best for their bright future.

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Factors Affecting on Springback in Sheet Metal Bending: A Review

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Abstract

Spring-back is a very common and critical phenomenon in sheet metal forming operations, which is caused by the elastic redistribution of the internal stresses after the removal of deforming forces. Spring-back compensation is absolutely essential for the accurate geometry of sheet metal components. This paper reviews the various parameters affecting spring back such as punch angle, grain direction of sheet metal material, die opening, ratio of die radius to sheet thickness, sheet thickness, punch radius, punch height, coining force, pre stressed condition of strip etc.

***Keywords:** Springback; bending; punch angle; grain direction; die opening etc; Review*

I. INTRODUCTION

Springback refers to the elastic recovery of deformed parts. Springback occurs because of the elastic relief from the bending moment imparted to the sheet metal during forming.[1] Springback is common and inevitable in each stage of the production process where the material undergoes geometrical changes. Accordingly, factors related to the generation of stress in the material during loading and unloading processes influence the springback behaviour of press-formed parts [2]. In every industry, quality and productivity are major issues for being competitive. For example, a car frame needs to be designed to achieve strength requirements and aesthetic aspects; on the other hand, cost of production and repeatability is crucial to the business. A

World Academy of Science, Engineering and Technology
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Optimization of Process Parameters Affecting on Spring-Back in V-Bending Process for High Strength Low Alloy Steel HSLA 420 Using FEA (HyperForm) and Taguchi Technique

Navajyoti Panda, R. S. Pawar

***Abstract*—**In this study, process parameters like punch angle, die opening, grain direction, and pre-bend condition of the strip for deep draw of high strength low alloy steel HSLA 420 are investigated. The finite element method (FEM) in association with the Taguchi and the analysis of variance (ANOVA) techniques are carried out to investigate the degree of importance of process parameters in V-bending process for HSLA 420&ST12 grade material. From results, it is observed that punch angle had a major influence on the spring-back. Die opening also showed very significant role on spring back. On the other hand, it is revealed that grain direction had the least impact on spring back; however, if strip from flat sheet is taken, then it is less prone to spring back as compared to the strip from sheet metal coil. HyperForm software is used for FEM simulation and experiments are designed using Taguchi method. Percentage contribution of the parameters is obtained through the ANOVA techniques.

***Keywords*—**Bending, V-bending, FEM, spring-back, Taguchi, HyperForm, profile projector, HSLA 420 & St12 materials.

I. Introduction

MANUFACTURING industries are very much concerned about the manufacturing of high-precision sheet metal. Sheet metals are used in automotive industries, housing-utensil industries, and electronics industries. Every industry is trying to reduce the trial time to deliver the good quality product on time. Sheet metal bending is the most widely used process in sheet metal industries. Spring-back is common and critical or major factor in sheet metal non-cutting operations, which is caused by the elastic redistribution of the internal stresses after the removal of deforming forces from the sheet metals. Spring-back prediction is a driven factor for the achieving exact shape of sheet metal components which are used in the automotive and aerospace industry. The spring-back criteria change from material to material. However, the spring-back is studied in most of these researches: for example:

Yi et al. [1] studied a model based on differential strains after relief from the maximum bending stress, derived for six different deformation patterns in order to predict spring back analytically [1].

Buranathiti and Cao [2] studied an effective analytical model for spring back prediction in straight flanging processes [2].

The effect of punch height on V-bending angle is examined by Thipprakmas [3] using FEM, and results are validated through experiments [3].

Huang [4] studies the effects of process variables on V-die bending process for steel sheet with a model which predicts the correct punch load for bending and the precise accurate shape of products after unloading of the punch pressure, in relation to the tensile properties of the material and the geometry [4].

Slota and Jurčišin [5] analyzed TRIP, AHSS, and mild-steel considering normal anisotropic behavior of the materials for prediction of Springback in V-bending for automotive industry using experimental and numerical approaches [5].

Gajjar et al. [6] focused on application of HyperForm, LS-DYNA for Finite Element Analysis of Sheet Metal Air – bending [6].

Wang et al. [7] and Chan et al. [8] studied the spring-back control of sheet metal air bending process [7], [8].

Imaia et al. [9] study the real-time identification of V-bending metal forming (non-cutting operation) process with one clamped end and another free end, with different die punch parameters like different punch radius and angle which are varied in V-bending system to identify material and material behaviors in order to realize high precision V-bending components [9].

Leu and Hsieh [10] investigated the influence of the coining force on spring-back reduction in V-die bending process [10].

Groze et al. [11] elaborated the simulation model of the V-bending process of sheet metals where ABAQUS is used for finite element simulation for springback prediction of the V-bending Process [11].

Thipprakmas and Phanitwong [12] used the Taguchi technique for process parameter design of spring-back and spring-go in V-bending process where parameters like bending angle, material thickness and punch radius are investigated [12].

Chen and Muammer Koc [13] studied the simulation of springback variation in forming of advanced high strength steels for advanced high strength steel (AHSS) parts. Design of experiment (DOE), i.e. response surface method and finite

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MANTECH PUBLICATIONS

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This is to certify that the manuscript entitled "*Design and Wear Analysis of Rotary Tiller Blades: A Review*" submitted by "*Nikhil Metange & K. T. Patil*" has been published in "*Journal of Research in Mechanical Engineering and Applied Mechanics*" *Volume 3 Issue 1 Year 2018*

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DISSERTATION REPORT

on

Comparative Numerical Analysis of Thermal System with Sintered Copper Powder Wick Heat Pipe by using Water & Al_2O_3 Nanofluid as Coolant through Hybrid Vortex Al Plate

Submitted by

Miss. Punam Madhukar Sonawane

PG Student

Under the Guidance of

Prof. M.D. SHENDE

in partial fulfilment for the award of

Master Degree in Mechanical Engineering - Heat Power

of

Dr. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY

AURANGABAD (M.S.)

SHREEYASH PRATISHTHAN

MISSION EDUCATION

Department of Mechanical Engineering

Shreeyash College of Engineering and Technology, Aurangabad

Maharashtra state, India

(2017)

CERTIFICATE

This is to certify that, the dissertation entitled **"Comparative Numerical Analysis of Thermal System with Sintered Copper Powder Wick Heat Pipe by using Water & Al_2O_3 Nanofluid as Coolant through Hybrid Vortex Al Plate"**, which is being submitted herewith for the award of the **'Master of Engineering'** in **'Mechanical Engineering– Heat Power'** of Dr. Babasaheb Ambedkar Marathwada Unversity, Aurangabad, Maharashtra State. This is the result of the original research work and contribution by **'Miss. Punam Madhukar Sonawane'** under my supervision and guidance. The work embodied in this dissertation has not formed earlier for the basis of the award of any degree or compatible certificate or similar title of this any other diploma/examination body or university to the best of knowledge and belief.

Place: Aurangabad

Date: 14/7/17

14/7/17

Prof. M.D. Shende

Guide

Department of Mechanical Engineering

15/7/17

Prof. G.S. Dhage

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Dr. R.S. Pawar

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Shreeyash College of Engineering and Technology

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DISSERTATION REPORT

on

Enhancement of Aerodynamic Drag Reduction for Sedan Based Passenger Car Model Using Add on Device

Submitted by

Mr. Shinde Shivaji Sanjiv

PG Student

Under the Guidance of

Prof. SHENDE M.D.

in partial fulfilment for the award of

Master Degree inMechanical Engineering - Heat Power

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Place: Aurangabad

Date: 5/6/2017

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Enhancement of Aerodynamic Drag Reduction of Passenger Vehicle using CFD analysis- Review

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Associate Professor, Dept. of Mechanical Engineering Department, Shreeyash College of Engineering & Technology, Aurangabad, Maharashtra India[2]

ABSTRACT: The rapidly increasing fuel prices and the regulation of greenhouse gasses to control global warming give tremendous pressure on design engineers to enhance the current designs of the automobile using the concepts of aerodynamics with the help of computational fluid dynamic. It is also used to understand the fuel consumption, stability of the automobile and passenger comfort. The air flow over automobile is analyzed and calculates the drag with the help of CFD simulation. Drag reduction is most important method for improving the aerodynamic effect as well as improving fuel efficiency in automobile industry. Computational fluid dynamics (CFD) technique are used for reducing drag. Thus, CFD technique is performed very important role in automobile industries for grate design and increasing aerodynamic effect. In this paper, review is taken to study the various passive flow control methods to reducing the drag in automobile industry and improving the performance of automobile as well as introducing the superior design in automobile sector with the help of CFD.

KEYWORDS: Aerodynamic, Automobile Design, CFD, Coefficient of Drag, Passive flow control

I. INTRODUCTION

A. AERODYNAMIC: The subject "Aerodynamics" studies with air flow passing over the automobile and also the behavior of air flow with the help of experimental setup like as Wind Tunnel as well as theoretical (analytical or semi analytical) and computational fluid dynamics (CFD) approaches respectively. The term "air" is used in a generic sense. It basically means the flowing gaseous medium which could be air, helium, or any other gas for that matter depending on condition. Anything is passing through air then effect of aerodynamic is shown, like rocket launching, kite flying in sky. Even cars passing through air is also affected by aerodynamics effect [6]. CFD analysis is only efficient tool in order to evaluate specific design parameterization of a generic shape of automobile. Computational Fluid Dynamics (CFD) is a branch of fluid mechanics that uses numerical methods and algorithms to solve and analyze the problems that involve fluid flows. The analysis of system is associated by means of computer based simulation. Nowadays consume fuel 50% for ground vehicle all over worldwide and affected 60% greenhouse gas affected by the emission of gases from consuming fuel [1]. In recent times increasing the greenhouse effect in global warming world to reduce CO_2 emission with the help increasing the performance of automobile by reducing the drag coefficient by using the various methods like passive flow control system ex. Ahmed body, Add-on Device, VG is conclude [2][3]. The effect of aerodynamic design is increasing fuel efficiency, reducing drag and also improving the stability of automobile in high speed is shown in survey taken by Lynette Cheah & John Heywood [4].

B. COMPUTATIONAL FLUID DYNAMICS: Computational fluid dynamics (CFD) is the branch of fluid dynamics providing a commercial tool means of simulation authentic flows by the numerical solution of the governing equations. Computational fluid dynamics (CFD) is the science which deals with the fluid flow, heat transfer, mass transfer,

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Computational Study to Reduction of Aerodynamic drag of Passenger Car Using Rectangular Perforated Tail plate

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ABSTRACT: Aerodynamic drag is concept use of increasing car performance at high speed. Race car Design Engineers realized that air flowing over the car could be used to increase down force and reduce aerodynamic drag force on the car. This technique is also useful for the domestic sedan base passenger car. As fuel economy became a strong factor in road vehicle design, engineers soon realized that the methods of reducing aerodynamic drag on passenger cars could be transferred to road vehicles in order to improve fuel economy. Optimizing the various type of add on device installed on vehicle to reduce aerodynamic drag.

This paper revealed computational Study & effect of rectangular Plane tail plate & Perforation plate 10mm & 20mm RPP and RP1, RP2 respectively is reducing the drag coefficient of sedan baseline (BM) passenger car. A baseline drag value is obtained for a simplified sedan baseline car in WORKBENCH ANSYS 16.O. CFD software with SST k-ω turbulence model was applied. In order to have high accuracy, Second Order discretization schemes were chosen. The drag reduction of a proposed rectangular shaped tail plate (RPP) is compared to rectangular perforation plate (RP1 & RP2) at High speed 120 km/hr (33 m/sec). The Tail plates are installed at back side of the roof of the passenger car at 12° inclination angle. Similarly observe the effect of perforation tail plate on coefficient of drag for sedan baseline car model with respective diameter of hole. A maximum drag reduction of 6.5% is achieved using a Rectangular Perforation 10mm (RP1) with 0.18 m length axis towards direction of flow. Hence, the drag force can be reduced by using add on devices on passenger car and fuel economy, stability of a passenger car can be improved.

KEYWORDS: Aerodynamic, CFD, Coefficient of Drag, Passenger car, Perforation, Tail Plate.

I. INTRODUCTION

In present day Automobile Sector fuel efficiency at high speed, Comfort Driving & Environmental safety is very important factors. Fuel resources are one of the most important problems in Automobile sector. Day by day because of increasing population and maximum utilization of fuels for automobile sector increased consumption of fuel. Since From 1900's up to today date fossil fuel is use as energy resources for all automobile factories. The cost of fuel are goes on increasing, for this reason most of the manufacturing company have their research focus on development of engine efficiency with minimum fuel consumption. Addition to this improvement in fuel efficiency as result of better aerodynamic shape is the new area in research point of view [1]. "Aerodynamics" is concept of passing air flow over the automobile and also the study of behaviour of air flow with the computational fluid dynamics (CFD) approaches respectively. The term "air" is used in a generic sense. It basically means the flowing gaseous medium which could be

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Mr. Shivaji Shinde has performed the experiment on "Sub Sonic Speed Wind Tunnel". He has successfully done the experimental work. The experimental Result on Wind Tunnel is very excellent.

With Best Regards,

27.3.17

Dr. Pradeep A. Patil
HOD (Mech)

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MECHANICAL ENGINEERING DEPARTMENT
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20-21January 2017

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This is to certify that Prof./Dr./Mr. / Ms. Shivaji S. Shinde
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has participated / presented a paper entitled Enhancement of Aerodynamic Drag Reduction of Passenger Vehicle Using CFD Analysis - Review
in International Conference on Recent Trends in Engineering & Science (ICRTES-2017) held on 20th & 21st January, 2017 under R & D Cell, Government College of Engineering, Jalgaon

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Study the Effect of Tolerances for Press Tool Assembly: Computer Aided Tolerance Analysis

Authors : Subodh Kumar, Ramkisan Pawar, Gopal D. Belurkar

Abstract : This paper describes a study for simple blanking tool. In blanking or piercing operation, punch and die should be concentric for proper cutting. In this study, tolerance analysis method is used to analyze the variation in the press tool assembly. Variation results into the eccentricity in between die and punch due to cumulative tolerance of parts used in assembly. 1D variation analysis were performed by CREO parametric computer aided design (CAD) Software Powered by CETOL 6σ computer aided tolerance analysis software; Use of CAD analysis software given the opportunity to find out the cause of variation in tool assembly. Accordingly, the new specification of tolerance and process setting for die set manufacturing has determined. Tolerance allocation and tolerance analysis method were performed iteratively to conclude that position tolerance as well as size tolerance of hole in top plate for bush and size tolerance of guide pillar were more responsible for eccentricity in punch and die. This work proposes optimum tolerance for press tool assembly parts to achieve 100 % yield for specified .015mm minimum tolerance zone.

Keywords : blanking, GD&T (Geometric Dimension and Tolerancing), DPMU (defects per million unit), press tool, stackup analysis, tolerance allocation, yield percentage
Conference Title : ICDMC 2018 : 20th International Conference on Design Management and Cultures
Conference Location : Mumbai, India
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APPENDIX F

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Outward No. : SNDCOE/MECH/ 868 /17-18 Date:13 /04/2018

CERTIFICATE

This is to certify that Mr. Subodh C. Pawar PG student (ME- Mechanical Engg.) of Shreeyash College of Engineering & Technology, Aurangabad, has successfully conducted trials related to their dissertation entitled " Thermal Analysis of Cylindrical Roller Bearing with change in Roller Material (Ceramic and steel) " on Wear and Friction monitor (TR-20LE-PHM-400 DUCOM Made) at dept. of Mechanical Engg. of our institute during 12/04/2018 to 13/04/2018.

SND College of Engg. & Research center Yeola, Dist. Nashik Mechanical Engg. Department

Prof. V.G. Bhamre
HOD (Mechanical Dept.)
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APPENDIX G

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Date: 28.04.2018

To,
The Principal
Shreeyash College of Engineering and Technology,
Aurangabad

TO WHOM IT MAY CONCERN

This is to certify that, **Mr. Subodh C. Pawar,** ME (Mechanical) Student of **Shreeyash College of Engineering and Technology Aurangabad,** has completed his Project (Thermal Analysis of cylindrical roller bearing with change in roller materials silicon carbide and EN31) in our organization. He has proposed the solution as per our requirement.

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DISSERTATION REPORT

on

HEAT TRANSFER ENHANCEMENT IN DOUBLE PIPE HEAT EXCHANGER USING TWISTED TAPE.

Submitted by

Mr. Swapnil Chandrashekhar Karwande

PG Student

Under the Guidance of

Prof. SHENDE M.D.

in partial fulfilment for the award of

Master Degree in Mechanical Engineering - Heat Power

of

Dr. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY

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Department of Mechanical Engineering

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Maharashtra state, India

(2017)

CERTIFICATE

This is to certify that, the dissertation entitled **"heat transfer enhancement in double pipe heat exchanger using twisted tape"**, which is being submitted herewith for the award of the **'Master of Engineering'** in **'Mechanical Engineering – Heat Power'** of Dr. Babasaheb Ambedkar Marathwada Unversity, Aurangabad, Maharashtra State. This is the result of the original research work and contribution by **'Mr. Swapnil Chandrashekhar Karwande'** under my supervision and guidance. The work embodied in this dissertation has not formed earlier for the basis of the award of any degree or compatible certificate or similar title of this any other diploma/examination body or university to the best of knowledge and belief.

Place: Aurangabad

Date: 27/4/17

27/4/17

Prof. M.D. Shende

Guide

Department of Mechanical Engineering

Prof. G.S. Dhage

Head

Department of Mechanical Engineering

27.4.17

Dr. R.S. Pawar

Principal

Shreeyash College of Engineering and Technology

Aurangabad

"Dissertation Report on"

"OPTIMIZATION OF CRANKSHAFT USING FEA TOOL"

For the Degree of

Master of Engineering in Mechanical

Submitted By

VINOD CHHAGANRAO SHAHANE

Under the Guidance of

Dr. R. S. PAWAR

SHREEYASH PRATISHTHAN

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Aurangabad

CERTIFICATE

This is to certify that the thesis entitled **"Optimization of Crankshaft using FEA Tool"**, which is being submitted herewith for the award of the **Degree of Master in Mechanical Engineering** of **Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.** This is the result of the original research work and contribution by **Vinod Chhaganrao Shahane** under my supervision and guidance.

29.3.17

Dr. R. S. Pawar
(Guide)

Prof. G. S. Dhage
(Head of Department)
Mechanical

29.3.17

Dr. R. S. Pawar
(Principal)

Department of Mechanical Engineering

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A Review on Finite Element Analysis of crankshaft of Internal Combustion Engine

Mr. V C. Shahane[1], Dr. R. S. Pawar[2], Prof. Vilas Patil[3]

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Abstract - *Crankshaft is mechanical component with complex geometry which transforms reciprocating motion into rotary motion, hence crankshaft plays a key role in its functioning. The crankshaft is connected to the piston through the connecting rod. The journals of the crankshaft are supported on main bearings, housed in the crankcase. The design of crankshaft and analysis study is most important process for effective engine design and engine performance improvement in the internal combustion engine. Crankshaft is subjected to different pressure load with respect to crank angle hence study the crankshaft subjected to different physics is most significant for effective design.*

Key Words: Crankshaft, Structural Analysis, Dynamic Analysis, Computer Aided Design, ANSYS Software.

1.INTRODUCTION

The advancement in industry and technology leads the need of low cost and highly reliable product. Internal combustion engine is one of the most important devices in the industry which converts chemical energy to mechanical energy. Hence there is a constant requirement of highly efficient and durable internal combustion engine in the market. Crankshaft plays a pivotal role in its functioning. Stresses evaluation, fatigue calculation and vibration analysis are most important for satisfactory working performance and life of engine. Modal analysis gives information of the characteristic of the vibration structure. Fatigue analysis gives an idea of life of the components whereas stress intensities and critical stresses are evaluated using structural analysis. Therefore Finite Element Analysis is the most effective technique for designing the crankshaft which helps engineers to improve the existing crankshaft design and also helps to find out the best optimized crankshaft design.

2. Literature Review Summary

Authors studied the design analysis of crankshafts for different types internal combustion engines. Furthermore many authors studied the crankshaft optimization techniques using finite Element Analysis under structural, dynamic and fatigue analysis.

Literature summary of many research papers authors are summarized below.

2.1 Computer Aided Modeling and Optimization of Crankshaft

Summary: In this research paper, author studied on optimization crankshaft in the area of fatigue to evaluate and compare the fatigue performance of two competing manufacturing technologies for automotive crankshafts namely forged steel and ductile cast iron

Conclusion: Authors analyzed static analysis of both i.e. forged steel and ductile cast iron crankshaft and observed that forged steel withstand the static load from strength of view. Furthermore authors comments for process to replace cast iron crankshaft to forged steel

2.2Dynamic Load and Stress analysis of a crankshaft

Summary: In above research paper, author studied dynamic simulation of crankshaft for single cylinder four stroke engine. Dynamic analysis was done analytically and verified by simulation in ADAMS. Furthermore static analysis versus dynamic load analysis discussed. In addition above Comparision of stresses from FEA and strain gauges of a crankshaft in a bench test are presented.

Conclusion: Authors analyzed dynamic loading analysis of the crankshaft results in more realistic stresses whereas static analysis provides an overestimate results. Furthermore experimental and FEA results showed close agreements within 7% difference.

2.3Finite Element Analysis approach for crankshaft Optimization

Automot Engine Technol
DOI 10.1007/s41104-016-0014-0

ORIGINAL PAPER

Optimization of the crankshaft using finite element analysis approach

V. C. Shahane[1] · R. S. Pawar[2]

Received: 30 August 2016 / Accepted: 21 November 2016

Abstract Crankshaft is one of the most critical components for effective and precise working of the internal combustion engine. In this paper, a static structural and dynamic analysis was conducted on a single cylinder four-stroke diesel engine crankshaft. A solid model of the crankshaft was created using higher-end computer-aided design software, i.e., Pro/Engineer software according to the dimensional details drawing of the existing crankshaft. Finite element analysis was performed using ANSYS software under the static and dynamic condition to obtain the variation of stresses at different critical locations of the crankshaft. Boundary conditions were applied on finite element model in accordance with engine specification chart and engine mounting conditions. Optimization of the crankshaft was studied in the area of geometry and shape on the existing crankshaft, however especially working on geometry and shape optimization, the optimized crankshaft design should be replaced with existing crankshaft, without changes in the engine block and cylinder head. The optimized crankshaft helps to improve the performance of the engine and causes reduction in weight. This optimization study of the crankshaft helps to reduce 4.37% of the weight in the original crankshaft.

Keywords Diesel engine · Crankshaft · Structural analysis · Dynamic analysis · Computer-aided design · Finite element analysis · ANSYS

1 Introduction

The crankshaft is one of the most important moving parts in the internal combustion engine. Crankshaft is a large component with a complex geometry consisting of bearing plates as the crank webs and balancing mass in the engine, which converts the reciprocating displacement of the piston into rotary motion. This study was conducted on a single cylinder four-stroke diesel engine. The crankshaft must be strong enough to take the downward force during power stroke without excessive bending. Thus, the reliability and life of the internal combustion engine depend largely on the strength of the crankshaft. The crankshaft is the large volume production part; hence an optimized design is an effective method to increase the fuel efficiency and overall cost of the engine. However as the engine runs, the power impulses hit the crankshaft in one place and then another. The torsional vibration appears when a power impulse hits a crankpin toward the front of the engine and the power stroke ends. If not controlled, it can break the crankshaft. A solid three-dimensional parametric geometry of a single cylinder crankshaft of a four-stroke diesel engine is created using higher-end CAD software, i.e., Pro/Engineer according to the detailed two-dimensional drawing. This solid geometry was imported in step format for finite element simulation purpose under structural and dynamic simulation using ANSYS workbench software. The static and dynamic analyses on the existing design were done to verify the results under static and dynamic conditions by applying boundary conditions according to engine specification and

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