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ADAMA SCIENCE AND TECHNOLOGY UNIVERSITY
School of engineering

Product Engineering, Tooling and manufacturing Process Development for Disc Gang Assembly

(Case study METEC- Metal Fabrication Industry)

A Thesis submitted in partial fulfillment of the requirements for the award of the degree of

Master of Science

In

Manufacturing Engineering

By

Yewendim Fenta wondim

Advisor: Wassihun Yimer (PhD.)

Department of Mechanical and Vehicle Engineering

June, 2015

Adama

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Approved by Board of Examiners

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External Examiner	Signature	Date
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Advisor	Signature	Date

CANDIDATE'S DECLARATION

I hereby declare that the work which is being presented in the thesis entitled "**Product Engineering, Tooling and manufacturing Process Development for Disc gang Assembly ”** in partial fulfillment of the requirements for the award of the degree of master of science in manufacturing engineering is an authentic record of my own work carried out from October 2014 to June 2015 under the supervision of Wassihun Yimer (PhD).

The matter embodied in this thesis has not been submitted by me for the award of any other degree or diploma. All relevant resources of information used in this thesis have been duly acknowledged.

Student	**Signature**	**Date**

This is to certify that the above statement made by the candidate is correct to the best of my knowledge and belief. This thesis has been submitted for examination with my approval.

Advisor	**Signature**	**Date**

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List of Abbreviations

SKD – semi knockdown

NPD – New product development

CKD – complete knockdown

METEC – Metal Engineering Corporation

FDRE- Federal Democratic Republic Of Ethiopia

CMM – coordinate measuring machine

OEM – original equipment manufacturer

RE- reverse engineering

FEA – Finite element analysis

UNECA- United Nation Economic Commission

FAO – World Food and Agriculture Organization

EDM- electro discharge machining

CGI- Capturing Geometry Internally

CAD- computer aided design

CAPP- computer aided process planning

SME- society of manufacturing engineers

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Abstract

Local manufacturing companies of the country, to remain competitive in today's global market manufacturing companies must produce market oriented quality product at the highest possible efficiency. The introduction of agricultural machinery and implements has been the most significant feature of the development of Ethiopian agriculture. The concept of producing import substitute products was highly emerged in Ethiopia manufacturing sector. For countries like Ethiopia who have limited facility and poor documentation for new product development, it is better to start with by reengineering products which are already available in market. Rather than producing it from scratch, proto typing and testing by setting up an expensive NPD facility.

The current thesis aim to, reengineer the disc gang assembly parts of light duty 14 discs model disc harrow. The design of the disc gang assembly parts was done by using systematic reverse engineering technique. The required knowledge and information regarding the design, manufacturing and safe usage of the disc harrow was extracted and the parts were fully designed. The principal parts of the disc harrow were also selected and the necessary static load analysis was done for disc blade, and gang axle. For the implementation stage of the RE process the necessary manufacturing process was selected based on the information gathered during RE analysis. The necessary tooling for the disc blade and gang axle was also done and design of the upset forging and sheet metal forming dies model and analysis for the designed tools was performed by using CATIA V5 software. The static load, Von Misses stress analysis result showed that the design was safe. The thesis integrates the product engineering through RE technique into the manufacturing process of parts of the disc gang parts and product tooling. It also evaluates the applicability of systematic reverse engineering technique trough examination of the actual disc gang parts redesign and manufacturing project.

Key words: disc gang, reverse engineering, product tooling, disc gang manufacturing process etc.