A CASE STUDY ON FAILURE OF COCONUT HUSK CHIPPING BLADES

Nuwanthi Chamika Wijesinghe

179452X

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DECLARATION

I declare that this is my own work, and this Dissertation does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or Institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text. I retain the right to use this content in whole or part in future works (such as articles or books).

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Name of Co- Supervisor: Mr. A.J.L. Adikari

Signature of the Co- Supervisor: Date:

Name of Supervisor:

Signature of the Supervisor: Date:

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ABSTRACT

The exportation of coconut-based products is one of the major foreign currency earnings in Sri Lanka. Among those products, grow bags made from coconut husk chips is performed a main role. The quality of the grow bags is highly influenced by the chip quality.

Existing coconut husk chipping machines consist of two circular blades which are encountered unexpected production difficulties due to fracture in the blade material and low lifetime. However, despite this component failing frequently, industrialists have no idea about the reason for the failure or a method to avoid the failure. This study has focused on the identification of the existing blade material, the reason for the material failure, and proposed a treatment to avoid the failure.

Accordingly, a detailed failure analysis was carried out using Arc Spark Spectrometer, Optical Microscope and Micro hardness tester. The study has found that Type 01 blade has manufactured by cold work D2 steel. The undesirable primary carbide network (coarse carbides) present in there reduces the toughness of the steel and leads to material cracking and distortions. Also, the retain austenite is present in the cold work steel at the room temperature due to different cooling rates and thermal contractions between surface and the core. It produces comprehensive residual stresses that ultimately lead to a hardness gradient along the cross section of the blade. It favors the crack generation and mechanical failures of the blade due to high anisotropy. This anisotropic mechanical response along the cross section is mainly due to material type and lack of control of thermal treatments. In order to avoid the failure residual internal stresses and hardness gradient were eliminated by the tempering at 350 ^{o}C.

Keywords: Coconut husk chipping blade, D2 steel, Hardness gradient, Tempering

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LIST OF ABBREVIATIONS

Abbreviation	Description
LAS	Low Alloy Steel
HSS	High Speed Steel
DLC	Diamond Like Carbon
PVD	Physical Vapor Deposition
CVD	Chemical Vapor Deposition
WC	Tungsten Carbide
HVOF	High Velocity Oxygen Fuel
SEM	Scanning Electrone Microscope
XRD	X Ray Diffraction
MAS	Mossbauer Absorption Spectroscopy
FH	Fast Heating
SH	Slow Heating
AISI	American Iron and Steel Institute
HRC	Rockwell C Hardness
VH	Vicker’s Hardness
CO_2	Carbon Dioxide

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