

# Analysis of Physical and Mechanical Properties of Backhoe's Bucket Repairment with Cladding Methode

*by Program Studi Teknik Mesin*

---

**Submission date:** 26-Sep-2022 02:31PM (UTC+0700)

**Submission ID:** 1909243879

**File name:** Analysis\_of\_Physical\_and\_Mechanical\_Properties\_of.pdf (1.17M)

**Word count:** 4605

**Character count:** 24386

0 items

Registration Log In



Search



## Paper Titles



# Analysis of Physical and Mechanical Properties of Backhoe's Bucket Repairment with Cladding Methode

 112

### Abstract:

Buckets are the most important component in backhoe construction, the bucket functions as a digger and carrier component in an excavator. Due to the heavy working media of the excavator so that this component is the most easily damaged part, damage that often occurs is wear caused by friction arising so that the thickness of the bucket is reduced which can eventually cause cracks in the bucket and in continuous use can cause the bucket to crack and broken. Cladding method is done to shorten the time or simplify the repair process is to directly patch the damaged part with a welding layer and then do the grading using a grinding. This




study aims to determine the physical and mechanical properties of the material from the cladding process when compared with the raw material, the variations used are raw material, cladding with filler welding, and cladding with plates. The welding process is carried out with GMAW (Gas Metal Arc Welding) and low carbon steel. Welding results will be tested tensile strength, bending strength, impact test, hardness test, chemical composition, and corrosion rate. From the hardness test results showed that the weld metal from plate variation has the highest hardness value of 443 VHN. From the results of tensile testing the basic material has the highest value with 359.08 MPa. From the bending test results the highest value obtained from filler verification with 494.01 Mpa and the highest impact price obtained from the plate variation cladding method with a value of 1.49 J / mm<sup>2</sup>



Access through your institution

ADD TO CART 

### Info:

Periodical:	<a href="#">Key Engineering Materials (Volume 841)</a>
Edited by:	Prof. Mosbeh Kaloop
Pages:	254-258
DOI:	<a href="https://doi.org/10.4028/www.scientific.net/KEM.841.254">https://doi.org/10.4028/www.scientific.net/KEM.841.254</a>
Citation:	<a href="#">Cite this paper</a>
Online since:	May 2020
Authors:	 <a href="#">Yustiasih Purwaningrum*</a> , <a href="#">Muhammad Hafiz</a> , <a href="#">Risky Suparyanto</a>
Keywords:	<a href="#">Cladding</a> , <a href="#">Corrosion Rate</a> , <a href="#">Hardness</a> , <a href="#">Tensile Strength</a>
Export:	<a href="#">RIS</a> , <a href="#">BibTeX</a>
Price:	39,00 €
Permissions:	 <a href="#">Request Permissions</a>
Share:	

\* - Corresponding Author

**References** >

**Cited by** >

**Related Articles** >

- DISTRIBUTION & ACCESS
- FOR PUBLICATION
- INSIGHTS
- DOWNLOADS
- ABOUT US
- POLICY & ETHICS
- CONTACT US

IMPRINT

PRIVACY POLICY

SITEMAP

ALL CONFERENCES

ALL SPECIAL ISSUES

ALL NEWS



 0 items

[Registration](#) [Log In](#)



Search



Journals



## Engineering Research

Advanced Engineering Forum

Applied Mechanics and Materials

Engineering Innovations

Journal of Biomimetics, Biomaterials and Biomedical Engineering

International Journal of Engineering Research in Africa

## Materials Science

Advanced Materials Research

Defect and Diffusion Forum

Diffusion Foundations and Materials Applications

<sup>2</sup> [Journal of Metastable and Nanocrystalline Materials](#)

[Journal of Nano Research](#)

## Key Engineering Materials

Materials Science Forum

Nano Hybrids and Composites

Solid State Phenomena

## Engineering Series

Advances in Science and Technology

Construction Technologies and Architecture



Books



Special Book Collections



Foundations of Materials Science and Engineering

Specialized Collections

Retrospective Collection

2

## Key Engineering Materials - Editorial Board



ISSN: 1662-9795

Details

Volumes

Editorial Board

Founding Editor

**Fred H. Wohlbiert**

Editor(s) in Chief

**Assoc. Prof. Dr. Cecilia Poletti**



[ORCID](#)

Graz University of Technology, Institute of Materials Science, Joining and Forming; Kopernikusgasse 24/1, Graz, A-8010, Austria;

**Prof. Dr. José Manuel Torralba**



[ORCID](#)

Universidad Carlos III de Madrid, IMDEA Materials; Av. Universidad 30, Leganés, 28911, Spain;

## <sup>2</sup> Editorial Board

---

### **Prof. Aldo Roberto Boccaccini**

University of Erlangen-Nürnberg, Institute of Biomaterials, Department of Materials Science and Engineering; Cauerstrasse 6, Erlangen, 91058, Germany;

---

### **Prof. Mónica Campos**

[ORCID](#)

University Carlos III de Madrid, Department of Materials Science and Engineering; Av. Universidad 30, Leganés-Madrid, 28911, Spain;

---

### <sup>2</sup> **Dr. Li Chang**

University of Sydney, School of Aerospace, Mechanical and Mechatronic Engineering; Sydney, Australia, 2006;

---

### **Prof. Yi Bing Cheng**

[ORCID](#)

Monash University, Department of Materials Science and Engineering; PO Box 197, Caulfield East, Australia, 3145;

---

### **Prof. Ilaria Cristofolini**

[ORCID](#)

University of Trento, Department of Industrial Engineering; Via Sommarive 9, Povo, 38123, Italy;

---

### **Prof. Robert Danzer**

Montanuniversität Leoben, Institut für Struktur- und Funktionskeramik; Peter-Tunner-Strasse 5, Leoben, A-8700, Austria;

---

### <sup>2</sup> **Prof. Suong Van Hoa**

Concordia University, Department of Mechanical and Industrial Engineering; 1455 Demaisonneuve West # EV 4-145, Montreal, Canada, H3G1M8;

---

### **Prof. Xiao Zhi Hu**

University of Western Australia, School of Mechanical and Chemical Engineering; Perth, Australia, WA 6009;

---

### <sup>2</sup> **Prof. Mohamed A. Taha**

Ain-Shms University, Department of Design and Production Engineering, Faculty of Engineering; Khalifa El-Maamon st, Abbasiya sq., Cairo, Egypt, 11566;

---

### **Prof. Alejandro Ureña Fernandez**

Universidad Rey Juan Carlos (URJC), Department of Materials Science and Engineering; Tulipan s/n 28933, Mostoles, Madrid, Spain;

---

**Prof. Dragan P. Uskokovic**

Institute of Technical Sciences of the Serbian Academy of Sciences and Arts; Knez Mihailova 35/IV, Belgrade, Serbia;

**Prof. Maria Teresa Vieira**

[ORCID](#)

Universidade de Coimbra, ICEMS - Instituto de Ciência e Engenharia de Materiais e Superfícies ; Pólo II-Pinhal de Marrocos, Coimbra, 3030-788, Portugal;

**2 Prof. Zhi Rui Wang**

University of Toronto, Department of Materials Science and Engineering; 184 College Street, Toronto, Canada, M5S 3E4;

**Prof. Ming Xing Zhang**

University of Queensland, School of Mechanical and Mining Engineering; St. Lucia, Queensland, Australia, QLD 4072;

[DISTRIBUTION & ACCESS](#)

[FOR PUBLICATION](#)

[INSIGHTS](#)

[DOWNLOADS](#)

[ABOUT US](#)

[POLICY & ETHICS](#)

[CONTACT US](#)

[IMPRINT](#)

[PRIVACY POLICY](#)

[SITEMAP](#)

[ALL CONFERENCES](#)

[ALL SPECIAL ISSUES](#)

[ALL NEWS](#)



**2** Scientific.Net is a registered brand of Trans Tech Publications Ltd  
© 2022 by Trans Tech Publications Ltd. All Rights Reserved



## Table of Contents

### Preface

### Chapter 1: Engineering Materials

<b>Effect of Plating Thickness on Fatigue Strength of Galvanized Steel</b> K. Hasegawa, T. Hayashi, M. Morita and S. Motoda	3
<b>Influence of Nano-Silica Dosage on Properties of Cement Paste Incorporating with High Calcium Fly Ash</b> Suwan, P. Jitsangiam and P. Chindapasirt	9
<b>Mechanical and Shrinkage Behaviors of Ductile Fiber-Reinforced Polymer Repair Mortar</b> Y. Han and J.L. Luo	14
<b>Development of a TAPE-Agar Liquid Gel Bandage</b> F.M. Bautista, M.R.H. Tam, K.A.D. Wong and T. Tumolva	20
<b>Frequent Start-Stop Test Study of Graphene Coatings on Journal Bearings</b> B. Wang, Y.F. Zhang and Z.W. Yin	26
<b>A New Technology to Prevent the Formation of Limescale in Hot Water Supply Systems</b> M. Jalilov, A. Jalilova, G. Feyziyeva and M. Azimova	36
<b>Development of a CuFe<sub>2</sub>O<sub>4</sub> - Reduced Graphene Oxide-Based Electrochemical Sensor for Malathion</b> A.T. Battad, J.G. Estacio, J.L.C. Indiongco and M.J.L. Mopon	41
<b>Nano-Crystallization of Steel Surface by Slide-Burnishing</b> Kato, K. Yamamoto and K. Yasunaga	48
<b>Numerical Simulation of Material Plastic Deformation Using the Drawing Forming Process of Contoured Internal Surface Tubes</b> Necpal, E. Hodúlová and M. Martinkovič	54
<b>Solvent Absorption and Dissolution Kinetics Modelling for the Chemical Recycling of Waste Plastic Laminates</b> M.S.P. Deang, R.I.C. Alindayu, K.V.H. Escasa, G.M.G. Riña and T. Tumolva	59
<b>Feasibility of Paper Production from Oil Palm Trunk Using Arrowroot Flour as a Binder</b> Phruksaphithak and J. Wangprayot	64
<b>Study on Morphology Features and Mechanical Properties of Nanofibers Films Prepared by Different Composite Electrospinning Methods</b> He, H. Wang, L.X. Huang, P. Wang and W. Gao	70
<b>Studying the Stability and Conductivity of the Composite Films via Electrospinning/Spray Process</b> X. Huang, H. Wang, F.Y. Fang, P. Wang and W. Gao	76
<b>Electrospinning/Spray: The Interaction between Graphene Nanosheets and Different Nanofibers</b> Z. Chen, H. Wang, F.Y. Fang, H. Mei and L. Wang	82
<b>Tensile Properties of Cellulose-Filled Recycled Thermoplastic Composite Filaments for 3D Printing</b> Hyvärinen and T. Kärki	87
<b>3D Reconstruction of Microstructure for Centrifugal Casting Babbitt Lining of Bimetallic Bearing Based on Mimics</b> Dong, Z.W. Yin, H.L. Li, Y. Mao and G.Y. Gao	94
<b>X-Ray Powder Diffraction Data and Crystal Refinement of Ternary Compound Ti<sub>4</sub>ZrSi<sub>3</sub></b> L.Q. Liang, Y.Y. Wei and D.G. Li	99
<b>The Green Preparation of Cellulose Fibrils from Oil Palm Leaf Stalk Fibers for Hydrogel Applications</b> Srirachya and A. Nido	103
<b>Evaluation of Recycled Aggregate (RAP) Presence Impact under Indirect Tensile Strength of Bitumen Stabilized Mix with Foamed Asphalt for a Base Layer</b> M.A.V. Guzmán, H.D. Alamilla, E.M.A. Guzmán, W.M. Molina, H.L.C. García and R.R. Ruiz	108

<b>1</b>	<b>Scanning Electron Microscope in Rocks and their Comparison with Physical-Mechanical Properties</b>	
	M.A.N. Seras, F.J.D. Mota, E.M.A. Guzmán, W.M. Molina, H.L.C. García, J.G.T. Ruiz and A.G. Torres	114
<b>1</b>	<b>Natural Additive to Retard the Setting of a Mortar and Increase its Resistance</b>	
	D. González, L.A.G. Luna, E.M.A. Guzmán, W.M. Molina, H.L.C. García and J.A.V. Perez	119
<b>1</b>	<b>Electrochemical Synthesis of Hydroxyapatite Nanosheet-Assembled Porous Structures with Bipolar Membrane</b>	
	A. Nur, A.W. Budiman, A. Jumari, N. Nazriati and F. Fajarah	124
<b>1</b>	<b>The Comparison between Mechanical Properties of Laser-Welded Ultra-High-Strength Austenitic and Martensitic Steels</b>	
	M. Hietala, M. Keskitalo and A. Järvenpää	132
<b>1</b>	<b>Mechanical Properties of Concrete Using Treated Recycled Concrete Aggregate in Marine Environment</b>	
	Ismail and M. Ramli	138
<b>1</b>	<b>Failure Analysis of Spur Gears Used in Transmission System Applied on a Hand Tractor</b>	
	Musaini, D.M. Dawud, T.E. Putra and N. Ali	144
<b>1</b>	<b>Biofuel Production from Jatropa Bio-Oil Derived Fast Pyrolysis: Effect of Catalysts Supported</b>	
	T. Rodseanglung, T. Ratana, M. Phongaksorn and S. Tungkamani	150
<b>1</b>	<b>Experimental Investigation and Modelling of Claystone from Mae Moh Coal Mine, Thailand</b>	
	Wongchana and P. Jitsangiam	155
<b>1</b>	<b>Preliminary Investigation of Crushed Rock-Based Geopolymer for Road Applications</b>	
	H. Thongchua, P. Jitsangiam, T. Suwan, D. Rinchumphu, S. Kwunjai and P. Chindaprasirt	161
<b>1</b>	<b>Hemp Fiber Reinforced Geopolymer Composites: Effects of NaOH Concentration on Fiber Pre-Treatment Process</b>	
	P. Maichin, T. Suwan, P. Jitsangiam and P. Chindaprasirt	166
<b>1</b>	<b>Crushed Rock Geopolymer as a Future Road Construction Material: An Evaluation on Strength Performance and Compaction Characteristics</b>	
	S. Kwunjai, P. Jitsangiam, T. Suwan, D. Rinchumphu, H. Thongchua, P. Chindaprasirt and S. Ampattagul	171
<b>1</b>	<b>Response Behavior of Local Surface Failure due to Repetitive Impact of Stainless Steel</b>	
	I. Sukpat and K. Tuchinda	177
<b>1</b>	<b>Study of Properties of 3D Printed Short Carbon Fiber Composite</b>	
	Saithongkum and K. Tuchinda	182
<b>1</b>	<b>High Purity Lime as an Ecologic Alternative for Construction Mortars and Pastes</b>	
	E.G. Navarro Mendoza, J.A. Bedolla-Arroyo, A.S. Calvillo, E.M.A. Guzmán, V.H. Blancas-Herrera, W.M. Molina and H.L.C. García	188
<b>1</b>	<b>Cemented Mortar Matrices Densified with Organic Additions</b>	
	L.C. Velázquez, E.M.A. Guzmán, W.M. Molina, H.L.C. García, M.C.G. Chiquito and M.A. Sánchez	193
<b>1</b>	<b>Evaluation of the Electrical Resistivity, Ultrasonic Pulse Velocity and Mechanical Properties in Portland Cement Pastes Type II</b>	
	J.A.V. Perez, E.M.A. Guzmán, W.M. Molina, H.L.C. García, I.T. Moreno and M.A. Sánchez	198
<b>1</b>	<b>Characterization of Hydraulic Concrete with Polystyrene-Based Emulsion</b>	
	M.C.G. Chiquito, E.M.A. Guzmán, W.M. Molina, H.L.C. García and N.D. González	203
<b>1</b>	<b>Preparation and Performance Study of Fluorosilicone Oligomer Anti-Sticking Coatings</b>	
	D.B. Guan, X.J. Zhai, Y.N. Biansai, B.J. Cao, Y.F. Zhu and J.L. Li	209
<b>1</b>	<b>The Effect of Alloying on the Fractional Composition, Shape and Grain Size Distribution of the Structure Alloy GAP the Fe-Nd-B System</b>	
	V.A. Chaika, V.V. Savin, M. Sorokovikov and A. Marikhin	214
<b>1</b>	<b>Optimization of Methylene Blue Adsorption via Functionalized Activated Carbon Using Response Surface Methodology with Central Composite Design</b>	
	Saafie, M.F.R. Samsudin and S. Sufian	220
<b>1</b>	<b>Rejection Rate Reduction of the Automotive Thermoplastic Parts in Injection Moulding Using Response Surface Methodology</b>	
	H.R. Ong, I.M. Shah, W.M.E. Iskandar, M.M.R. Khan, C.S. Hong, R. Ramli and M.K.A. Mohamed	225

<b>Simulation of Gap Flow Field in EDM Process Used Oil-in-Water Working Fluid</b>	
W.J. Chang, Y.Y. Xi and H.W. Li	232
<b>Synthesis, Preparation and Characterization of Amine-Induced Bacterial Cellulose-Poly(Vinyl Alcohol) Semi-Interpenetrating Network Hydrogel</b>	
E. Arikibe, R. Lata and D. Rohindra	238
<b>Effect of Substrate Temperature on the Electronic Properties of MgO Thin Films on Si (100) Grown by Electron Beam Evaporation</b>	
Y.R. Denny, T. Firmansyah, V. Gustiono and S.S. Lee	243
<b>Button of Hydroxyapatite Composite for Craniotomy Flap Fixation: Fabrication and Mechanical Properties</b>	
A. Raksujar and S. Punyanitya	248
<b>Analysis of Physical and Mechanical Properties of Backhoe's Bucket Repairment with Cladding Methode</b>	
Y. Purwaningrum, M. Hafiz and R. Suparyanto	254
<b>Fabrication Study of Cu-C-Ni for EDM Electrode by a Sintering Technique</b>	
Janmanee, A. Muttamara, R. Saodaen and A. Rodchanarowan	259
<b>Synthesis and Characterization of Active Biocarbon Material for Use in Cosmetics and Personal Care Products</b>	
A. Palsan, J.Y. Lim and A. Nor Asfaliza	266
<b>Characterization of Adsorbents Derived from Palm Fiber Waste and its Potential on Methylene Blue Adsorption</b>	
Zulkania, M. Iqbal and Syamsumarlin	273
<b>Potential Activity Evaluation of Phosphorus on CoMo/Al<sub>2</sub>O<sub>3</sub>-TiO<sub>2</sub> Catalysts to Co-Processing Model</b>	
Rodseanglung and J. Paksamut	278
<b>Investigation of the Tensile and Flexural Behavior of Polylactic Acid Based Jute Fiber Bio Composite</b>	
M. Aadithya, V.K. Kirubakar, T. Aakash and C. Senthamarai kannan	283
<b>Fatigue and Fracture Mechanism of Aluminum-Carbon Fiber Reinforced Hybrid Composites</b>	
M.M. Rahman and M.S. Ferdous	288
<b>Fatigue-Corrosion of High Strength Steels in Synthetic Seawater under Cathodic Protection</b>	
S. Lorenzi, C. Testa, M. Cabrini, F. Carugo, L. Coppola and T. Pastore	294
<b>Effect of Cr and Si Contents on the Magnetic and Mechanical Properties of Fe-Cr-Si Alloys by MIM Process</b>	
M. Kimura, T. Shimizu and H. Watari	300
<b>Microstructure and Mechanical Properties of Laser Welded 316L SLM Parts</b>	
T. Rautio, J. Mäkikangas, M. Jaskari, M. Keskitalo and A. Järvenpää	306
<b>The Effect of Calcination Temperature on Metakaolin Characteristic Synthesized from Badau Belitung Kaolin</b>	
R. Ulfiati, D. Dhaneswara, J.F. Fatriansyah and S. Harjanto	312
<b>Flavor Quality Changes of Turbot (<i>Psetta maxima</i>) Stored at -2 and 0°C</b>	
L. Zhao, Y.M. Yin, Y. Liu, Y.X. Xu, X.P. Li and J.R. Li	317
<b>Investigation on Mechanical Behavior of Sisal Fiber Reinforced Polylactic Acid and Sisal/Epoxy Composites</b>	
S. Dhannush, S. Aushwin, A.R. Arunagiri and C. Senthamarai kannan	322
<b>Evaluation of Mechanical Properties of Sugarcane Reinforced Hybrid Natural Fibre Composites by Conventional Fabrication and Finite Element Method</b>	
D.S. Ram, P.N.B. Kumar, R.S. Kumar and B.V. Ramnath	327
<b>Study of Deep Cryogenic Treatment Process Effect on Microstructure and Properties of CuBeZr Alloy</b>	
Wannaprawat and K. Tuchinda	335
<b>Casting of High Aluminum Content AM Series Magnesium Alloys by Using a Horizontal Twin Roll Caster</b>	
Tozuka, K. Seki, H. Watari and T. Haga	340
<b>Estimation of Cold Roll Forming Characteristics of Wrought Magnesium Alloy with Tension-Compression Asymmetry</b>	
H. Kobayashi, H. Tozuka and H. Watari	346

---

**Chapter 2: Materials Properties and Application**

<b>Analogy of Non-Destructive Tests for the Detection of Defectologies in Aluminium Cylinder Heads</b> S.S. Valencia, L.C. Galárraga, H.C. Terán and O. Arteaga	355
<b>Surface Roughness Prediction Based on Acoustic Emission Signals in High-Precision Diamond Turning of Rapidly Solidified Optical Aluminum Grade (RSA443)</b> Z. Hweju and K. Ábou-El-Hosseín	363
<b>Flow Field Analysis and Experimental Investigation of Electrochemical Etching</b> Y.L. Chen, C.H. Guo, P.X. Chen, Z. Liu and A.S. Lv	369
<b>3D FEM Study of the Flow Uniformity of Flat Polypropylene Film/Sheet Extrusion Dies</b> D. Igali, A. Perveen, D.M. Wei, D.C. Zhang and A. Mentbayeva	375
<b>Prediction of the Fatigue Life of the SAE 5160 Carbon Steel Coil Spring Based on Strain-Life Approach</b> T.E. Putra, Husaini and H. Prakasa	381
<b>Design and Optimization of Die Body for Polymer Extrusion</b> T. Saparov, U. Belgibay, D.C. Zhang, D.M. Wei, C.N. Sun, A. Mentbayeva and A. Perveen	387

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/342025519>

# Analysis of Physical and Mechanical Properties of Backhoe's Bucket Repairment with Cladding Methode

Preprint · June 2020

CITATIONS  
0

READS  
96

3 authors, including:



Yustiasih Purwaningrum  
Universitas Islam Indonesia

18 PUBLICATIONS 20 CITATIONS

SEE PROFILE



## 1 Analysis of Physical and Mechanical Properties of Backhoe's Bucket Repairment with Cladding Methode

Yustiasih Purwaningrum<sup>1,a\*</sup>, Muhammad Hafiz<sup>1</sup> and Risky Suparyanto<sup>1</sup>

<sup>1</sup>Mechanical Engineering Department, Islamic University of Indonesia,  
Jalan Kaliurang Km 14,5, Ngemplak Sleman Yogyakarta, Indonesia

<sup>a</sup>yustiasih.purwaningrum@uii.ac.id

**Keywords:** Cladding, Tensile strength, Corrosion rate, Hardness

**Abstract.** Buckets are the most important component in backhoe construction, the bucket functions as a digger and carrier component in an excavator. Due to the heavy working media of the excavator so that this component is the most easily damaged part, damage that often occurs is wear caused by friction arising so that the thickness of the bucket is reduced which can eventually cause cracks in the bucket and in continuous use can cause the bucket to crack and broken. Cladding method is done to shorten the time or simplify the repair process is to directly patch the damaged part with a welding layer and then do the grading using a grinding. This study aims to determine the physical and mechanical properties of the material from the cladding process when compared with the raw material, the variations used are raw material, cladding with filler welding, and cladding with plates. The welding process is carried out with GMAW (Gas Metal Arc Welding) and low carbon steel. Welding results will be tested tensile strength, bending strength, impact test, hardness test, chemical composition, and corrosion rate. From the hardness test results showed that the weld metal from plate variation has the highest hardness value of 443 VHN. From the results of tensile testing the basic material has the highest value with 359.08 MPa. From the bending test results the highest value obtained from filler verification with 494.01 Mpa and the highest impact price obtained from the plate variation cladding method with a value of 1.49 J / mm<sup>2</sup>.

### Introduction

Heavy equipment is equipment that are widely used in building construction or mining. Increasing infrastructure development and mining has led to higher demand for heavy equipment. The type of heavy equipment that is most often used is a digger or also known as an excavator. Excavators are used to dig soil or rocks, including types of excavators are front shovels, backhoes, draglines and clamshells. The construction of a backhoe excavator is divided into several parts, including: buckets that are used as digging containers, arms of the backhoe, the wheelhouse of the operator, the engine as a motor, and the shoe track frame that functions as a wheel on the excavator.

Bucket is the most easily damaged component. Damage that often occurs is wear caused by friction that arises so that the bucket thickness is reduced which can eventually cause bucket cracks and in continuous use can cause the bucket to crack and break. Bucket replacement costs and takes a long time so if there is damage to the bucket, repairs that can be done is to cut the damaged part and replace with a new steel plate using welding. However, what is generally done by the company to shorten the time or simplify the repair process is to directly patch the damaged part with the weld layer. After all the damaged parts are covered with welds, then grading is done using a grinding. Repairing buckets with this methode can minimize the unit in a breakdown condition. This repaired methode is called cladding.

Cladding is a process where material covers or coats another either internally or externally [1]. Cladding can be done by forming processes such as rolling and casting, and joining processes such as welding [2]. Different types of arc welding like Shielded Metal Arc Welding (SMAW), Gas Tungsten Arc Welding (GTAW), Gas Metal Arc Welding (GMAW), Flux Cored Arc Welding (FCAW) can successfully produce cladding. GMAW is widely accepted by industry to produce weld cladding [3 4].

The advantages of Gas Metal Arc Welding (GMAW) are high productivity, low cost and high reliability [5 6]. The shape of cladding influences mechanical properties of cladding steel welded [7].

## Experimentals

**Welding System.** This experimental used SWRM 1008 Low Carbon Steel as a raw material. The spectrometric analysis of the specimen was done by using Spectromax and the chemical compositions of base metal and welding metal were reported in Table 1. The welding processes was carried out by GMAW (Gas Metal Arc Welding) with electrode ER 70S-6 as a filler metals. The welding parameter is shown in Table 2.

Table 1 Chemical Composition of SWRM 1008 Low Carbon Steel

Element	Fe	C	Mn	P	Si	Cu	S	Ni	Cr	Mo
<b>Raw Material</b>	99.5318	0.0666	0.2537	0.0308	0.0117	0.1400	0.0156	0.0063	0.0229	0.0052
<b>Filler</b>	97.7337	0.0647	1.0909	0.1640	0.6826	0.2642	0.0163	0.0392	0.0467	0.0014

Table 2 Welding Parameter

<b>Material</b>	Low Carbon Steel (SWRM 1008)
<b>Dimension</b>	250 mm x 250 mm x 1.36 mm
<b>Type</b>	GMAW
<b>Electrode</b>	AWS A5.18 ER 70S-6 , diameter 1.2 mm
<b>Current</b>	80 A
<b>Welding rate</b>	2.7 mm/s
<b>Voltage</b>	16 Volt
<b>Wire feed rate</b>	1 m/min
<b>Welding gas</b>	Argon

The variation buttering of welding that used were filler and plate. The schematic of cladding is shown in Fig. 1. In variations of cladding with filler, the surface of the raw material with dimensions of 250x250 mm welded on its surface is then flattened with a grinding. The other variation, cladding with plate, a plate measuring 250 mm x 10 mm was added to the top of the base plate in a row with a gap of about 1 mm. In the plate variation the welding process is carried out only on gaps that have been prepared in advance. This welding is carried out in a continuous direction (sequence) to avoid large deformations.



Fig. 1 Variation Cladding Steel Welded

**Joints Characterizations.** Mechanical properties of cladding weld steels obtained from tensile strength and bending strength testing. The tensile strength of cladding steel welded were tested by Universal Testing Machine. The specimens tested were according to the standar ASTM E - 8M. Three point bending method used to measure the bending strength of buttering weld steels. This test is carried out using standards JIS Z2204.

Corrosion and Vickers microhardness testing is carried out to obtain physical properties of buttering weld steels. Vickers indenter under 200 gr force for 10 seconds was used to investigate the hardness of buttering weld steels.

$$corrosion\ rate = \frac{W}{TSA \times \frac{T}{365}}$$

W = weight loss (gram)  
 TSA = total surface area (mm<sup>2</sup>)  
 T = time of exposure (days)

**Results and Discussion**

**Tensile Strength.** Fig. 2 shown the tensile strength and elongation of cladding steel. The experimental results showed that the method of cladding steel welded to repair bucket decreased tensile strength and elongation of material. The decline of tensile strength in a row as follows: cladding with filler = 273.89 MPa and cladding with plate = 318.89 MPa.

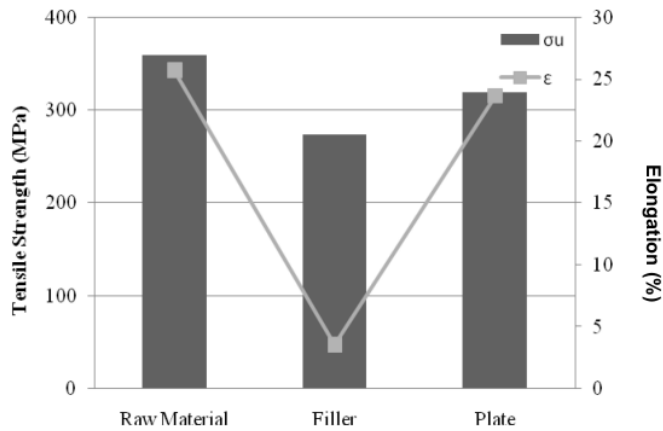


Fig. 2 Tensile Strength of Cladding Steel Welded

**Bending Strength.** As we can see from Fig. 3 the weld metals with filler cladding has a highest bending strength. The values of bending strength of this variation is 494.01 Mpa, this value is 31.06 % more than raw material.

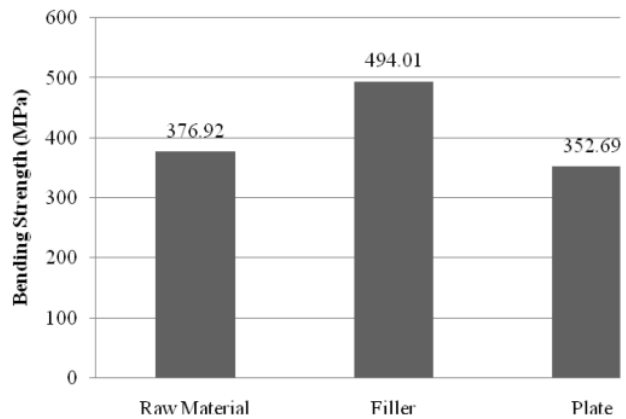


Fig. 3 Bending Strength of Cladding Steel Welded



**Corrosion.** The value of corrosion rate can be seen at Fig. 4. From this diagram, it was found that filler specimens had the best resistance to corrosion with a value of 1.43 mmpy slightly different from raw material specimens which had an average value of 1.54 mmpy. whereas specimens with plate cladding variations have the lowest resistance of corrosion with a value of 4.24 mmpy.

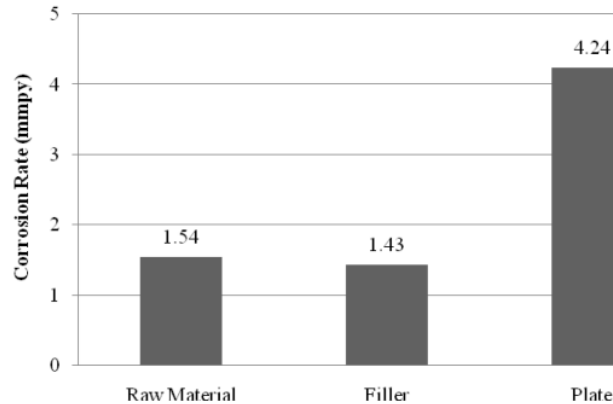


Fig. 4 Corrosion rate of Cladding Steel Welded

**Hardness.** Variation of hardness from buttering steel is shown in Fig. 5. The Fig.1 shows that hardness of welding metal has highest values. The hardness number of weld metals are 443 VHN for plate cladding and 423 VHN for filler cladding.

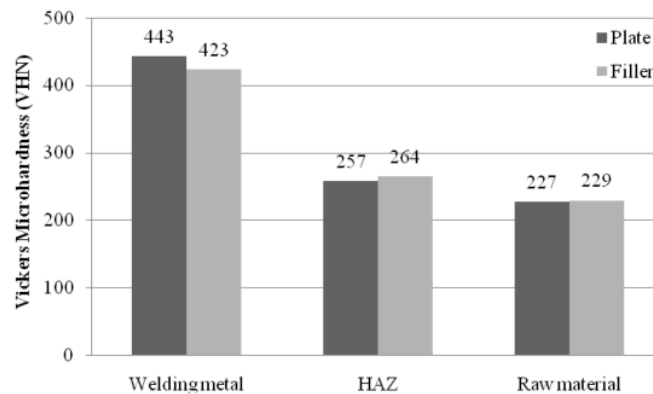


Fig. 5 Hardness Number of Cladding Steel Welded

### Summary

Based on the results of tests that have been carried out in research into the repaired of the backhoe bucket with cladding method with variations in the welding process with variations of filler and plate, the following conclusions can be drawn:

- The chemical composition of cladding steel welded such as S, Ni, Si, Cr, Mn, N, Cu and Ti has increased, but the element C has decreased. The reduction of element C causes the mechanical properties of the filler variation to increase, this is seen in bending testing
- Cladding with plate variations have better mechanical properties because have better hardness, tensile strength and strain values than filler variations.

- The corrosion rate on cladding steel welded with plate variations has very poor corrosion resistance with a value of 4.2429 mmpy compared to raw material specimens and filler variation with a value of 1.4358 mmpy.

**References**

- [1] M. K. Saha, S. Das, Gas Metal Arc Weld Cladding and its Anti-Corrosive Performance-A Brief Review, *Athens J. Technol. Eng.* 5(2) 155-174.
- [2] J. R. Davis, Davis&Associates, *Stainless Steel Cladding and Overlays*, ASM Specialty Handbook: Stainless Steels, 06398G. (1984).
- [3] W. Lucas, Arc surfacing and cladding processes to enhance performance in service and to repair worn components, *Welding Metal Fabrication*. 62(2) (1994) 55-60.
- [4] T. Kannan, J. Yoganandh, Effect of process parameters on clad bead geometry and its shape relationships of stainless steel claddings deposited by GMAW, *Int. J. Adv. Manufact. Technol.* 47(9-12) (2010) 1083-1095.
- [5] F. Kjeld, Gas metal arc welding for the collision repair industry, *American Welding J.* 70(4) (1991) 39-46.
- [6] K.A. Lyttle, GMAW-A versatile process on the move, *American Welding J.* 62(3) (1983) 15-23.
- [7] D. C. Montgomery, *Design and Analysis of Experiments*, John Wiley& Sons, Inc. (1984).

# Analysis of Physical and Mechanical Properties of Backhoe's Bucket Repairment with Cladding Methode

---

## ORIGINALITY REPORT

---

**23%**

SIMILARITY INDEX

**25%**

INTERNET SOURCES

**14%**

PUBLICATIONS

**3%**

STUDENT PAPERS

---

## PRIMARY SOURCES

---

**1**

[searchworks.stanford.edu](https://searchworks.stanford.edu)

Internet Source

**16%**

---

**2**

[repository.unair.ac.id](https://repository.unair.ac.id)

Internet Source

**7%**

---

Exclude quotes  On

Exclude matches  < 3%

Exclude bibliography  On