UNIVERSITI PUTRA MALAYSIA

EFFECT OF DIFFERENT STRESS RATIO ON FATIGUE CRACK PROPAGATION OF RICE HUSK POLYPROPYLENE COMPOSITES UNDER CONSTANT AMPLITUDE LOADING

SITY AINY BINTI NOR MOHAMED

FK 2021 109

EFFECT OF DIFFERENT STRESS RATIO ON FATIGUE CRACK PROPAGATION OF RICE HUSK POLYPROPYLENE COMPOSITES UNDER CONSTANT AMPLITUDE LOADING

By

SITY AINY BINTI NOR MOHAMED

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Doctor of Philosophy

April 2021

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

EFFECT OF DIFFERENT STRESS RATIO ON FATIGUE CRACK PROPAGATION OF RICE HUSK POLYPROPYLENE COMPOSITES UNDER CONSTANT AMPLITUDE LOADING

By

SITY AINY BINTI NOR MOHAMED

April 2021

Chairman : Associate Professor Edi Syams bin Zainudin, PhD
Faculty : Engineering

The presence of excessive agricultural by product waste often create issues in the disposal process and contributing to environmental pollution. Thus, the conversion of this agro waste into potential raw materials for production has gained attention in research. Comparing the physical properties of composite fibreboard material made from agro waste compared with conventional fibreboard, it has been discovered that this composite material can be used for low-cost construction. These components application on ceiling board are subjected to constant loads from the roof trusses, gravity load and the weight of the structure itself which lead to fatigue failure, crack initiation and crack growth progressively. In order to maintain the safety design of components, the component performance prediction is important to facilitate the management of risk assessment, inspection and maintenance scheduling.

Thus, this study considers the evaluation of fatigue behavior and fatigue crack growth of polypropylene composites with rice husk fibers from the point of experimental and fracture mechanics theory. The main objective of this research is to define the fatigue behavior and crack growth rate of rice husk reinforced polypropylene composite and determination of the fatigue life prediction significantly through the application of mathematical representation in using equivalent initial flaw size (EIFS) concept. Fatigue behavior of materials characterized by fatigue life and energy dissipation in comparison to the various stress ratios R = 0.1, R = 0.3 and R = 0.5 for the stresses $\sigma_{75}, \sigma_{80}, \sigma_{85}, \sigma_{90}$ and σ_{95}. Fatigue tests were performed at constant stress according to ASTM D3479/D3479M. The specimens used were based D638-03 standards. The highest value of energy released for R = 0.1, in the range between 5 kJ / m^3 and 30 kJ / m^3, while for R = 0.3 in the range between 2 kJ / m^3 and 16 kJ / m^3, and the lowest energy released for R = 0.5 in the range of 2 kJ / m^3 and 5 kJ / m^3.

In the characterization of the fatigue crack behavior, the fatigue crack growth is described by plotting the relationship between the log fatigue crack growth rates, *da/dN* against the log strain energy release rate, $\Delta\sqrt{G}$ as a relationship in a Paris representation. The experiment was conducted on compact tension specimens in accordance with ASTM D647-13a standards for the stress between 80-90% of the ultimate tensile strength for $R = 0.1$, 0.3, and 0.5. The values of the Paris constants of C and n are found to increase with increasing ratio of applied stresses. The value of C increases with the values of, 7×10^{-17}, 2×10^{-16} , and 1×10^{-15} respectively. While the value of constant n also showed an increase with readings of 6.6657, 6.7076 and 6.8303 at stress ratios $R = 0.1$, 0.3, and 0.5. Both of these parameters give the value of the coefficient of determination, R^2 in the range of more than 0.85.

The predictive model are respectively expressed in mathematical representations as, $S = 24.436N^{-0.058}$, $S = 46.364N^{-0.149}$, and $S = 58.687N^{-0.147}$ for the quantitative assessment of fatigue damage, by applying the back extrapolation method in the equivalent initial flaw size (EIFS) approach, which the correlation gives the value of the coefficient of determination, R^2 in the range 0.89 to 0.99. This stress life curve model, encourages the ability to monitor fatigue crack propagation, and to identify initial measurements of defects resulting from non-uniform structures enabled in the evaluation and characterization of the fatigue life. This relationship provides good accuracy in the logarithmic mean squared error, based on statistical analysis, which is in the range of 1.5% to 2.5%. With this, a fatigue failure monitoring method as well as predicting the fatigue life of natural fiber composites was produced using a combination of EIFS approaches.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

KESAN NISBAH TEGASAN YANG BERBEZA TERHADAP KOMPOSIT POLIPROPILENA SEKAM PADI DI BAWAH PEMBEBANAN AMPLITUD MALAR

Oleh

SITY AINY BINTI NOR MOHAMED

April 2021

Pengerusi : Profesor Madya Edi Syams bin Zainudin, PhD
Fakulti : Kejuruteraan

Kewujudan sisa agro secara berlebihan sering menimbulkan masalah dalam proses pembuangan dan seterusnya menyumbang kepada pencemaran persekitaran. Oleh demikian, penukaran sisa agro menjadi bahan mentah yang berpotensi untuk pengeluaran telah mendapat perhatian dalam penyelidikan. Perbandingan sifat fizikal bahan papan serat komposit yang terbuat daripada sisa agro dibandingkan dengan papan serat konvensional, diperhatikan bahawa bahan komposit ini dapat digunakan untuk kerja pembinaan bagi kategori pembinaan kos rendah. Komponen ini tertakluk kepada beban berterusan dari kekuda bumbung, graviti dan berat struktur itu sendiri yang membawa kepada kegagalan lesu, permulaan retak dan pertumbuhan retak secara beransur-ansur. Dalam usaha untuk mengekalkan keselamatan reka bentuk komponen, ramalan prestasi komponen tersebut adalah penting bagi memudahkan penilaian risiko dalam pengurusan, penjadualan pemeriksaan dan penyelenggaraan.

Justeru, kajian ini mempertimbangkan penilaian tingkah laku lesu dan pertumbuhan retak lesu komposit polipropilena serat sekam padi dari sudut eksperimen dan teori mekanik patah. Objektif utama penyelidikan ini adalah untuk mentakrifkan kelakuan lesu dan retak lesu komposit polipropilena sekam padi sekaligus menentukan signifikan ramalan hayat lesu melalui perwakilan matematik dengan aplikasi konsep ukuran cacat awal yang setara. Kelakuan lesu bahan dicirikan oleh kadar pelepasan tenaga terikan melalui perbandingan kepada nisbah tegasan iaitu R = 0.1, R = 0.3 dan R = 0.5 bagi tegasan pada $\sigma_{75}, \sigma_{80}, \sigma_{85}, \sigma_{90}$ dan σ_{95}. Ujikaji lesu dijalankan pada tegasan malar mengikut ASTM D3479/D3479M. Spesimen yang digunakan adalah berdasarkan piawaian D638-03. Nilai tenaga yang paling tinggi dilepaskan bagi R = 0.1, adalah dalam julat antara 5 kJ / m^3 dan 30 kJ / m^3, manakala bagi R = 0.3 dalam julat antara 2 kJ / m^3 dan 16 kJ / m^3, dan tenaga dilepaskan paling rendah bagi R = 0.5 dalam julat 2 kJ / m^3 dan 5 kJ / m^3.

Dalam pencirian kelakuan retak lesu, pertumbuhan retak lesu diterangkan melalui plot hubungan antara log kadar pertumbuhan retak lesu, *da/dN* melawan log kadar pelepasan tenaga terikan, $\Delta\sqrt{G}$ sebagai hubungan dalam satu perwakilan Paris. Ujikaji ini dijalankan ke atas spesimen tegangan padat mengikut piawaian ASTM D647-13a merentasi beban tegasan antara 80-90% dari kekuatan tegangan muktamad untuk R = 0.1, 0.3, dan 0.5. Nilai pemalar Paris iaitu C dan n didapati meningkat dengan peningkatan nisbah tegasan yang dikenakan. Nilai C meningkat dengan nilai masing-masing adalah 7×10^{-17}, 2×10^{-16}, dan 1×10^{-15}. Manakala nilai constant n juga menunjukkan peningkatan dengan bacaan 6.6657, 6.7076 dan 6.8303 pada nisbah tegasan R=0.1, 0.3, dan 0.5. Kedua-dua pekali ini memberikan nilai pekali penentuan, R^2 dalam julat lebih daripada 0.85.

Model ramalan yang dinyatakan dalam perwakilan matematik sebagai $S = 24.436N^{-0.058}$, $S = 46.364N^{-0.149}$, dan $S = 58.687N^{-0.147}$ merupakan penilaian secara kuantitatif bagi kerosakan lesu, menerapkan kaedah ekstrapolasi belakang dalam pendekatan ukuran cacat awal yang setara (EIFS), memberikan nilai pekali penentuan, R^2 dalam julat 0.89 hingga 0.99. Model lengkung *S-N* ini, mendorong kemampuan pemantauan perambatan retak lesu, dan untuk mengenal pasti ukuran awal kecacatan yang dihasilkan dari struktur yang tidak seragam berkemampuan dalam penilaian dan pencirian hayat lesu. Hubungan ini memberikan ketepatan yang baik dalam ralat logaritman kuasa dua min, berdasarkan analisis statistik, iaitu dalam julat 1.5% hingga 2.5%. Dengan ini, satu kaedah pemantauan kegagalan lesu sekaligus meramal hayat lesu komposit serat semulajadi dihasilkan dengan menggunakan gabungan pendekatan EIFS.

ACKNOWLEDGEMENTS

In the name of Allah, the Most Gracious and the Most Merciful.

All praises to Allah and His blessing for the completion of this thesis. I thank to Allah for all the opportunities, trials and strength that have been showered on me to finish writing the thesis. I experienced so much during this process, not only from the academic aspect but also from the aspect of personality. My humblest gratitude to the holy Prophet Muhammad (Peace be upon him) whose way of life has been a continuous guidance for me.

First and foremost, I would like to sincerely thank my supervisor Assoc. Prof. Dr. Edi Syams Zainudin, Chairman of the Supervisory Committee, for his guidance, understanding, and patience and most importantly, he has provided positive encouragement and a warm spirit to finish this thesis. It has been a great pleasure and honors to have him as my supervisor. I would also like to express my sincere appreciation to the members of the Supervisory Committee, Prof. Ir. Dr. Mohd Sapuan Salit, (Institute of Tropical Forestry and Forest Products, UPM), Dr. Mohd Azaman Md Deros (School of Manufacturing Engineering, UMP) and Ts. Dr. Ahmad Mubarak Tajul Arifin (Faculty Mechanical & Manufacturing, UTHM) for their coaching and assistances. They were not only the catalyst for my ever-growing research but also a source of inspiration and encouragement from the start to completion of my PhD.

My deepest gratitude goes to my beloved husband Mr. Mohd Najib Sueb, who has stood by me through all my travails, my absences, my fits of pique and impatience. He gave me unwavering support and prayers, discussed ideas and prevented several wrong turns. It would not be possible to write this thesis without full support from him.

Last but not least, I would sincerely like to thank Ministry of Education Malaysia and Putra Research Grant (GP-IPS/2017/9538700) for supporting the financial throughout the study. I also want to extend my thanks to Mr. Hj. Nasrizal bin Mohd Rashdi (Universiti Kuala Lumpur Kampus Cawangan Malaysia France Institute) and Assoc. Prof. Dr. Mohamed Ansari Mohamed Nainar (Universiti Tenaga Nasional) for their help and support in the laboratory works.

May God shower the above cited personalities with success and honors in their life.

This thesis was submitted to the Senate of the Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

Edi Syams bin Zainudin, PhD
Associate Professor
Faculty of Engineering
Universiti Putra Malaysia
(Chairman)

Mohd Sapuan bin Salit @ Sinon, PhD
Professor, Ir.
Faculty of Engineering
Universiti Putra Malaysia
(Member)

Mohd Azaman Md Deros, PhD
Senior Lecturer
School of Manufacturing Engineering
Universiti Malaysia Perlis
(Member)

Ahmad Mubarak bin Tajul Arifin, PhD
Senior Lecturer Ts.
Faculty Mechanical and Manufacturing
Universiti Tun Hussein Onn
(Member)

____

ZALILAH MOHD SHARIFF, PhD
Professor and Dean
School of Graduate Studies
Universiti Putra Malaysia

Date: 12 August 2021

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF SYMBOLS

A	Constant
a	Crack length
a_i	Current crack length
a_f	Final crack length
a_c	Critical crack length
B	Fatigue strength exponent
b	Constant
C	Paris coefficient
da/dN	Fatigue crack growth rate
E	Young's Modulus
E_{RMSLE}	Root mean square logarithm error
ε	Strain
ε^*m	Matrix strain
ε^*f	Fibre strain
ε_{ym}	Matrix yield strain
f	Geometry factor
G_c	Critical strain energy release rate
ΔG	Strain energy release rate
$G_{\min}$	Minimum strain energy release rate
$G_{\max}$	Maximum strain energy release rate
$g(a)$	Crack growth rate function
$K_{\min}$	Minimum stress intensity factor
$K_{\max}$	Maximum stress intensity factor
K_c	Critical stress intensity factor

ΔK	Stress intensity factor range
ΔK_{th}	Threshold stress intensity factor
K_{Ic}	Fracture toughness
n	Material coefficient
N_f	Cycle to failure
N_i	Current life cycles
$N_{\exp}$	Experimental fatigue life
N_{cal}	Calculated fatigue life
$P_{\max}$	Maximum load
$P_{\min}$	Minimum load
Q	Heat
R	Ratio
R^2	Coefficient of determination
S_y	Yield stress
S_{ut}	Ultimate strength
S_e	Material fatigue limit
S	Geometry correction value
SS_k	Sums of the square one of tested parameter
SS_S	Sums of the square standard
SS_T	Total sums of the square
SS_e	Sums of the square error
SS_t	Sums of the square treatment
Syj	Sum of all trial results involving parameter at level
ΔU	Internal energy
W	Energy released
y_i	Characteristic value in grey relational grade
$\sigma_f{}^*$	Fiber stress

σ_a	Stress amplitude
σ_m	Mean stress
$\sigma_{\max}$	Maximum stress
$\sigma_{\min}$	Minimum stress
σ_f'	Material strength coefficient
σ_{UTS}'	Ultimate tensile strength
ξ_i	Grey relational coefficient
ζ	Distinguishing coefficient
γ_i	Grey relational grade

LIST OF ABBREVIATIONS

ANOVA	Analysis of variance
BRHA	Black rice husk ash
CDF	Crack driving force
CT	Compact tension
DOE	Design of experiments technique
DOF	Degree of freedom
EIFS	Equivalent initial flaw size
EPFM	Elastic–plastic fracture mechanics
GRC	Grey Relational Coefficient
GRG	Grey Relational Grade
HDPE	High density polyethylene
HRR	Rockwell R Hardness Number
IB	Internal strength
KT	Kitagawa-Takahashi
LDPE	Low-density polyethene
LEFM	Linear elastic fracture mechanics
MOE	Modulus of elasticity
MOR	Modulus of rupture
NDI	Non-destructive inspection
NDT	Non-destructive test
OA	Orthogonal array
RCBD	Randomized complete block design
RH	Rice husk

SEM	Scanning electron microscopy
SFRP	Short fibre reinforced polymer
SIF	Stress intensity factor
S/N	Signal to noise
S-N	Stress life
SSE	Sum square error
TTCI	The time to crack initiation
WRHA	White rice husk ash

CHAPTER 1

INTRODUCTION

1.1 Background

The last several decades have seen polymers replacing numerous traditional materials, including metals, for a host of applications. Such is the case because polymers provide several advantages compared to traditional materials. Polymers offer several benefits, such as ease of processing, lesser cost, and higher productivity (Saheb & Jog, 1999). In a majority of the applications, the specific characteristics of polymers help change fibres or filler material to obtain the high modulus or strength requirement (Omrani et al., 2016). A fibre-reinforced polymer (FRP) composite comprises a polymer matrix meshed with strong fibres made from carbon, aramid, or glass. Vinyl monomers in polymer chains are small molecules having double-bonded carbon atoms; their monomers are used for producing vinyl polymers (Mallakpour & Zadehnazari, 2013). This is the most prominent polymer family. Typically, the vinyl polymer classification comprises elastomers, thermosetting (vinyl esters), and thermoplastic (Saba et al., 2014).

Presently, a majority of the bio-fibre matrix consists of thermoplastic substances. The widely-used thermoplastics for such applications are polyethene, polypropylene (PP), and polyvinyl chloride (PVC). At the same time, epoxy, phenolic, and polyester resins are routinely used for thermosetting matrices (Puglia et al., 2005). Compared to traditional substances, fibre-reinforced polymers offer better advantages considering specific characteristics. The fibre-based reinforcing material is integrated with the polymers to enhance their mechanical and physical characteristics. Fibre-reinforced polymers are versatile and interesting since they are biodegradable, lightweight, strong, stiff, and have low friction coefficient and high resistance against corrosion. These mechanical aspects are crucial for several engineering domains. Hence, there has been immense effort to use polymers for several commercial applications.

Wood flour and fibres are the most widely natural fibres used in the development of natural fibre reinforced polymer composites (NFRPCs); however, there are concerns about growing environmental damage (global warming and biodiversity) due to deforestation which also contributes to forest degradation has prompted researchers to look for cheaper and available alternatives other than wood. Research and studies have been developed on the application of agricultural products and agro-industrial by-products that can be used as a direct substitute for wood in the development of polymer composites. The development and advancement of the use of agriculture residues as an alternative to wood fibre has begun to be an option in some applications while reducing the high demand for wood fibre. Among the potential wood substitutes, for example include kenaf, flax, rice husk (RH), jute, sisal, hemp, and bamboo (La Mantia et al., 2011; Burgstaller, 2014).

Paddy (a member of the monocotyledon group of plants and botanically known as Oryza sativa L.) is one of the most widely grown crops and covers about 1% of the earth's surface. It is a major food crop for a group of people especially in South Asia and Africa. According to the United Nations Food and Agriculture Organization (FAO), global rice production (un-milled rice or paddy) reached more than 740 million metric tons in 2014, with more than 90% of global rice production produced by Asia (Monika, 2013; Bandumula, 2018). At the world level, China and India are ranked first and second among rice producing countries, with an average production of 202 and 155 million metric tons per year. Other major producers include Indonesia, Bangladesh, and Vietnam with an average share of 69, 51, and 43 million metric tons each year. The largest rice exporters reported are involving countries such as Thailand, Vietnam, and Pakistan. Due to the large rice production each year, a large number of these by-products have no commercial value. Thus, various attempts have been made to vary the use of these biomass materials (Johar et al., 2012).

Several applications that are dependent on composites reinforced using natural fibres comprise aspects of cyclic loading. Such loading leads to cumulative damage and decrease in material characteristics. Hence, it is vital to conduct a study that focuses on the estimation of the fatigue life of composites reinforced using natural fibres; such a study is required primarily for situations involving cyclic loading. When composites exhibit fatigue failure, it typically means that the material is reaching failure as a result of the varying loads applied on a specific point (Campbell, 2012). Fatigue failure can be defined as material deterioration under repeated cycles of stress and strain, resulting in progressive cracks that eventually result in fractures. Fatigue is associated with structural failure under cyclical loads generally at much lower loads than is required for quasi-static failures where plastic deformation is low and slow. Fatigue failure depends on various factors, such as material type and condition (Kluger & Lagoda, 2013), component geometry, load type (Pawliczek & Kluger, 2013), stress conditions, and residual stress (Coupard et al., 2008).

Fatigue is one of the leading causes of mechanical failure on various structures and these occur suddenly and result in huge losses in terms of life and property. Although there is no exact percentage of mechanical failure caused by fatigue, many studies have suggested that 50% to 90% of all mechanical failure is causes by fatigue failure (Pook, 2007). The three main causes of fatigue failure are including improper maintenance, fabrication defects, and deficiencies in design. The study also emphasizes that the cost of fractures caused by fatigue can be dramatically reduced by using proper methods of analysis and fatigue technology. However, knowledge of fatigue failure in composite materials, components and structures is less clear and incomprehensible, where it is difficult to predict by engineers due to the complex nature of this failure mechanism (Ye et al., 2018; Wicaksono et al., 2018). Damage assessment for composite materials, specifically premature failure. Moreover, the ability of a material to sustain by constant amplitude loadings against fatigue failure at the structural level are significant concerns in the manufacturing engineering domain.

Fatigue led deformation of a fibre reinforced composite material is relatively complicated and is a function of how much the fibre-matrix interface is damaged (Harris, 1999). Liang et al., (2012) studied the tension-tension fatigue characteristics of glass epoxy and biaxial flax-based composite materials. It was found that despite glass/epoxy materials demonstrating increased resistance to fatigue as a consequence of better static strength, the stress-life (*S-N*) curve are steeper, which means that cyclic load will lead to a higher reduction in fatigue strength. It should be noted that there is a reduction in fatigue stress levels. Composites do not witness an immediate reduction in strength in response to fatigue; however, material stiffness typically reduces. Liang et al., (2012) indicated that a glass/epoxy composite had a stiffness reduction in the 50-70% range during its fatigue cycle. On the other hand, flax/epoxy-based composite materials demonstrated relatively stable fatigue characteristics and the reduction in stiffness ranged between 15% and 20%.

There are several efforts to use RH by taking advantage of its constituent features and composition. Therefore, its use in composite fabrication has been suggested by researchers (Premalal et al., 2002; Quirino & Larock, 2011). Silica, a key component of RH, has been shown to enhance the mechanical properties of various polymeric materials (Kumagi & Matsuo, 2013). Gerardi and Minelli (1998) analysed the potential of wood replacement with RH in the manufacture of particle board wood-based composites and observed that the physical characteristics of RH-reinforced composites are similar to wood fibre-based composites. Some of these natural fibres have been used effectively as reinforcement in the manufacture of particle board (Ciannamea et al., 2010), thus further strengthening the potential of RH as reinforcement. In addition, the incorporation of RH as filler for composite panels has also been proposed (Leiva et al., 2007; Hakeem et al., 2015). RH composites are found to provide better dimensional stability when exposed to higher humidity and resistance as well as termite or biological attacks, when compared to wood fibre reinforced composites, this property is an added advantage of RH composites (Chen et al., 2015). The potential for strengthening RH has been studied by many researchers, and research reviews have been put in place recently. However, a study of the structural properties of RH in natural fibre reinforced polymer composite (NFRPC) expansion and enhancement applications has not been carried out in more detail.

Crack growth in composite materials at the structural level is because of bond separation and the movement concerns and build-up of dislocations owing to structure irregularities. Four failure mechanisms are recognised, namely, delamination, matrix cracking, interfacial debonding, and fibre breakage (Božić et al., 2014). Hence, the material surface is the crack nucleation and growth plane for the initial stage of the crack, i.e., before failure. It may be understood as the material reacting to the critical load imposed on it. When a load is applied at the area of a structural defect, the load is not immediately critical; however, after a threshold, it begins to create crack growth (Zamanzadeh et al., 2015). The crack may grow at a stable or unstable rate, and this is determined by the material resistance against continuous crack growth. However, when the increasing load stage is reached, structure or component failure is because of the inability of the material concerning the services function.

The essential identifiers for fatigue failure are load amplitude and load type; increasing values of load lead to fractures. Considering the micro-level changes, local plasticity leads to elastic stress as a consequence of the load. Defective surfaces or impurities lead to stress concentration, and the fatigue crack propagates in this area, thereby leading to small-scale cracks. Furthermore, deformation is a significant aspect determining the beginning of cracks on a plane; the deformation orientation can be determined by observing the grain. This plane is referred to as the deformation process zone. Increasing the count of load cycles leads to local plastic deformities, and they accumulate and lead to stress and the creation of areas where fatigue cracks initiate (Qiu et al., 2015). This stage has cracks that are in the micro or macro meter scale. The significant characteristics at this stage include load level and the characteristics of the micro-structure around the crack. Aspects like orientation, grain boundary, and characteristics that are not suitable for the local grain around the crack tip may create resistance against sustained crack growth.

1.2 Problem Statements

The construction industries are developing rapidly due to the increased demands of the growing population and higher standards of living. As a result, there has been a need to design high-performance synthetic construction materials. Some materials like carbon fibre and glass fibre-reinforced composites are currently available in the market. However, these composite materials are quite costly and are generally used in high-tech applications. Hence, lightweight and high-strength wood or wood-based composite fibres are the preferred choice for construction owing to their reasonable prices. On the other hand, many deforestation activities are being carried out for collecting wood that have adversely affected the soil structure (leading to soil erosion, earthquakes and similar natural disasters) and environment, leading to global warming. As a result, there has been an interest in finding or developing alternative raw materials for the construction industry.

Agriculture and its related activities are dominant amongst the developing countries. These activities have generated large quantities of natural fibres like sugarcane, paddy, palm oil, etc. An increase in agricultural activities is responsible for the accumulation of agricultural waste in the environment, which can further cause many environmental issues. For solving the problems related to the disposal of agricultural wastes and developing alternative raw materials for the construction industry, researchers have investigated the use of lignocellulosic agricultural waste as an alternative to wood panels. It has been noted that the natural fibres produced in the form of agricultural waste, display excellent mechanical and physical properties. One such material that is used in the construction industry includes rice husk (RH). RH are the by-products of rice production and are regarded as a probable alternative for wood or wood-based boards. RH in the formation of various kinds of boards shows good properties such tough and abrasive, low bulk density (90-150 kg/m3), has a unique composition and resists weathering.

RH consists of a high concentration of silica in the amorphous and crystalline (quartz) forms. The presence of the amorphous form of silica in RH is responsible for its pozzolanic effect. This pozzolanic effect displays cementitious properties that increase the rate of strength gain by the material. The RH particleboards are seen to be an inexpensive and cost-effective alternative to high-end materials. These boards can be easily glued together or to other decorative laminates with appropriate adhesives. The RH boards are used in many building interiors like ceiling linings, walls, partitions and for insulation purposes during construction. The results indicated that the behaviour of the RH particleboards was similar to that displayed by other wood-based boards.

Fibreboard is seen to be a highly heterogeneous and anisotropic material. If properly designed, it shows a good load-bearing capacity and dimensional stability (Beer et al. 2008). However, any deformation, fracture or cracks occurring in these materials can adversely affect the structure of the fibreboard. The cracks appear at the ceilings and can intersect with the walls if the roof trusses shift a little due to seasonal changes in humidity or temperature. All these changes and fluctuations can lead to the uplifting of the trusses, further causing a shift or movement of roof trusses. This issue commonly arises in the interior walls.

The cracks usually appear on the walls perpendicular to the direction and movement of the trusses. These cracks run across the ceilings to the walls giving rise to a continuous crack that propagates through the ceiling. This form of crack highlights a structural problem for building. Any engineer designs a building with an aim to stabilise all the components involved in the development of the structure and stresses that can affect the structure. Hence, the problems related to the building material must be recognised and viable raw materials have to be used for the various building applications. Standard and appropriate testing processes are used in the fibreboard industries and can generate a lot of valuable data that can be used for optimising the use of the available products. One such test that is used in these industries is called the internal bond strength test. The failure occurs at the localised flaws present on the material and hence is best described using the fracture mechanics instead of the classical strength theory.

The mechanical properties of the fibreboards that were made using natural materials and placed in the in-plane direction that combines the core and face layers, were investigated using the standard test methods like fracture energy tests, internal bond strength and bending strength. The bending experiments can lead to the build-up of pressure on the top layer face and tension in the bottom face layer of the panel. It was noted that the specimens usually failed the tension face layer and the transition zone between the face and core layers. Furthermore, the bending strength only described the failure of the complete sample, however, it could isolate the core layer’s behaviour.

A majority of the fracture mechanical standards assumed the presence of the self-similar crack propagation, wherein self-similar indicated that 2 samples having differing crack lengths from one another. However, this assumption was violated in the case of the materials that developed process zones, like the fibres bridging in the composites. In these materials, the initial cracks did not have any process zone, but the zone develops during the propagation. Under Mode I loading, the fibreboard cracks tend to propagate in a straight line and are perpendicular to the loads that are applied. However, these cracks cannot be easily detected due to a lot of material that bridges the crack surfaces. Hence, the propagation is not considered a self-similar crack propagation. Therefore, it is essential to identify and recognise the initial cracks for effectively treating the materials.

Numerous methods have been suggested regarding component design with a specific focus on failures caused by fatigue cracks. It is feasible to formulate an applicable design framework using the concepts from fracture mechanics in order to model fatigue cracks and the associated damage. During this technique, the applied driving load force is estimated for the point where the crack begins. Several factors need to be known in order to estimate fatigue crack growth propagation rate; these factors are material characteristics, service load, geometrical aspects of the crack and the components (Qi & Wang, 2013). The use of this technique has been emphasised in applications where safety and reliability of industrial components are paramount.

The safe-life design technique is the typical method for the assessment of material life during health and safety inspection of engineering structures. When this technique is employed, the assumption is that the present component design is devoid of weaknesses and defects. Stress amplitude is the primary characteristic used to model component fatigue life; additionally, different stress ratio is another aspect that helps determine whether the material has finite or infinite fatigue life and this information is based only on the material's fatigue characteristics, among other aspects (James 2014). During the testing process, if the component suffers from minor damage, it is immediately replaced with a new replica even if the original component had still well functioned; this is done to ensure component design safety. Furthermore, this method does not mandate any other inspection concerning the structure or its components during their design life.

This study focused on fatigue crack growth using numerical, experimental, and theoretical observations, along with the fracture mechanics theory. The research has emphasised and built upon the subject of fatigue life estimation of structure components considering higher loads applied to the crack tip. Presently, the focus is to obtain new information of life prediction on constant loading concerning the crack growth rate of natural fibre composite material under various stress ratios. It is possible to define the size of the initial deformation of the defect on the analysed component. Detection may begin with the appearance of a discontinuity that has the propensity to degenerate into micro cracks. The time from this event till the proliferation of macro cracks or complete material failure can be recorded. Structural reliability may be ensured by employing monitoring methods, more-frequent inspections, determining material characteristics and using fracture mechanics. Higher structural reliability leads to a lesser need for replacing critical parts.

The fundamental assumption made during the determination of structural integrity using this technique is that it is possible to keep using the components until any part of the component reaches a predetermined critical level. This way, before the damaged structure is unable to handle the load, the crack can increase to the critical levels. Hence, it is presupposed that the structure can handle repeated loading through the nucleation of the initial defects and that the defect can proliferate by way of cracks. This study employed the above mentioned as the basis for evaluating component failure. This approach encouraged the authors to assess the propagation of fatigue cracks, determine the size of the initial defect exist due to structural non-uniformity, and estimate component fatigue life. The authors formulated equivalent initial flaw size concept technique to determine the structural properties, components service life and the crack growth rate in order to assess the creation of a fatigue crack monitoring.

1.3 Research Objectives

In this study, there are four main objectives that need to be met to ensure the novelty of the study can be achieved. The research objectives can be specified as following:

1) Optimization of injection moulding parameters to obtain the optimum tensile strength and quality of specimen using integrated Taguchi method and grey relational analysis (GRA).

2) Identification of the fatigue behaviour of risk husk reinforced polypropylene composite when subjected to different stress ratios under constant amplitude loading.

3) Formulation a mathematical representation by associating fatigue crack growth through an equivalent initial flaw-size concept.

4) Verification of the mathematical representation for ascertaining the accuracy of the expression.

1.4 Research Scope

The scope of this study includes tests conducted on a laboratory scale. The material used is rice husk composite where the geometry is based on the standards set in ASTM D3479 / D3479M. The determination of the mechanical behaviour of a material is obtained from a tensile test, while the fatigue behaviour is determined through a cyclic test. The implementation of the test is done according to the ASTM D638-3 requirements to determine the mechanical behaviour of the material. To determine the fatigue of the material, the implementation of the test according to the method ASTM D3479 / D3479M is carried out. By focusing on the characterization of fatigue crack propagation behaviour, three load ratios were used to study the influence of stress ratio on fatigue life. The test was performed on five constant amplitude loads at values of 0.75 σ_{UTS} to 0.95 σ_{UTS} at three stress ratios, *R* of 0.1, 0.3 and 0.5. The rate of fatigue crack propagation is calculated based on the existing model and the accuracy of the test data on the predicted life is obtained through correlation analysis.

Specimen fatigue life was studied in relation to the effect of variable load ratios. The effect of stress ratio is assessed through the method of analysis proposed through the Paris equation. Based on the length of the crack opening, coefficient values such as C and n are obtained by plotting the distribution of experimental data in the correlation graph of da/dN vs strain energy release rate (SERR). Mathematical prediction model to determine the overall fatigue life is published using the back-extrapolation method where the equivalent initial flaw size (EIFS) value is determined based on the findings obtained through experiments. Through this method, complete fracture is considered to occur when the value of K_{max} is equal to the value of fracture toughness, K_{IC}. With a combination of Basquin's equation approaches, an equation for predicting fatigue life at different stress ratio conditions can be determined.

Through the proposed model, the representation of fatigue life is only focused on the analysis based on the fatigue crack propagation model in term of the EIFS method. However, there are many factors that affect the parameters of fatigue crack propagation. Thus, the validation of the fatigue crack propagation model produced was also evaluated using scatter band error analysis, correlation and the root mean square logarithm error, E_{RMSLE} also conducted to support the findings obtained. Through the analysis of the correlation relationship between the proposed model and the experimental model, the matching of the distributions presented for verification, it can highlight the scientific contribution in this study.

1.5 Structure of Thesis

This thesis follows the alternative thesis template provided by the Universiti Putra Malaysia, and it uses the publications related to this study. Every chapter of this study corresponds to a different study that has the corresponding sections like: 'Introduction', 'Materials and method', 'Results and discussion', and 'Conclusions'. The structure is detailed further in the upcoming paragraphs.

Chapter 1

The problems that motivate the undertaking of this research and the corresponding objectives are specified in this chapter. This chapter also details the scope of this research and work significance.

Chapter 2

This chapter consists of a detailed review of the literature pertaining to the topics addressed in this thesis. Moreover, there are also clarifications concerning the research gaps identified during the review.

Chapter 3

This chapter details the methodology employed for the research specifically concerning material preparation, testing process, and data gathering.

Chapter 4

This chapter comprises the first article titled "**Integration of Taguchi-Grey Relational Analysis Technique in Parameter Process Optimization for Rice Husk Composite**." This article contains the details of the most significant aspect affecting material characteristics and quality for the optimal settings concerning the injection moulding process.

Chapter 5

This chapter comprises the second article titled "**Energy behaviour assessment of rice husk fibres reinforced polymer composite**." This article focuses on the analysis of the energy released by the material during different cyclical loading ratios.

Chapter 6

This chapter comprises the third article titled "**Effects of different stress ratios on fatigue crack growth of rice husk fibre-reinforced composite**." This article emphasises how stress ratios affect the constants pertaining to the Paris relationship.

Chapter 7

This chapter comprises the fourth article titled "**Crack Growth Analysis for Rice Husk Reinforced Polypropylene Composite Using Equivalent Initial Flaw Size Concept**." It deals with the method chosen for evaluating the propagation and growth of the fatigue crack. This technique uses fracture mechanics and traditional LEFM. The total fatigue life is ascertained using a mathematical framework that relies on quantitative evaluations.

Chapter 8

This chapter comprises the conclusions derived from this study and the recommendations for future research and improvements in this domain.

REFERENCES

Abdelhaleem, A. M., Megahed, M. & Saber, D. (2018). Fatigue behavior of pure polypropylene and recycled polypropylene reinforced with short glass fiber. *Journal of Composite Materials*, *52*(12), 1633-1640.

Abo-Elkhier, M., Hamada, A. A. & El-Deen, A. B. (2014). Prediction of fatigue life of glass fiber reinforced polyester composites using modal testing. *International Journal of Fatigue*, *69*, 28-35.

Ahmad, I., Baharum, A. & Abdullah, I. (2006). Effect of extrusion rate and fiber loading on mechanical properties of Twaron fiber-thermoplastic natural rubber (TPNR) composites. *Journal of reinforced plastics and composites*, *25*(9), 957-965.

Ahmad, M., Rahmat, A. R. & Hassan, A. (2010). Mechanical properties of unplasticised PVC (PVC-U) containing rice husk and an impact modifier. *Polymers and Polymer Composites*, *18*(9), 527-536.

Ahmad, R., Hamid, R. & Osman, S. A. (2019). Physical and chemical modifications of plant fibres for reinforcement in cementitious composites. *Advances in Civil Engineering*, *2019*.

Akil, H., Omar, M. F., Mazuki, A. A. M., Safiee, S. Z. A. M., Ishak, Z. M. & Bakar, A. A. (2011). Kenaf fiber reinforced composites: A review. *Materials & Design*, *32*(8-9), 4107-4121.

Akin, D. E., Ljungdahl, L. G., Wilson, J. R. & P.J. Harris, P. J. (1990). Microbial and plant opportunities to improve lignocellulose utilization by ruminants. (pp. 428). Elsevier, New York.

Alderliesten, R. C., Brunner, A. J. & Pascoe, J. A. (2018). Cyclic fatigue fracture of composites: What has testing revealed about the physics of the processes so far? *Engineering Fracture Mechanics*, *203*, 186-196.

Ali, M. A. M., Idayu, N., Izamshah, R., Kasim, M. S. & Salleh, M. S., Sivarao. (2018). Multi objective optimization of injection moulding process parameters on mechanical properties using Taguchi method and grey relational analysis. *International Journal of Engineering & Technology*, *7*(3.7), 14-16.

Al-Mukhtar, A. M., Biermann, H., Hübner, P. & Henkel, S. (2010). Determination of some parameters for fatigue life in welded joints using fracture mechanicsmethod. *Journal of materials engineering and performance*, *19*(9), 1225-1234.

An, T. J. S. (2010). DOE Based Statistical Approaches in Modeling of Laser Processing– Review & Suggestion. *International Journal of Engineering & Technology, 10*(4), 1-7.

Androuin, G., Michel, L., Maillet, I. & Gong, X. (2018). Characterization of fatigue delamination growth under mode I and II: Effects of load ratio and load history. *Engineering Fracture Mechanics*, *203*, 172-185.

Aprianti, E., Shafigh, P., Bahri, S. & Farahani, J. N. (2015). Supplementary cementitious materials origin from agricultural wastes–A review. *Construction and Building Materials*, *74*, 176-187.

Arjmandi, R., Hassan, A., Majeed, K. & Zakaria, Z. (2015). Rice husk filled polymer composites. *International Journal of Polymer Science*, *2015*.

Arjmandi, R., Hassan, A. & Zakaria, Z. (2017). Rice husk and kenaf fiber reinforced polypropylene biocomposites. In *Lignocellulosic Fibre and Biomass-Based Composite Materials* (pp. 77-94). Woodhead Publishing.

Armentano, I., Dottori, M., Fortunati, E., Mattioli, S. & Kenny, J. M. (2010). Biodegradable polymer matrix nanocomposites for tissue engineering: a review. *Polymer degradation and stability*, *95*(11), 2126-2146.

Ashori, A. (2008). Wood–plastic composites as promising green-composites for automotive industries! *Bioresource technology*, *99*(11), 4661-4667.

ASTM D638-03 (2004). Standard test method for tensile properties of plastics,"ASTM International, West Conshohocken, PA.

ASTM E647-13a (2014). Standard test method for measurement of fatigue crack growth rates, ASTM International, West Conshohocken, PA, USA.

ASTM D785-08 (2008). Standard test method for Rockwell hardness of plastics and electrical insulating materials, ASTM International, West Conshohocken, PA.

Atuanya, C. U., Olaitan, S. A., Azeez, T. O., Akagu, C. C., Onukwuli, O. D. & Menkiti, M. C. (2013). Effect of rice husk filler on mechanical properties of polyethylene matrix composite. Int J Curr Res Rev, *5*(15), 111.

Bader, Q. & Kadum, E. (2014). Mean stress correction effects on the fatigue life behavior of steel alloys by using stress life approach theories. *International Journal of Engineering & Technology IJETIJENS*, *10*, 50.

Bandara, C. S., Siriwardane, S. C., Dissanayake, U. I. & Dissanayake, R. (2016). Full range S–N curves for fatigue life evaluation of steels using hardness measurements. *International Journal of Fatigue*, *82*, 325-331.

Bandara, C. S., Siriwardane, S. C., Dissanayake, U. I. & Dissanayake, R. (2015). Developing a full range S–N curve and estimating cumulative fatigue damage of steel elements. *Computational Materials Science*, *96*, 96-101.

Bandumula, N. (2018). Rice production in Asia: Key to global food security. *Proceedings of the National Academy of Sciences, India Section B: Biological Sciences*, *88*(4), 1323-1328.

Baptista, C. A. R. P., Adib, A. M. L., Torres, M. A. S. & Pastoukhov, V. A. (2012). Describing fatigue crack growth and load ratio effects in Al 2524 T3 alloy with an enhanced exponential model. *Mechanics of Materials*, *51*, 66-73.

Barbero, E. J. (2017). *Introduction to composite materials design*. CRC press.

Barbosa, J. F., Correia, J. A., Freire Junior, R. C. S., Zhu, S. P. & De Jesus, A. M. (2019). Probabilistic SN fields based on statistical distributions applied to metallic and composite materials: State of the art. *Advances in Mechanical Engineering*, *11*(8), 1-22.

Battegazzore, D., Bocchini, S., Alongi, J., Frache, A. & Marino, F. (2014). Cellulose extracted from rice husk as filler for poly (lactic acid): preparation and characterization. *Cellulose*, *21*(3), 1813-1821.

Belaadi, A., Bezazi, A., Maache, M. & Scarpa, F. (2014). Fatigue in sisal fiber reinforced polyester composites: hysteresis and energy dissipation. *Procedia Engineering*, *74*, 325-328.

Benaarbia, A., Chrysochoos, A. & Robert, G. (2014). Kinetics of stored and dissipated energies associated with cyclic loadings of dry polyamide 6.6 specimens. *Polymer Testing*, *34*, pp.155-167.

Berto, F. & Ayatollahi, M. R. (2011). Fracture assessment of Brazilian disc specimens weakened by blunt V-notches under mixed mode loading by means of local energy. *Materials & Design*, *32*(5), 2858-2869.

Bhat, S. & Patibandla, R. (2011). Metal fatigue and basic theoretical models: a review. *Alloy Steel-Properties and Use* (pp.203-236).

Bilal, A., Lin, R. J. T., Jayaraman, K. & Zhang, C. (2014). Evaluation of mechanical properties on rice husk and expanded rice husk filled polyethylene composites. *International Journal of the Institute of Materials Malaysia*, *1*, 165-170.

Bisht, N. & Gope, P. C. (2015). Mechanical properties of rice husk flour reinforced epoxy bio-composite. *Int Journal of Engineering Research and Applications*, *5*, 123-128.

Blasón, S., Correia, J. A. F. O., Apetre, N., Arcari, A., De Jesus, A. M. P., Moreira, P. M. G. P. & Fernández-Canteli, A. (2016). Proposal of a fatigue crack propagation model taking into account crack closure effects using a modified CCS crack growth model. *Procedia Structural Integrity*, *1*, 110-117.

Boonyapookana, A., Nagata, K. & Mutoh, Y. (2011). Fatigue crack growth behavior of silica particulate reinforced epoxy resin composite. *Composites science and technology*, *71*(8), 1124-1131.

Bořůvka, V., Zeidler, A. & Holeček, T. (2015). Comparison of stiffness and strength properties of untreated and heat-treated wood of Douglas fir and alder. *BioResources*, *10*(4), 8281-8294.

Bougherara, H., El Sawi, I., Fawaz, Z. and Meraghni, F. (2015). Investigation and modeling of the fatigue damage in natural fiber composites. In *Proceedings of the TMS Middle East—Mediterranean Materials Congress on Energy and Infrastructure Systems (MEMA 2015)* (pp. 35-44). Springer, Cham.

Božić, Ž., Schmauder, S., Mlikota, M. & Hummel, M. (2014). Multiscale fatigue crack growth modelling for welded stiffened panels. *Fatigue & fracture of engineering materials & structures*, *37*(9), 1043-1054.

Burgueno, R., Quagliata, M. J., Mehta, G. M., Mohanty, A. K., Misra, M. & Drzal, L. T. (2005a). Sustainable cellular biocomposites from natural fibers and unsaturated polyester resin for housing panel applications. *Journal of Polymers and the Environment*, *13*(2), 139-149.

Burgstaller, C. (2014). A comparison of processing and performance for lignocellulosic reinforced polypropylene for injection moulding applications. *Composites Part B: Engineering*, *67*, 192-198.

Burgueno, R., Quagliata, M. J., Mohanty, A. K., Mehta, G., Drzal, L. T. & Misra, M. (2004). Load-bearing natural fiber composite cellular beams and panels. *Composites Part A: applied science and manufacturing*, *35*(6), 645-656.

Burgueno, R., Quagliata, M. J., Mohanty, A. K., Mehta, G., Drzal, L. T. & Misra, M. (2005b). Hybrid biofiber-based composites for structural cellular plates. *Composites Part A: applied science and manufacturing*, *36*(5), 581-593.

Burhan, I. & Kim, H. S. (2018). SN curve models for composite materials characterisation: an evaluative review. *Journal of Composites Science*, *2*(3), 38.

Campbell, F. C. (2012). *Fatigue and fracture: understanding the basics*. ASM International.

Campilho, R.D. (2015). *Natural fiber composites*. CRC Press.

Cao, Y. & Wu, Y. Q. (2008). Evaluation of statistical strength of bamboo fiber and mechanical properties of fiber reinforced green composites. *Journal of Central South University of Technology*, *15*(1), 564-567.

Cao, X.V., Ismail, H., Rashid, A.A., Takeichi, T. & Vo-Huu, T. (2011). Mechanical properties and water absorption of kenaf powder filled recycled high density polyethylene/natural rubber biocomposites using MAPE as a compatibilizer. *BioResources*, *6*(3), 3260-3271.

Capela C., Oliveira S.E. & Ferreira JA. (2019). Fatigue behavior of short carbon fiber reinforced epoxy composites. *Compos Part B Eng*, 164:191–7.

Cardona-Uribe, N., Arenas-Echeverri, C., Betancur, M., Jaramillo, L. & Martínez, J. (2018). Possibilities of rice husk ash to be used as reinforcing filler in polymer sector-a review Posibilidades de usar la ceniza de cascarilla de arroz como reforzante en el sector de polímeros–una revisión. *Revista UIS Ingenierías*, *17*(1), 127-142.

Carpinteri, A., Ronchei, C., Scorza, D. & Vantadori, S. (2015). Fracture mechanics based approach to fatigue analysis of welded joints. *Engineering Failure Analysis*, *49*, 67-78.

Castro, F.C., Araújo, J.A., Pires, M.S.T. & Susmel, L. (2015). Estimation of fretting fatigue life using a multiaxial stress-based critical distance methodology. *Frattura ed Integrità Strutturale*, *9*(33), 444-450.

Cavazzuti, M. (2012). *Optimization methods: from theory to design scientific and technological aspects in mechanics*. Springer Science & Business Media.

Chand, N., Sharma, P. & Fahim, M. (2010). Tribology of maleic anhydride modified rice-husk filled polyvinylchloride. *Wear*, *269*(11-12), 847-853.

Chavda, S.P., Desai, J.V. & Patel, T.M. (2014). A review on optimization of MIG Welding parameters using Taguchi's DOE Method. *International Journal of Engineering and Management Research (IJEMR)*, *4*(1), 16-21.

Chen, R. S., Ab Ghani, M. H., Salleh, M. N., Ahmad, S. & Tarawneh, M. A. A. (2015). Mechanical, water absorption, and morphology of recycled polymer blend rice husk flour biocomposites. *Journal of Applied Polymer Science*, *132*(8).

Chen, D.C. & Chen-Kun, H. (2016). Study of injection molding warpage using analytic hierarchy process and Taguchi method. *Advances in Technology Innovation*, *1*(2), 46.

Ching, Y. C., Ali, M. E., Abdullah, L. C., Choo, K. W., Kuan, Y. C., Julaihi, S. J., Chuah, C. H. & Liou, N. S. (2016). Rheological properties of cellulose nanocrystal-embedded polymer composites: A review. *Cellulose*, *23*(2), 1011-1030.

Cholachagudda, V. V. & Ramalingaiah, P. U. (2013). Mechanical characterisation of coir and rice husk reinforced hybrid polymer composite. International Journal of Innovative Research in Science, 2, 3779-3786.

Chomsamutr, K. & Jongprasithporn, S. (2012). Optimization parameters of tool life model using the Taguchi approach and response surface methodology. *International Journal of Computer Science Issues (IJCSI)*, *9*(1), 120.

Chowdhury, P. & Sehitoglu, H. (2016). Mechanisms of fatigue crack growth–a critical digest of theoretical developments. *Fatigue & Fracture of Engineering Materials & Structures*, *39*(6), 652-674.

Chung, D. D. (2010). *Composite materials: science and applications*. Springer Science & Business Media.

Chung, D. D. L. (2017). Polymer-matrix composites: Structure and processing. *Carbon Composites: Composites with Carbon Fibers, Nanofibers, and Nanotubes*, 161-217.

Ciannamea, E.M., Stefani, P.M. & Ruseckaite, R.A. (2010). Medium-density particleboards from modified rice husks and soybean protein concentrate-based adhesives. *Bioresource Technology*, *101*(2), 818-825.

Coupard, D., Palin-luc, T., Bristiel, P., Ji, V. & Dumas, C. (2008). Residual stresses in surface induction hardening of steels: Comparison between experiment and simulation. *Materials Science and Engineering: A*, *487*(1-2), 328-339.

Correia, J. A. F. D. O., Blasón, S., De Jesus, A. M. P., Canteli, A. F., Moreira, P. M. G. P. & Tavares, P. J. (2016). Fatigue life prediction based on an equivalent initial flaw size approach and a new normalized fatigue crack growth model. *Engineering Failure Analysis*, *69*, 15-28.

Correia, J. A., De Jesus, A. M., Moreira, P. M. & Tavares, P. J. (2016). Crack closure effects on fatigue crack propagation rates: application of a proposed theoretical model. *Advances in Materials Science and Engineering*, *2016*.

Cui, W. (2002). A state-of-the-art review on fatigue life prediction methods for metal structures. *Journal of marine science and technology*, *7*(1), 43-56.

Czél, G., Jalalvand, M. & Wisnom, M. R. (2016). Design and characterisation of advanced pseudo-ductile unidirectional thin-ply carbon/epoxy–glass/epoxy hybrid composites. *Composite Structures*, *143*, 362-370.

da Costa Mattos, H. S. (2017). Modelling low-cycle fatigue tests using a gradient-enhanced continuum damage model. *International Journal of Damage Mechanics*, *26*(8), 1242-1269.

Dar, U. A., Xu, Y. J., Zakir, S. M. & Saeed, M. U. (2017). The effect of injection molding process parameters on mechanical and fracture behavior of polycarbonate polymer. *Journal of Applied Polymer Science*, *134*(7).

Das, S. (2009). Jute composite and its applications. In *International workshop, IJSG, Indian Jute Industries Research Association, Kolkata, India.*

Das, A. M., Ali, A. A. & Hazarika, M. P. (2014). Synthesis and characterization of cellulose acetate from rice husk: Eco-friendly condition. *Carbohydrate polymers*, *112*, 342-349.

Davis, J.R. ed. (2004). *Tensile testing*. ASM international.

Davis, R. & John, P. (2018). Application of Taguchi-Based Design of Experiments for Industrial Chemical Processes. *Statistical Approaches with Emphasis on Design of Experiments Applied to Chemical Processes*, *137*.

Deblieck, R. A., Van Beek, D. J. M., Remerie, K. & Ward, I. M. (2011). Failure mechanisms in polyolefines: The role of crazing, shear yielding and the entanglement network. *Polymer*, *52*(14), 2979-2990.

de Moraes, D. V. O., Magnabosco, R., Donato, G. H. B., Bettini, S. H. P. and Antunes, M. C. (2015). Influence of loading frequency on the fatigue behaviour of coir fibre reinforced PP composite. *Polymer Testing*, *41*, 184-190.

Dimzoski, B., Bogoeva-Gaceva, G., Gentile, G., Avella, M. & Grozdanov, A. (2009). Polypropylene-based eco-composites filled with agricultural rice hulls waste. Chemical and Biochemical Engineering Quarterly, *23*(2), 225-230.

Dittenber, D. B. & GangaRao, H. V. (2012). Critical review of recent publications on use of natural composites in infrastructure. *Composites Part A: applied science and manufacturing*, *43*(8), 1419-1429.

Dixit, S., Goel, R., Dubey, A., Shivhare, P. R. and Bhalavi, T. (2017). Natural fibre reinforced polymer composite materials-a review. *Polymers from renewable resources*, *8*(2), 71-78.

Dobah, Y., Bourchak, M., Bezazi, A., Belaadi, A. & Scarpa, F. (2016). Multi-axial mechanical characterization of jute fiber/polyester composite materials. *Composites Part B: Engineering*, *90*, 450-456.

Dowling, N. E. (2013). *Mechanical Behavior of Materials: International Edition*. Pearson Higher Ed.

Du, Y., Yan, N. & Kortschot, M. T. (2015). The use of ramie fibers as reinforcements in composites. *Biofiber Reinforcements in Composite Materials*, 104-137.

Duy Tran, T., Dang Nguyen, M., Thuc, C. N., Thuc, H. H. & Dang Tan, T. (2013). Study of mechanical properties of composite material based on polypropylene and Vietnamese rice husk filler. *Journal of Chemistry*, *2013*, 1-7.

Duran, J. A. R., Boloy, R. M. & Leoni, R. R. (2015). Some remarks on the engineering application of the fatigue crack growth approach under nonzero mean loads. *Frontiers of Mechanical Engineering*, *10*(3), 255-262.

Dwivedi, V., Anas, M. & Siraj, M. (2014). Six Sigma: As applied in quality improvement for injection moulding process. *International Review of Applied Engineering Research*, *4*(4), 317-324.

Dwiwedi, A.K., Kumar, S., Rahbar, N.N. & Kumar, D. (2015). Practical application of Taguchi method for optimization of process parameters in Injection Molding

Machine for PP material. *International Research Journal of Engineering and Technology (IRJET) e-ISSN* (pp. 2395-0056).

Ellyin, F. (2012). *Fatigue damage, crack growth and life prediction*. Springer Science & Business Media.

Ellyin, F. & El-Kadi, H. (1990). A fatigue failure criterion for fiber reinforced composite laminae. *Composite Structures*, *15*(1), 61-74.

El Messiry, M. & El Deeb, R. (2016). Engineering fiber volume fraction of natural fiber staple-spun yarn reinforced composite. *Journal of Textile Science & Engineering*, *6*(06), 1-6.

Espert, A., Vilaplana, F. & Karlsson, S. (2004). Comparison of water absorption in natural cellulosic fibres from wood and one-year crops in polypropylene composites and its influence on their mechanical properties. *Composites Part A: Applied science and manufacturing*, *35*(11), 1267-1276.

Etaati, A., Pather, S., Fang, Z. & Wang, H. (2014). The study of fibre/matrix bond strength in short hemp polypropylene composites from dynamic mechanical analysis. *Composites Part B: Engineering*, *62*, 19-28.

Fao, F. & Foods, M. (2008). Food and Agriculture Organization of the United Nations, Rome, Italy.

Farotti, E. & Natalini, M. (2018). Injection molding. Influence of process parameters on mechanical properties of polypropylene polymer. A first study. *Procedia Structural Integrity*, *8*, 256-264.

Fatemi, A. & Yang, L. (1998). Cumulative fatigue damage and life prediction theories: a survey of the state of the art for homogeneous materials. *International journal of fatigue*, *20*(1), 9-34.

Fawaz, S., Lo, J. & Hsu, C. (1999). Equivalent initial flaw size distribution in fuselage skin splices. In *Higher Education Press, Fatigue'99: Proceedings of the Seventh International Fatigue Congress*, *4*, 2551-2556.

Fawaz, S.A. (2003). Equivalent initial flaw size testing and analysis of transport aircraft skin splices. *Fatigue & Fracture of Engineering Materials & Structures*, *26*(3), 279-290.

Fazeli, H. & Mirzaei, M. (2012). Shape identification problems on detecting of defects in a solid body using inverse heat conduction approach. *Journal of mechanical science and technology*, *26*(11), 3681-3690.

Fei, N. C., Mehat, N. M. & Kamaruddin, S. (2013). Practical applications of Taguchi method for optimization of processing parameters for plastic injection moulding: a retrospective review. *ISRN Industrial engineering*.

Fernberg, P. (2002). *Toughness of short fiber composites: an approach based on crack-bridging* (Doctoral dissertation, Luleå tekniska universitet).

Forth, S. C., Newman Jr, J. C. & Forman, R. G. (2003). On generating fatigue crack growth thresholds. *International Journal of Fatigue*, *25*(1), 9-15.

Fotouh, A., Wolodko, J. D. & Lipsett, M. G. (2014). Fatigue of natural fiber thermoplastic composites. *Composites Part B: Engineering*, *62*, 175-182.

Fragoudakis, R. (2017). Failure Concepts in Fiber Reinforced Plastics. *Failure Analysis and Prevention*, 81.

Gaaz, T. S., Sulong, A. B., Kadhum, A. A. H., Nassir, M. H. & Al-Amiery, A. A. (2016). Optimizing injection molding parameters of different halloysites type-reinforced thermoplastic polyurethane nanocomposites via Taguchi complemented with ANOVA. *Materials*, *9*(11), 947.

Garcia, D., Lopez, J., Balart, R., Ruseckaite, R. A. & Stefani, P. M. (2007). Composites based on sintering rice husk–waste tire rubber mixtures. *Materials & Design*, *28*(7), 2234-2238.

Gerardi, V., Minelli, F. & Viggiano, D. (1998). Steam treated rice industry residues as an alternative feedstock for the wood based particleboard industry in Italy. *Biomass and Bioenergy*, *14*(3), 295-299.

Geremew, A., De Winne, P., Demissie, T. A. & De Backer, H. (2021). Treatment of Natural Fiber for Application in Concrete Pavement. *Advances in Civil Engineering*, 2021, 1-13.

Ghag, M. J. & Rao, M. V. (2015). Review on optimization techniques such as DOE and GRA used for process parameters of resistance spot welding. *International Journal of Science and* Research, *4*(6), 701-705.

Ghavami, K. (2005). Bamboo as reinforcement in structural concrete elements. *Cement and concrete composites*, *27*(6), 637-649.

Ghosh, R., Reena, G., Krishna, A. R., & Raju, B. H. L. (2011). Effect of fibre volume fraction on the tensile strength of banana fibre reinforced vinyl ester resin composites. *International Journal of Advanced Engineering Sciences and Technologies, 4*(1), 89-91.

Giurgiutiu, V., Reifsnider, K. & Rogers, C. (1996). Rate-independent energy dissipation mechanisms in fiber-matrix material systems. In *37th Structure, Structural Dynamics and Materials Conference* (pp. 1420).

Gorash, Y., Comlekci, T. & MacKenzie, D. (2015). Comparative study of FE-models and material data for fatigue life assessments of welded thin-walled cross-beam connections. *Procedia Engineering*, *133*, 420-432.

Gowda, T. Y., Sanjay, M. R., Bhat, K. S., Madhu, P., Senthamaraikannan, P. & Yogesha, B. (2018). Polymer matrix-natural fiber composites: An overview. *Cogent Engineering*, *5*(1), 1446667.

Graupner, N., Ziegmann, G., Wilde, F., Beckmann, F. & Müssig, J. (2016). Procedural influences on compression and injection moulded cellulose fibre-reinforced polylactide (PLA) composites: Influence of fibre loading, fibre length, fibre orientation and voids. *Composites Part A: Applied Science and Manufacturing*, *81*, 158-171.

Groover, M.P. (2020). *Fundamentals of modern manufacturing: materials, processes, and systems*. John Wiley & Sons.

Guimaraes, A. V., Brasileiro, P. C., Giovanni, G. C., Costa, L. R. O. & Araujo, L. S. (2016). Failure analysis of a half-shaft of a formula SAE racing car. *Case Studies in Engineering Failure Analysis*, *7*, 17-23.

Hakeem, K. R., Jawaid, M. & Alothman, O.Y. eds. (2015). *Agricultural biomass based potential materials*. Springer.

Hamid, M.R.Y., Ab Ghani, M.H. & Ahmad, S. (2012). Effect of antioxidants and fire retardants as mineral fillers on the physical and mechanical properties of high loading hybrid biocomposites reinforced with rice husks and sawdust. *Industrial Crops and Products*, *40*, 96-102.

Han, Q., Wang, Y., Yin, Y. & Wang, D. (2015). Determination of stress intensity factor for mode I fatigue crack based on finite element analysis. *Engineering Fracture Mechanics*, *138*, 118-126.

Hariharan, K., Prakash, R. V. & Prasad, M. S. (2011). Weighted error criterion to evaluate strain–fatigue life prediction methods. *International Journal of Fatigue*, *33*(5), 727-734.

Harris, B. (1999). *Engineering composite materials*.

Hashim, R., Nadhari, W. N. A. W., Sulaiman, O., Sato, M., Hiziroglu, S., Kawamura, F., Sugimoto, T., Seng, T.G. & Tanaka, R. (2012). Properties of binderless particleboard panels manufactured from oil palm biomass. *BioResources*, *7*(1), 1352-1365.

Hashim, M. Y., Roslan, M. N., Amin, A. M., Zaidi, A. M. A. & Ariffin, S. (2012). Mercerization treatment parameter effect on natural fiber reinforced polymer matrix composite: a brief review. *World academy of science, engineering and technology*, *68*, 1638-1644.

Ho, M. P., Wang, H., Lee, J. H., Ho, C. K., Lau, K. T., Leng, J. & Hui, D. (2012). Critical factors on manufacturing processes of natural fibre composites. *Composites Part B: Engineering*, *43*(8), 3549-3562.

Hodzic, A. & Shanks, R. eds. (2014). *Natural fibre composites: materials, processes and properties*. Woodhead Publishing.

Hojjati-Talemi, R., Zahedi, A. & De Baets, P. (2015). Fretting fatigue failure mechanism of automotive shock absorber valve. *International Journal of Fatigue*, *73*, 58-65.

Holbery, J. & Houston, D. (2006). Natural-fiber-reinforced polymer composites in automotive applications. *Jom*, *58*(11), 80-86.

Hu, D., Mao, J., Song, J., Meng, F., Shan, X. & Wang, R. (2016). Experimental investigation of grain size effect on fatigue crack growth rate in turbine disc superalloy GH4169 under different temperatures. *Materials Science and Engineering: A*, *669*, 318-331.

Hu, W., Jones, R. & Kinloch, A. J. (2016). Discussion of the stress ratio effect on the fatigue delamination growth characterization in FRP composite structures. *Procedia Structural Integrity*, *2*, 66-71.

Hu, Z. (2016). Injection parameters optimization and artificial aging of automotive die cast aluminum alloy. *Materials and Manufacturing Processes*, *31*(6), 787-793.

Huang, X. & Moan, T. (2007). Improved modeling of the effect of R-ratio on crack growth rate. *International Journal of fatigue*, *29*(4), 591-602.

Huang, M. C. & Tai, C. C. (2001). The effective factors in the warpage problem of an injection-molded part with a thin shell feature. *Journal of materials processing technology*, *110*(1), 1-9.

Huda, M. S., Drzal, L. T., Ray, D., Mohanty, A. K. & Mishra, M. (2008). Natural-fiber composites in the automotive sector. In *Properties and performance of natural-fibre composites*, 221-268.

Ibrahim, H., Farag, M., Megahed, H. & Mehanny, S. (2014). Characteristics of starch-based biodegradable composites reinforced with date palm and flax fibers. *Carbohydrate polymers*, *101*, 11-19.

Ibrahim, M. H. I., Zainol, M. Z., Othman, M. H., Amin, A. M., Asmawi, R. & Sa'ude, N. (2014). Optimisation of processing condition using Taguchi method on strength of HDPE-natural fibres micro composite. In *Applied Mechanics and Materials*, *660*, 33-37.

Iranpour, M. & Taheri, F. (2013). Applicability of equivalent constant amplitude loading for assessing the fatigue life of pipelines and risers and the influence of compressive stress cycles. *Journal of pressure vessel technology*, *135*(2).

Ismail, H., Norjulia, A. M. & Ahmad, Z. (2010). The effects of untreated and treated kenaf loading on the properties of kenaf fibre-filled natural rubber compounds. *Polymer-Plastics Technology and Engineering*, *49*(5), 519-524.

İşmal, Ö. E. & Paul, R. (2018). Composite textiles in high-performance apparel. In *High-Performance Apparel*, 377-420.

Jain, A., Van Paepegem, W., Verpoest, I. & Lomov, S. V. (2016). A feasibility study of the Master SN curve approach for short fiber reinforced composites. *International Journal of Fatigue*, *91*, 264-274.

Jalalvand, M., Czél, G., Fuller, J. D., Wisnom, M. R., Canal, L. P., González, C. D. & LLorca, J. (2016). Energy dissipation during delamination in composite materials–An experimental assessment of the cohesive law and the stress-strain field ahead of a crack tip. *Composites Science and Technology*, *134*, 115-124.

Jarabo, R., Monte, M.C., Fuente, E., Santos, S.F. & Negro, C. (2013). Corn stalk from agricultural residue used as reinforcement fiber in fiber-cement production. *Industrial Crops and Products*, *43*, 832-839.

James, M. N. (2014). Fracture-Safe and Fatigue-Reliable Structures. *Frattura ed Integrità Strutturale*, *8*(30), 293-303.

Jauhari, N., Mishra, R. & Thakur, H. (2015). Natural fibre reinforced composite laminates–a review. Materials Today: Proceedings, *2*(4-5), 2868-2877.

Jawaid, M., Paridah, M. T. & Saba, N. eds. (2017). *Lignocellulosic fibre and biomass-based composite materials: processing, properties and applications*. Woodhead Publishing.

Jawaid, M.H.P.S. & Khalil, H.A. (2011). Cellulosic/synthetic fibre reinforced polymer hybrid composites: A review. *Carbohydrate polymers*, *86*(1), 1-18.

Jayabal, S. & Natarajan, U. (2011). Influence of fiber parameters on tensile, flexural, and impact properties of nonwoven coir–polyester composites. *The International Journal of Advanced Manufacturing Technology*, *54*(5), 639-648.

Joadder, B., Shit, J., Acharyya, S. & Dhar, S. (2011). Fatigue failure of notched specimen—A strain-life approach. *Materials Sciences and Applications*, *2*(12), 1730.

Joffre, T., Miettinen, A., Wernersson, E. L., Isaksson, P. & Gamstedt, E. K. (2014). Effects of defects on the tensile strength of short-fibre composite materials. *Mechanics of Materials*, *75*, 125-134.

Johar, N., Ahmad, I. & Dufresne, A. (2012). Extraction, preparation and characterization of cellulose fibres and nanocrystals from rice husk. *Industrial Crops and Products*, *37*(1), 93-99.

Johnson, W. S. (2010). The history, logic and uses of the Equivalent Initial Flaw Size approach to total fatigue life prediction. *Procedia Engineering*, *2*(1), 47-58.

Jollivet, T., Peyrac, C. & Lefebvre, F. (2013). Damage of composite materials. *Procedia Eng*, *66*, 746-758.

Jones, R., Pitt, S., Hui, D. & Brunner, A. (2013). Fatigue crack growth in nano-composites. *Composite Structures*, *99*, pp.375-379.

Jones, R., Pitt, S., Bunner, A. J. & Hui, D. (2012). Application of the Hartman–Schijve equation to represent Mode I and Mode II fatigue delamination growth in composites. *Composite Structures*, *94*(4), 1343-1351.

Kabir, M.M., Wang, H., Lau, K.T. & Cardona, F. (2012). Chemical treatments on plant-based natural fibre reinforced polymer composites: An overview. *Composites Part B: Engineering*, *43*(7), 2883-2892.

Kabir, M.M., Wang, H., Aravinthan, T., Cardona, F. & Lau, K.T. (2011). Effects of natural fibre surface on composite properties: A review. In *Proceedings of the 1st international postgraduate conference on engineering, designing and developing the built environment for sustainable wellbeing (eddBE2011)*, 94-99. Queensland University of Technology.

Kalia, S., Kaith, B. S. & Kaur, I. (2009). Pretreatments of natural fibers and their application as reinforcing material in polymer composites—a review. *Polymer Engineering & Science*, *49*(7), 1253-1272.

Kalyankar, R. R. & Uddin, N. (2012). Structural characterization of natural fiber reinforced polymeric (NFRP) laminates for building construction. *Journal of Polymers and the Environment*, *20*(1), 224-229.

Kamaruddin, S., Khan, Z. A. & Foong, S. H. (2010). Application of Taguchi method in the optimization of injection moulding parameters for manufacturing products from plastic blend. International Journal of Engineering and technology, *2*(6), 574.

Kaminski, M., Laurin, F., Maire, J. F., Rakotoarisoa, C. & Hémon, E. (2015). Fatigue damage modeling of composite structures: the onera viewpoint. *AerospaceLab*, (9), 1-12.

Karna, S. K. & Sahai, R. (2012). An overview on Taguchi method. *International journal of engineering and mathematical sciences*, *1*(1), 1-7.

Karr, D. G. & Akçay, F. A. (2016). A criterion for ductile fracture based on continuum modeling of energy release rates. *International Journal of Fracture*, *197*(2), 201-212.

Karthik, J. P., Chaitanya, K. L. & Sasanka, C. T. (2012). Fatigue life prediction of a parabolic spring under non-constant amplitude proportional loading using finite element method. *International Journal of Advanced Science and Technology*, *46*, 143-156.

Kc, B., Faruk, O., Agnelli, J. A. M., Leao, A. L., Tjong, J. & Sain, M. (2016). Sisal-glass fiber hybrid biocomposite: Optimization of injection molding parameters using Taguchi method for reducing shrinkage. *Composites Part A: Applied Science and Manufacturing*, *83*, 152-159.

Khan, R., Alderliesten, R., Yao, L. & Benedictus, R. (2014). Crack closure and fibre bridging during delamination growth in carbon fibre/epoxy laminates under mode I fatigue loading. *Composites Part A: Applied Science and Manufacturing*, *67*, 201-211.

Khan, M., Afaq, S.K., Khan, N.U. & Ahmad, S. (2014). Cycle time reduction in injection molding process by selection of robust cooling channel design. *International Scholarly Research Notices*, *2014*.

Kim, H. S., Lee, B. H., Choi, S.W., Kim, S. & Kim, H. J. (2007). The effect of types of maleic anhydride-grafted polypropylene (MAPP) on the interfacial adhesion properties of bio-flour-filled polypropylene composites. *Composites Part A: Applied Science and Manufacturing*, *38*(6), 1473-1482.

Kim, J., Zi, G., Van, S.N., Jeong, M., Kong, J. & Kim, M. (2011). Fatigue life prediction of multiple site damage based on probabilistic equivalent initial flaw model. *Structural Engineering and Mechanics*, *38*(4), 443-457.

Kirane, K. & Bažant, Z. P. (2016). Size effect in Paris law and fatigue lifetimes for quasibrittle materials: Modified theory, experiments and micro-modeling. *International Journal of Fatigue*, *83*, 209-220.

Kluger, K. & Łagoda, T. (2013). Fatigue life of metallic material estimated according to selected models and load conditions. *Journal of Theoretical and Applied Mechanics*, *51*(3), 581-592.

Komuraiah, A., Kumar, N. S. & Prasad, B. D. (2014). Chemical composition of natural fibers and its influence on their mechanical properties. *Mechanics of composite materials*, *50*(3), 359-376.

Kong, Y. S., Abdullah, S., Schramm, D., Omar, M. Z. & Haris, S. M. (2019). Development of multiple linear regression-based models for fatigue life evaluation of automotive coil springs. *Mechanical Systems and Signal Processing*, *118*, 675-695.

Krasnowski, B. R., Rotenberger, K. M. & Spence, W. W. (1991). A damage tolerance method for helicopter dynamic components. *Journal of the American Helicopter Society*, *36*(2), 52-60.

Ku, H., Wang, H., Pattarachaiyakoop, N. & Trada, M. (2011). A review on the tensile properties of natural fiber reinforced polymer composites. *Composites Part B: Engineering*, *42*(4), 856-873.

Kumagi, S. & Matsuo, Y. (2013). Composite produced from rice husk and chopped carbon fiber without using any binders. *Industrial crops and products*, *43*, 640-647.

Kumar, R., Kumar, K. & Bhowmik, S. (2014). Optimization of mechanical properties of epoxy based wood dust reinforced green composite using Taguchi method. *Procedia Materials Science*, *5*, 688-696.

Kuo, C. F. J., Lan, W. L., Chen, C. Y. & Tsai, H. C. (2015). Property modification and process parameter optimization design of polylactic acid composite materials. Part I: polylactic acid toughening and photo-degradation modification and optimized parameter design. *Textile Research Journal*, *85*(1), 13-25.

Kuram, E., Timur, G., Ozcelik, B. & Yilmaz, F. (2014). Influences of injection conditions on strength properties of recycled and virgin PBT/PC/ABS. *Materials and Manufacturing Processes*, *29*(10), 1260-1268.

Kuzmanović, M., Delva, L., Cardon, L. & Ragaert, K. (2016). The effect of injection molding temperature on the morphology and mechanical properties of PP/PET blends and microfibrillar composites. *Polymers*, *8*(10), 355.

Kwon, J. H., Ayrilmis, N. & Han, T. H. (2014). Combined effect of thermoplastic and thermosetting adhesives on properties of particleboard with rice husk core. *Materials Research*, *17*(5), 1309-1315.

Kwon, J. H., Ayrilmis, N. & Han, T. H. (2013). Enhancement of flexural properties and dimensional stability of rice husk particleboard using wood strands in face layers. *Composites Part B: Engineering*, *44*(1), 728-732.

La Mantia, F. P. & Morreale, M. (2011). Green composites: A brief review. *Composites Part A: Applied Science and Manufacturing*, *42*(6), 579-588.

Landis, E. N., Kravchuk, R. & Loshkov, D. (2019). Experimental investigations of internal energy dissipation during fracture of fiber-reinforced ultra-high-performance concrete. *Frontiers of Structural and Civil Engineering*, *13*(1), 190-200.

Lal, S. K. & Vasudevan, H. (2013). Optimization of injection moulding process parameters in the moulding of low density polyethylene (LDPE). *Internatinal Jounal of Engineering Research and Development*, *7*(5), 35-39.

Lalit, R., Mayank, P. & Ankur, K. (2018). Natural fibers and biopolymers characterization: A future potential composite material. *Strojnícky časopis-Journal of Mechanical Engineering*, *68*(1), 33-50.

Lau, K.T., Hung, P. Y., Zhu, M. H. & Hui, D. (2018). Properties of natural fibre composites for structural engineering applications. *Composites Part B: Engineering*, *136*, 222-233.

Lassen, T. (1990). The effect of the welding process on the fatigue crack growth. *Welding Journal*, *69*, 75S-81S.

Lazzarin, P., Campagnolo, A. & Berto, F. (2014). A comparison among some recent energy-and stress-based criteria for the fracture assessment of sharp V-notched components under Mode I loading. *Theoretical and Applied Fracture Mechanics*, *71*, 21-30.

Lee, Y. K., Kim, S. M., Yang, H. S. & Kim, H. J. (2003). Mechanical properties of rice husk flour-wood particleboard by urea-formaldehyde resin. *Journal of the Korean Wood Science and Technology*, *31*(3), 42-49.

Leiva, P., Ciannamea, E., Ruseckaite, R. A. & Stefani, P. M. (2007). Medium-density particleboards from rice husks and soybean protein concentrate. *Journal of Applied Polymer Science*, *106*(2), 1301-1306.

Li, F., Wen, Z., Wu, Z., Liu, S., Li, Z., Pei, H. & Yue, Z. (2020). A safe fracture fatigue life prediction based on equivalent initial flaw size. *International Journal of Fatigue*, *142*, 105957.

Li, Y., Wang, H. & Gong, D. (2012). The interrelation of the parameters in the Paris equation of fatigue crack growth. *Engineering Fracture Mechanics*, *96*, 500-509.

Li, Q. & Matuana, L. M. (2003). Surface of cellulosic materials modified with functionalized polyethylene coupling agents. *Journal of Applied Polymer Science*, *88*(2), 278-286.

Liang, S., Gning, P. B. & Guillaumat, L. (2012). A comparative study of fatigue behaviour of flax/epoxy and glass/epoxy composites. *Composites Science and Technology*, *72*(5), 535-543.

Liang, S., Gning, P.B. & Guillaumat, L. (2014). Properties evolution of flax/epoxy composites under fatigue loading. *International Journal of Fatigue*, *63*, 36-45.

Liber-Kneć, A., Kuźniar, P. & Kuciel, S. (2015). Accelerated fatigue testing of biodegradable composites with flax fibers. *Journal of Polymers and the Environment*, *23*(3), 400-406.

Lim, S. L., Wu, T. Y., Sim, E. Y. S., Lim, P. N. & Clarke, C. (2012). Biotransformation of rice husk into organic fertilizer through vermicomposting. *Ecological Engineering*, *41*, 60-64.

Liparoti, S., Speranza, V., Sorrentino, A. & Titomanlio, G. (2017). Mechanical properties distribution within polypropylene injection molded samples: Effect of mold temperature under uneven thermal conditions. *Polymers*, *9*(11), 585.

Liu, Y. & Mahadevan, S. (2009). Probabilistic fatigue life prediction using an equivalent initial flaw size distribution. *International Journal of Fatigue*, *31*(3), 476-487.

Liu, Q. & Hughes, M. (2008). The fracture behaviour and toughness of woven flax fibre reinforced epoxy composites. *Composites Part A: Applied Science and Manufacturing*, *39*(10), 1644-1652.

Liu, H., Shang, D.G., Liu, J.Z. & Guo, Z.K. (2015). Fatigue life prediction based on crack closure for 6156 Al-alloy laser welded joints under variable amplitude loading. *International Journal of Fatigue*, *72*, 11-18.

Lu, Z., Xiang, Y. & Liu, Y. (2010). Crack growth-based fatigue-life prediction using an equivalent initial flaw model. Part II: Multiaxial loading. *International Journal of Fatigue*, *32*(2), 376-381.

Lu, Y., Lu, Y. C., Hu, H. Q., Xie, F. J., Wei, X. Y. & Fan, X. (2017). Structural characterization of lignin and its degradation products with spectroscopic methods. *Journal of spectroscopy*, 2017.

Lupasteanu, V., Taranu, N. & Popoaei, S. (2013). Theoretical strength properties of unidirectional reinforced fiber reinforced polymer composites. *Buletinul Institutului Politehnic din lasi. Sectia Constructii, Arhitectura*, *59*(6), 83.

Lv, Z., Huang, H. Z., Zhu, S. P., Gao, H. & Zuo, F. (2015). A modified nonlinear fatigue damage accumulation model. *International Journal of Damage Mechanics*, *24*(2), 168-181.

Madsen, B., Thygesen, A. & Lilholt, H. (2009). Plant fibre composites–porosity and stiffness. *Composites Science and Technology*, *69*(7-8), 1057-1069.

Madurwar, M. V., Ralegaonkar, R. V. & Mandavgane, S. A. (2013). Application of agro-waste for sustainable construction materials: A review. *construction and Building materials*, *38*, 872-878.

Mahir, F. I., Keya, K. N., Sarker, B., Nahiun, K. M. & Khan, R. A. (2019). A brief review on natural fiber used as a replacement of synthetic fiber in polymer composites. *Materials Engineering Research*, *1*(2), 86-97.

Mahboob, Z. & Bougherara, H. (2018). Fatigue of flax-epoxy and other plant fibre composites: Critical review and analysis. *Composites Part A: Applied Science and Manufacturing*, *109*, 440-462.

Mahmudi, R., Roumina, R. & Raeisinia, B. (2004). Investigation of stress exponent in the power-law creep of Pb–Sb alloys. *Materials Science and Engineering: A*, *382*(1-2), 15-22.

Maierhofer, J., Gänser, H. P. & Pippan, R. (2015). Modified Kitagawa–Takahashi diagram accounting for finite notch depths. *International Journal of Fatigue*, *70*, 503-509.

Majeed, K., Jawaid, M., Hassan, A .A. B. A. A., Bakar, A. A., Khalil, H. A., Salema, A. A. & Inuwa, I. (2013). Potential materials for food packaging from nanoclay/natural fibres filled hybrid composites. *Materials & Design*, *46*, 391-410.

Maleque, M. A. & Salit, M. S. (2013). *Materials selection and design*. Springer Singapore.

Malkapuram, R., Kumar, V. & Negi, Y.S. (2009). Recent development in natural fiber reinforced polypropylene composites. *Journal of reinforced plastics and composites*, *28*(10), 1169-1189.

Mallakpour, S. & Zadehnazari, A. (2013). Thermoplastic vinyl polymers: From macro to nanostructure. *Polymer-Plastics Technology and Engineering*, *52*(14), 1423-1466.

Manjunath, G. B., Vijaykumar, T. N. & Bharath, K. N. (2015). Optimization of notch parameter on fracture Toughness of natural fiber reinforced composites using Taguchi method. *Journal of Materials Science & Surface Engineering*, *3*(2), 244-248.

Manni, A., Saviano, G. & Bonelli, M. G. (2021). Optimization of the ANNs Predictive Capability Using the Taguchi Approach: A Case Study. Mathematics, *9*(7), 766.

Mansor, N. I. I., Abdullah, S. & Ariffin, A. K. (2019). Effect of loading sequences on fatigue crack growth and crack closure in API X65 steel. *Marine Structures*, *65*, 181-196.

Mansor, M. R., Nurfaizey, A. H., Tamaldin, N. & Nordin, M. N. A. (2019). Natural fiber polymer composites: utilization in aerospace engineering. In *Biomass, Biopolymer-Based Materials, and Bioenergy*, 203-224.

Masuelli, M. A. (2013). Introduction of fibre-reinforced polymers− polymers and composites: concepts, properties and processes. In *Fiber Reinforced Polymers-The Technology Applied for Concrete Repair*. IntechOpen.

Mazurkiewicz S, & Porebska ˛ R. (2010). The methods of evaluation of mechanical properties of polymer matrix composites. *Arch Foundry Eng J*, *40*(3):209–12.

Md Yusof, F., Abd Rahim, M. K. H., Samsudin, A. S., Mohamad Nor, N. H., Ahmad, Z. U. R. A. I. D. A. & Halim, Z. A. H. U. R. I. N. (2016). Optimization of Natural Fiber Composite Parameter Using Taguchi Approach. In *Advanced Materials Research*, *1133*, 185-188.

Mehat, N.M. & Kamaruddin, S. (2011). Investigating the effects of injection molding parameters on the mechanical properties of recycled plastic parts using the Taguchi method. *Materials and Manufacturing Processes*, *26*(2), 202-209.

Megat-Yusoff, P. S. M., Abdul, L. & Ramli, M. S. (2011). Optimizing injection molding processing parameters for enhanced mechanical performance of oil palm empty fruit bunch high density polyethylene composites. *Journal of Applied Sciences*, *11*(9), 1618-1623.

Meneghetti, G. (2007). Analysis of the fatigue strength of a stainless steel based on the energy dissipation. *International journal of fatigue*, *29*(1), 81-94.

Meneghetti, G. & Quaresimin, M. (2011). Fatigue strength assessment of a short fiber composite based on the specific heat dissipation. *Composites Part B: Engineering*, *42*(2), 217-225.

Mikkola, E., Murakami, Y. & Marquis, G. (2014). Fatigue life assessment of welded joints by the equivalent crack length method. *Procedia materials science*, *3*, 1822-1827.

Mitra, S., Saha, S., Guha, B., Chakrabarti, K., Satya, P., Sharma, A.K., Gawande, S.P., Kumar, M. & Saha, M. (2013). Ramie: the strongest bast fibre of nature. *Technical bulletin*, 8.

Mitra, A. C., Jawarkar, M., Soni, T. & Kiranchand, G.R. (2016). Implementation of Taguchi method for robust suspension design. *Procedia Engineering*, *144*, 77-84.

Mohamed, W. Z. W., Baharum, A., Ahmad, I., Abdullah, I. & Zakaria, N. E. (2018). Effects of fiber size and fiber content on mechanical and physical properties of Mengkuang reinforced thermoplastic natural rubber composites. *BioResources*, *13*(2), 2945-2959.

Mohanty, A. K., Vivekanandhan, S., Pin, J. M. & Misra, M. (2018). Composites from renewable and sustainable resources: Challenges and innovations. *Science*, *362*(6414), 536-542.

Molent, L. (2010). Fatigue crack growth from flaws in combat aircraft. *International journal of fatigue*, *32*(4), 639-649.

Monika, B. D. (2013). Food security in Asia: challenges, policies and implications. *International Institute for Strategic Studies (IISS), London*.

Mortazavian, S. & Fatemi, A. (2015). Fatigue behavior and modeling of short fiber reinforced polymer composites: A literature review. *International Journal of Fatigue*, *70*, 297-321.

Mortazavian, S. & Fatemi, A. (2015). Effects of fiber orientation and anisotropy on tensile strength and elastic modulus of short fiber reinforced polymer composites. *Composites part B: engineering*, *72*, 116-129.

Mourtzis, D., Angelopoulos, J. & Panopoulos, N. (2021). Robust Engineering for the Design of Resilient Manufacturing Systems. Applied Sciences, *11*(7), 3067.

Muthuraj, R., Misra, M., Defersha, F. & Mohanty, A. K. (2016). Influence of processing parameters on the impact strength of biocomposites: A statistical approach. *Composites Part A: Applied Science and Manufacturing*, *83*, 120-129.

Naebe, M., Abolhasani, M. M., Khayyam, H., Amini, A. & Fox, B. (2016). Crack damage in polymers and composites: A review. *Polymer reviews*, *56*(1), 31-69.

Nishino, T., Hirao, K., Kotera, M., Nakamae, K. & Inagaki, H. (2003). Kenaf reinforced biodegradable composite. *Composites science and technology*, *63*(9), 1281-1286.

Norhidayah, M. H., Hambali, A. & Yuhazri, M. Y. (2015). The Effect Of Fiber Size on The Mechanical Properties of Bertam/Unsaturated Polyester Composites. In *Applied Mechanics and Materials*, *761*, 52-56.

Nourbakhsh, A., Karegarfard, A., Ashori, A. & Nourbakhsh, A. (2010). Effects of particle size and coupling agent concentration on mechanical properties of particulate-filled polymer composites. *Journal of Thermoplastic Composite Materials*, *23*(2), 169-174.

Nwanonenyi, S. C. & Ohanuzue, C. B. C. (2011). Effect of Rice-Husk Filler on Some Mechanical and End-Use Properties of Low Density Polyethylene. Journal of Technology and Education in Nigeria, *16*(1), 102-108.

O'Dowd, F., Levesque, M. & Gilchrist, M.D. (2006). Analysis of fibre orientation effects on injection moulded components. *Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture*, *220*(12), 1909-1921.

Omrani, E., Menezes, P. L. & Rohatgi, P. K. (2016). State of the art on tribological behavior of polymer matrix composites reinforced with natural fibers in the green materials world. *Engineering Science and Technology, an International Journal*, *19*(2), 717-736.

Osarenmwinda, J. O. & Nwachukwu, J. C. (2007). Effect of particle size on some properties of rice husk particleboard. In *Advanced Materials Research*, *18*, 43-48.

Özturk, S. (2010). Effect of fiber loading on the mechanical properties of kenaf and fiberfrax fiber-reinforced phenol-formaldehyde composites. *Journal of Composite Materials*, *44*(19), 2265-2288.

Pach, E., Korin, I. & Ipina, J. P. (2012). Simple Fatigue Testing Machine for Fiber-Reinforced Polymer Composite. *Experimental Techniques*, *36*(2), 76-82.

Pantano, A., Bongiorno, F., Marannano, G. & Zuccarello, B. (2021). Enhancement of static and fatigue strength of short sisal fiber biocomposites by low fraction nanotubes. Applied Composite Materials, *28*(1), 91-112.

Panthapulakkal, S., Sain, M. & Law, S. (2005). Effect of coupling agents on rice-husk-filled HDPE extruded profiles. *Polymer International*, *54*(1), 137-142.

Panthapulakkal, S., Zereshkian, A. & Sain, M. (2006). Preparation and characterization of wheat straw fibers for reinforcing application in injection molded thermoplastic composites. *Bioresource technology*, *97*(2), 265-272.

Paudzi, M. K. F. M., Abdullah, M. F. & Ali, A. (2018). Fatigue analysis of hybrid composites of kenaf/kevlar fibre reinforced epoxy composites. *Jurnal Kejuruteraan*, *1*(7).

Peças, P., Carvalho, H., Salman, H. & Leite, M. (2018). Natural fibre composites and their applications: a review. *Journal of Composites Science*, *2*(4), 66.

Peralta, P. & Laird, C. (2014). Fatigue of metals. In *Physical Metallurgy*, 1765-1880.

Petersen, R. C. (2013). Accurate critical stress intensity factor Griffith crack theory measurements by numerical techniques. *SAMPE journal. Society for the Advancement of Material and Process Engineering*, *2013*, 737.

Pickering, K.L., Efendy, M.A. & Le, T.M. (2016). A review of recent developments in natural fibre composites and their mechanical performance. *Composites Part A: Applied Science and Manufacturing*, *83*, 98-112.

Pook, L. (2007). *Why Metal Fatigue Matters* (pp. 161-165). Springer Netherlands.

Pracella, M., Haque, M. & Alvarez, V. (2010). Functionalization, compatibilization and properties of polyolefin composites with natural fibers. *Polymers*, *2*(4), 554-574.

Prasad, M. S., Venkatesha, C.S. & Jayaraju, T. (2011). Experimental methods of determining fracture toughness of fiber reinforced polymer composites under various loading conditions. *Journal of Minerals and Materials Characterization and Engineering*, *10*(13), 1263.

Prayogo, G. S. & Lusi, N. (2016). Application of Taguchi technique coupled with grey relational analysis for multiple performance characteristics optimization of EDM parameters on ST 42 steel. In *AIP Conference Proceedings*, 1725(1), 020061. AIP

Premalal, H. G., Ismail, H. & Baharin, A. (2002). Comparison of the mechanical properties of rice husk powder filled polypropylene composites with talc filled polypropylene composites. *Polymer Testing*, *21*(7), 833-839.

Puglia, D., Biagiotti, J. & Kenny, J. M. (2005). A review on natural fibre-based composites—Part II: Application of natural reinforcements in composite materials for automotive industry. *Journal of Natural Fibers*, *1*(3), 23-65.

Puh, F., Jurkovic, Z., Perinic, M., Brezocnik, M. & Buljan, S. (2016). Optimization of machining parameters for turning operation with multiple quality characteristics using Grey relational analysis. *Tehnički vjesnik*, *23*(2), 377-382.

Qi, K., Wang, W., Wang, X., Jiang, A., Liu, B., Guo, Z. & Liu, J. (2013). Safety assessment and fatigue life analysis of aged crane structures. In *Proceedings of the 13th International Conference on Fracture June. Beijing, China*.

Qiu, Z., Zhang, W., Yu, X., Guo, Y. & Jin, L. (2015). Monitoring yield failure of ferromagnetic materials with spontaneous abnormal magnetic signals. *Tehnički vjesnik*, *22*(4), 953-958.

Quirino, R. L. & Larock, R. C. (2011). Rice hull biocomposites. I. Preparation of a linseed-oil-based resin reinforced with rice hulls. *Journal of Applied Polymer Science*, *121*(4), 2039-2049.

Radhwan, H., Mustaffa, M. T., Annuar, A. F., Azmi, H., Zakaria, M. Z. & Khalil, A. N. M. (2015). An optimization of shrinkage in injection molding parts by using Taguchi method. *Journal of Advanced Research in Applied Mechanics*, *10*(1), 1-8.

Raghuraman, S., Thiruppathi, K., Panneerselvam, T. & Santosh, S. (2013). Optimization of EDM parameters using Taguchi method and grey relational analysis for mild steel IS 2026. *International Journal of Innovative Research in Science, Engineering and Technology*, *2*(7), 3095-3104.

Raheem, A. A. & Kareem, M. A. (2017). Chemical composition and physical characteristics of rice husk ash blended cement. In *International Journal of Engineering Research in Africa*, *32*, 25-35. Trans Tech Publications Ltd.

Rahman, M. Z., Jayaraman, K. & Mace, B. R. (2017). Vibration damping of flax fibre-reinforced polypropylene composites. *Fibers and Polymers*, *18*(11), 2187-2195.

Raju, B. S., Sekhar, U. C. & Drakshayani, D. N. (2017). Grey relational analysis coupled with principal component analysis for optimization of stereolithography process to enhance part quality. In *IOP Conference Series: Materials Science and Engineering* 225(1), 012228(1)-012228(13).

Ramdhonee, A. & Jeetah, P. (2017). Production of wrapping paper from banana fibres. *Journal of environmental chemical engineering*, *5*(5), 4298-4306.

Ramnath, B. V., Manickavasagam, V. M., Elanchezhian, C., Krishna, C. V., Karthik, S. & Saravanan, K. (2014). Determination of mechanical properties of intra-layer abaca–jute–glass fiber reinforced composite. *Materials & Design*, *60*, 643-652.

Rana, P. & Sadaphale, D. B. (2015). Crack analysis of composite laminate. *International Journal of Engineering Sciences & Research Technology*, *4*(7), 169-177.

Rans, C., Alderliesten, R. & Benedictus, R. (2011). Misinterpreting the results: How similitude can improve our understanding of fatigue delamination growth. *Composites Science and Technology*, *71*(2), 230-238.

Raos, P. & Stojsic, J. (2014). Influence of injection moulding parameters on tensile strength of injection moulded part. *Manufacturing and industrial engineering*, *13*(3-4), 1-3.

Rawal, M. R. & Inamdar, K. H. (2014). Review on various optimization techniques used for process parameters of resistance spot welding. *International Journal of Current Engineering and Technology*, *3*, 160-164.

Razavykia, A., Yusof, N. M. & Yavari, M. R. (2015). Determining the effects of machining parameters and modifier on surface roughness in dry turning of Al-20% Mg2Si-PMMC using design of experiments (DOE). *Procedia Manufacturing*, *2*, 280-285.

Renner, K., Kenyó, C., Móczó, J. & Pukánszky, B. (2010). Micromechanical deformation processes in PP/wood composites: Particle characteristics, adhesion, mechanisms. *Composites Part A: Applied Science and Manufacturing*, *41*(11), 1653-1661.

Ribeiro, A. S., Silva, A. L. L. & de Jesus, A. M. P. (2011). Evolution of fatigue history. In *21st Brazilian Congress of Mechanical*.

Rocha, M. K., Silva, L. M. F., de Oliveira, A. J., Duarte, A. L., Mendes, A. F. & Silva, M. B. (2015). The design of experiment application (DOE) in the beneficiation of cashew chestnut in northeastern Brazil. *American Journal of Theoretical and Applied Statistics*, *4*(1), 6-14.

Romli, F. I., Alias, A. N., Rafie, A. S. M. & Majid, D. L. A. A. (2012). Factorial study on the tensile strength of a coir fiber-reinforced epoxy composite. *AASRI Procedia*, *3*, 242-247.

Rosa, S. M. L., Santos, E. F., Ferreira, C. A. & Nachtigall, S. M. B. (2009). Studies on the properties of rice-husk-filled-PP composites: effect of maleated PP. Materials Research, 12(3), 333-338.

Saba, N., Tahir, P. M. & Jawaid, M. (2014). A review on potentiality of nano filler/natural fiber filled polymer hybrid composites. *Polymers*, *6*(8), 2247-2273.

Saheb, D. N. & Jog, J. P., (1999). Natural fiber polymer composites: a review. *Advances in polymer technology*, *18*(4), 351-363.

Sakamoto, J., Lee, Y. S. & Cheong, S.K. (2015). Effect of surface flaw on fatigue strength of shot-peened medium-carbon steel. *Engineering Fracture Mechanics*, *133*, 99-111.

Salvia, M., Fiore, L., Fournier, P. & Vincent, L. (1997). Flexural fatigue behaviour of UDGFRP experimental approach. *International journal of fatigue*, *19*(3), 253-262.

Sanap, P., Dharmadhikari, H.M. & Keche, A.J. (2016). Optimization of Plastic Moulding by Reducing Warpage With the Application of Taguchi Optimization Technique & Addition of Ribs in Washing Machine Wash Lid Component. *IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN*, 2278-1684.

Sanjay, M. R., Madhu, P., Jawaid, M., Senthamaraikannan, P., Senthil, S. & Pradeep, S. (2018). Characterization and properties of natural fiber polymer composites: A comprehensive review. *Journal of Cleaner Production*, *172*, 566-581.

Sapuan, S. M., Harimiand, M. & Maleque, M. A. (2003). Mechanical properties of epoxy/coconut shell filler particle composites. *Arabian Journal for Science and Engineering*, *28*(2), 171-182.

Saravanan, R. & Sivaraja, M. (2012). Durability studies on coir reinforced bio-composite concrete panel. *Eur. J. Sci. Res*, *81*(2), 220-30.

Sathishkumar, T. P., Navaneethakrishnan, P., Shankar, S., Rajasekar, R. & Rajini, N., (2013). Characterization of natural fiber and composites–A review. *Journal of Reinforced Plastics and Composites*, *32*(19), 1457-1476.

Savastano Jr, H., Santos, S. F., Radonjic, M. & Soboyejo, W. O. (2009). Fracture and fatigue of natural fiber-reinforced cementitious composites. *Cement and Concrete Composites*, *31*(4), 232-243.

Senthiil, P. V. & Sirsshti, A. (2014). Studies on material and mechanical properties of natural fiber reinforced composites. *International Journal of Engineering and Science*, *3*(11), 18-27.

Sevenois R.D., & Van Paepegem W. (2019). Fatigue testing for polymer matrix composites. *In Creep and Fatigue In Polymer Matrix Composites*, 403–37.

Shah, D. U., Schubel, P. J., Clifford, M. J. & Licence, P. (2013). Fatigue life evaluation of aligned plant fibre composites through S–N curves and constant-life diagrams. *Composites Science and Technology*, *74*, 139-149.

Shahani, A. R. & Kashani, H. M. (2013). Assessment of equivalent initial flaw size estimation methods in fatigue life prediction using compact tension specimen tests. *Engineering Fracture Mechanics*, *99*, 48-61.

Shahzad, A. (2019). Investigation into fatigue strength of natural/synthetic fiber-based composite materials. In *Mechanical and Physical Testing of Biocomposites, Fibre-Reinforced Composites and Hybrid Composites*, 215-239.

Sharanaprabhu, C. M. & Kudari, S. K. (2010). Mixed-mode (I/II) crack initiation direction for elastic-plastic materials based on crack-tip plastic zone. *International Journal of Engineering, Science and Technology*, *2*(11).

Sharba, M. J., Leman, Z., Sultan, M. T., Ishak, M. R. & Hanim, M. A. A. (2016). Effects of kenaf fiber orientation on mechanical properties and fatigue life of glass/kenaf hybrid composites. *BioResources*, *11*(1), 1448-1465.

Shen, W. & Choo, Y. S. (2012). Stress intensity factor for a tubular T-joint with grouted chord. *Engineering Structures*, *35*, 37-47.

Shivapragash, B., Chandrasekaran, K., Parthasarathy, C. & Samuel, M. (2013). Multiple response optimizations in drilling using Taguchi and grey relational analysis. *International Journal of Modern Engineering Research*, *3*(2), 765-768.

Singha, A. S. & Thakur, V. K. (2008). Mechanical properties of natural fibre reinforced polymer composites. *Bulletin of materials Science*, *31*(5), 791.

Silva, F. S. (2005). The importance of compressive stresses on fatigue crack propagation rate. *International journal of fatigue*, *27*(10-12), 1441-1452.

Silva, R. V., Spinelli, D., Bose Filho, W. W., Neto, S.C., Chierice, G. O. & Tarpani, J. R. (2006). Fracture toughness of natural fibers/castor oil polyurethane composites. *Composites science and technology*, *66*(10), 1328-1335.

Siválk, P. & Ostertagová, E. (2012). Evaluation of fatigue tests by means of mathematical statistics. *Procedia Engineering*, *48*, 636-642.

Soman, S., Murthy, K. & Robi, P. (2018). A simple technique for estimation of mixed mode (I/II) stress intensity factors. *Journal of Mechanics of Materials and Structures*, *13*(2), 141-154.

Sreenivasulu, R. & Rao, C. S. (2012). Application of grey relational analysis for surface roughness and roundness error in drilling of Al 6061 alloy. *International journal of lean thinking*, *3*(2), 67-78.

Sreenivasulu, R. & Rao, C. S. (2013). Design of Experiments based Grey Relational Analysis in Various Machining Processes-A Review. *Research Journal of Engineering Sciences*, *2*(1), 9472.

Srinivasa, C. V. & Bharath, K. N. (2011). Impact and hardness properties of areca fiber-epoxy reinforced composites. *J Mater Environ Sci*, *2*(4), 351-356.

Stephens, R. I., Fatemi, A., Stephens, R. R. & Fuchs, H. O. (2000). *Metal fatigue in engineering*. John Wiley & Sons.

Sufiyanto, S. (2017). Optimization of injection molding parameters using the Taguchi method to maximize biocomposite material tensile strength. *Jurnal Teknik Mesin (JTM)*, *7*(2), 81-87.

Sun, C., Lei, Z. & Hong, Y. (2014). Effects of stress ratio on crack growth rate and fatigue strength for high cycle and very-high-cycle fatigue of metallic materials. *Mechanics of materials*, *69*(1), 227-236.

Sun, Z. (2018). Progress in the research and applications of natural fiber-reinforced polymer matrix composites. *Science and Engineering of Composite Materials*, *25*(5), 835-846.

Suplicz, A., Szabo, F. & Kovacs, J. G. (2013). Injection molding of ceramic filled polypropylene: The effect of thermal conductivity and cooling rate on crystallinity. *Thermochimica Acta*, *574*, 145-150.

Swamy, R. P., Kumar, G. M., Vrushabhendrappa, Y. & Joseph, V. (2004). Study of areca-reinforced phenol formaldehyde composites. *Journal of reinforced plastics and composites*, *23*(13), 1373-1382.

Taghizadeh, H., Chakherlou, T. N. & Aghdam, A. B. (2013). Prediction of fatigue life in cold expanded Al-alloy 2024-T3 plates used in double shear lap joints. *Journal of Mechanical Science and Technology*, *27*(5), 1415-1425.

Tajvidi, M. (2005). Static and dynamic mechanical properties of a kenaf fiber–wood flour/polypropylene hybrid composite. *Journal of applied polymer science*, *98*(2), 665-672.

Tanaka, K., Kitano, T. & Egami, N. (2014). Effect of fiber orientation on fatigue crack propagation in short-fiber reinforced plastics. *Engineering Fracture Mechanics*, *123*, 44-58.

Tanaka, K., Oharada, K., Yamada, D. & Shimizu, K. (2015). Fatigue crack propagation in short-fiber reinforced plastics. *Frattura ed Integrita Strutturale 9*(34), 309-317.

Tanco, M., Viles, E. & Pozueta, L. (2009). Comparing different approaches for design of experiments (DoE). In *Advances in electrical engineering and computational science*, 611-621). Springer, Dordrecht.

Tao, G. & Xia, Z. (2007). Mean stress/strain effect on fatigue behavior of an epoxy resin. *International journal of fatigue*, *29*(12), 2180-2190.

Tao, G. & Xia, Z. (2009). Biaxial fatigue behavior of an epoxy polymer with mean stress effect. *International Journal of Fatigue*, *31*(4), 678-685.

Telford, J. K. (2007). A brief introduction to design of experiments. *Johns Hopkins apl technical digest*, *27*(3), 224-232.

Tholibon, D., Tharazi, I., Sulong, A. B., Muhamad, N., Ismial, N. F., Radzi, M. K. F. M., Radzuan, N. M. & Hui, D. (2019). Kenaf fiber composites: A review on synthetic and biodegradable polymer matrix. *J. Kejuruter*, *31*, 65-76.

Tomasi, J., Pisani, W. A., Chinkanjanarot, S., Krieg, A. S., Jaszczak, D., Pineda, E. J., Bednarcyk, B. A., Miller, S., King, J. A., Miskioglu, I. & Odegard, G. M. (2019). Modeling-Driven Damage Tolerant Design of Graphene Nanoplatelet/Carbon Fiber/Epoxy Hybrid Composite Panels for Full-Scale Aerospace Structures. In *AIAA Scitech 2019 Forum*, 1273.

Toro, P., Quijada, R., Murillo, O. & Yazdani-Pedram, M. (2005). Study of the morphology and mechanical properties of polypropylene composites with silica or rice-husk. Polymer International, *54*(4), 730-734.

Townsend, T. & Sette, J. (2016). Natural fibres and the world economy. In *Natural fibres: advances in science and technology towards industrial applications* (pp. 381-390). Springer, Dordrecht.

Towo, A. N. & Ansell, M .P. (2008). Fatigue of sisal fibre reinforced composites: Constant-life diagrams and hysteresis loop capture. *Composites Science and Technology*, *68*(3-4), 915-924.

Treviso, A., Van Genechten, B., Mundo, D. & Tournour, M. (2015). Damping in composite materials: Properties and models. *Composites Part B: Engineering*, *78*, 144-152.

Uddin, N. & Kalyankar, R. R. (2011). Manufacturing and structural feasibility of natural fiber reinforced polymeric structural insulated panels for panelized construction. *International journal of polymer science*, *2011*.

Valli, D. M. & Jindal, T. K. (2014). Application of Taguchi method for optimization of physical parameters affecting the performance of pulse detonation engine. *Journal of Basic and Applied Engineering Research*, *1*(1), 18-23.

Vignesh, K., Ramasivam, G., Natarajan, U. & Srinivasan, C. (2016). Optimization of process parameters to enhance the mechanical properties of bone powder and coir fiber reinforced polyester composites by Taguchi method. *APRN Journal of Engineering and Applied Sciences*, *11*(2), 1224-1231.

Voragen, A. G., Coenen, G. J., Verhoef, R. P. & Schols, H.A. (2009). Pectin, a versatile polysaccharide present in plant cell walls. *Structural Chemistry*, 20(2), 263-275.

Wahyuni, N. L. E. & Soeswanto, B. (2019). The effects of particle size and content on Morphology and Mechanical Properties of Rice Straw and Coal Fly Ash filled-Polypropylene Composites. In *Journal of Physics: Conference Series*, *1175*(1), 012282.

Walat, K. & Łagoda, T. (2014). Lifetime of semi-ductile materials through the critical plane approach. *International Journal of Fatigue*, *67*, 73-77.

Wang, F., Lu, M., Zhou, S., Lu, Z. & Ran, S. (2019). Effect of Fiber Surface Modification on the Interfacial Adhesion and Thermo-Mechanical Performance of Unidirectional Epoxy-Based Composites Reinforced with Bamboo Fibers. *Molecules*, *24*(15), 2682.

Wang, B., Panigrahi, S., Tabil, L. & Crerar, W. (2007). Pre-treatment of flax fibers for use in rotationally molded biocomposites. *Journal of reinforced plastics and composites*, *26*(5), 447-463.

Wang, X., Yin, D., Xu, F., Qiu, B. & Gao, Z. (2012). Fatigue crack initiation and growth of 16MnR steel with stress ratio effects. *International journal of fatigue*, *35*(1), 10-15.

Wei, J. & Meyer, C. (2016). Utilization of rice husk ash in green natural fiber-reinforced cement composites: Mitigating degradation of sisal fiber. *Cement and Concrete Research*, *81*, 94-111.

Witayakran, S., Smitthipong, W., Wangpradid, R., Chollakup, R. & Clouston, P. L. (2017). Natural fiber composites: review of recent automotive trends.

Wong, K. J., Zahi, S., Low, K. O. & Lim, C. C. (2010). Fracture characterisation of short bamboo fibre reinforced polyester composites. *Materials & Design*, *31*(9), 4147-4154.

Woo, C. S., Kim, W. D. & Kwon, J. D. (2008). A study on the material properties and fatigue life prediction of natural rubber component. *Materials Science and Engineering: A*, *483*, 376-381.

Wu, Y., Nan, B. & Chen, L. (2014). Mechanical performance and parameter sensitivity analysis of 3D braided composites joints. *The Scientific World Journal*, *2014*.

Xiang, Y. & Liu, Y. (2010). EIFS-based crack growth fatigue life prediction of pitting-corroded test specimens. *Engineering Fracture Mechanics*, *77*(8), 1314-1324.

Xu, D. & Schmauder, S. (1999). The plastic energy dissipation in metal matrix composites during cyclic loading. *Computational materials science*, *15*(1), 96-100.

Yadav, R., Pancharya, A. & Kant, R. (2021). Influence of injection and holding pressure on tribological and mechanical behavior of injection moulded thermoplastic. Materials Today: Proceedings, *41*, 915-920.

Yang, Y. & Urban, M. W. (2013). Self-healing polymeric materials. *Chemical Society Reviews*, *42*(17), 7446-7467.

Yao, L., Alderliesten, R.C., Zhao, M. & Benedictus, R. (2014). Discussion on the use of the strain energy release rate for fatigue delamination characterization. *Composites Part A: Applied Science and Manufacturing*, *66*, 65-72.

Yao, L., Alderliesten, R. C. & Benedictus, R. (2015). Interpreting the stress ratio effect on delamination growth in composite laminates using the concept of fatigue fracture toughness. *Composites Part A: Applied Science and Manufacturing*, *78*, 135-142.

Yao, L., Sun, Y., Alderliesten, R. C., Benedictus, R. & Zhao, M. (2017a). Fibre bridging effect on the Paris relation for mode I fatigue delamination growth in composites with consideration of interface configuration. *Composite Structures*, *159*, 471-478.

Yao, L., Sun, Y., Zhao, M., Alderliesten, R. C. & Benedictus, R. (2017b). Stress ratio dependence of fibre bridging significance in mode I fatigue delamination growth of composite laminates. *Composites Part A: Applied Science and Manufacturing*, *95*, 65-74.

Yatigala, N. S., Bajwa, D. S. & Bajwa, S. G. (2018). Compatibilization improves physico-mechanical properties of biodegradable biobased polymer composites. *Composites Part A: Applied Science and Manufacturing*, *107*, 315-325.

Wicaksono Ye, J., Wang, Y., Wang, Y., Shi, B., Li, Y. & Qiao, X. (2018). Microscopic modeling and effective properties evaluation of glass/epoxy plain woven composites. *Materials Research Express*, *5*(10), 105303.

Zaaba, N. F. & Ismail, H. (2019). Thermoplastic/Natural Filler Composites: A Short Review. *Journal of Physical Science*, *30*.

Zakaria, K. A., Jimit, R. H., Ramli, S. N. R., Abdul Aziz, A., Bapokutty, O., & Ali, M. B. (2016).Study on fatigue life and fracture behaviour of fibreglass reinforced composites. *Journal of Mechanical Engineering and Sciences (JMES)*, *10*(3), 2300-2310.

Zamanzadeh, M., Larkin, E. & Mirshams, R. (2015). Fatigue failure analysis case studies. *Journal of Failure Analysis and Prevention*, *15*(6), 803-809.

Zampaloni, M., Pourboghrat, F., Yankovich, S.A., Rodgers, B.N., Moore, J., Drzal, L.T., Mohanty, A.K. & Misra, M. (2007). Kenaf natural fiber reinforced polypropylene composites: A discussion on manufacturing problems and solutions. *Composites Part A: Applied Science and Manufacturing*, *38*(6), 1569-1580.

Zwawi, M. (2021). A Review on Natural Fiber Bio-Composites; Surface Modifications and Applications. *Molecules*, 26(2), 404.

Zerbst, U. & Ainsworth, R .A. (2003). *An overview of failure assessment methods in codes and standards* (No. GKSS--2003/31). GKSS-Forschungszentrum Geesthacht GmbH (Germany).

Zhang, Y., Yuan, Z. & Xu, C. C. (2017). Bio-based resins for fiber-reinforced polymer composites. In *Natural Fiber-Reinforced Biodegradable and Bioresorbable Polymer Composites*, 137-162.

Zhang, Y. H. & Maddox, S. J. (2009). Fatigue life prediction for toe ground welded joints. *International Journal of Fatigue*, *31*(7), 1124-1136.

Zhang, X., Gao, H. & Huang, H.Z. (2018). Total fatigue life prediction for welded joints based on initial and equivalent crack size determination. *International Journal of Damage Mechanics*, *27*(7), 1084-1104.

Zhang, Y.H. (2013). Fatigue Analysis of Welded Structures.

Zhao, Q., Zhang, B., Quan, H., Yam, R. C., Yuen, R.K. & Li, R. K. (2009). Flame retardancy of rice husk-filled high-density polyethylene ecocomposites. *Composites Science and Technology*, *69*(15-16), 2675-2681.

Zhou, M. & Fleury, R. (2016). Fail-safe topology optimization. *Structural and Multidisciplinary Optimization*, *54*(5), 1225-1243.