

## Editorial Board

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### Inside the Issue

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### Recent Publications

#### Published

1. Mohd Nor Hakim et al., 2020, IOP Conf. Series: Materials Science and Engineering, 1003(1)

#### Accepted

1. AA Ghaffar et al., The Int. J. Adv. Manuf. Technology, Accepted, 2021.

### Active Grants

#### RU Grant

Title: Formability Analysis of Tailor Welded Blank of Steel and Aluminum Alloys, 2019-2021

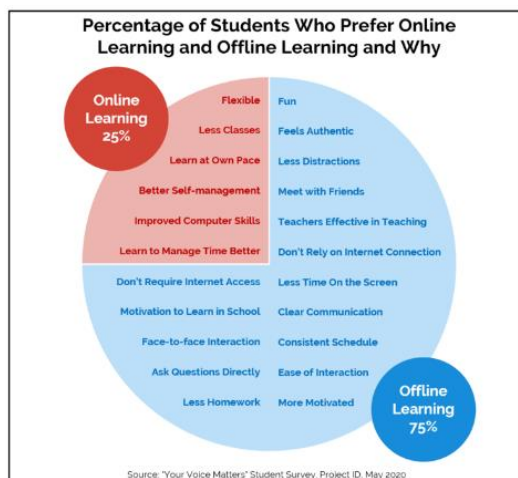
#### PRGS Grant

Title: Prototyping of hybrid machine; 2019-2022



## Preface

"Online class or e-learning is more stressful, and irritating compared than face to face" That is the most typical response gathered from many surveys conducted. Is that true? Bubble below represent the preference of students and list of advantages of both online and offline learning. Only quarter of the student prefer online learning compared than offline learning.



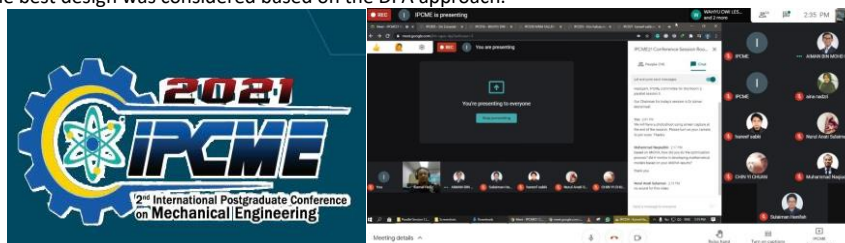
For some of the universities online learning is not new, they have implemented it quite some time. But for most of the public universities, especially program that requires hands-on and prefer more to offline learning. Therefore, issues on facility and readiness level quite challenging.

One of the reasons is many students complaint that they are learned nothing but most of their time spent to complete their assignment back-to-back. Another issue is limited internet access and poor internet coverage especially in rural areas.

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## Participation in IPCME 2020 – Virtual Conference

One of our members was participated and gave a oral presentation (virtual) in the 2nd International Postgraduate Conference on Mechanical Engineering (IPCME) from 19 to 20 January 2021. The conference was organized by Universiti Malaysia Pahang. His paper entitle Design of a fixture for single incremental forming (SPIF) process based on design for assembly (DFA) methods. This paper is part of his PhD work that aim on evaluation of springback of friction stir welded blank after going thru SPIF. In the paper, a fixture was design and fabricated. The best design was considered based on the DFA approach.



He gained a lot of experience during the oral presentation even though virtual oral presentation. He received valuable comments about the works from the panel. All these comments can be used to improve his work in the future. Participation in the conference is a good opportunity for student to build self-confident in presenting your own works. It is a good platform as well to established networking.

## New Member

MFRL would like to welcome new member of the group. Amer Isyraqi is the latest student registered in November 2020. His is pursuing his PhD study under JPA Scholarship. The details as below.

<b>Name</b>	Amer Isyraqi bin Husain
<b>Research Title</b>	Potential of Non-Uniform Thickness Section fabricated Via Friction Stir Welding (FSW) Technology for Stronger and Lighter Part
<b>Main Supervisor</b>	Assoc. Prof. Ir. Dr. Ahmad Baharuddin Abdullah
<b>Start</b>	November 2020



He is currently a staff of ADTEC Kulim (Kedah) and under study leave for 3 years. He is the 3<sup>rd</sup> staff from ADTEC Kulim joined the MFRL after Nor Azam (2016-2020) and Muhammad Kamarul (2020 – date).

His project is on evaluation of friction stir welded blank upon various test including impact and cyclic loading. The work in mainly on experimental and requires to comply certain standard. Hopefully, outcomes of his study will contribute to the enhancement of the technology especially automotive related industries in Malaysia.

.... continue Preface

There are also issue lies on teaching quality of the lecturers, mostly lecturers that incapable in grasping the technology to conduct e-learning. Some other student worries on online test or examination, which will definitely much more difficult and even decision made many universities on the usage of E-proctoring to avoid cheating make the situation worse. These are the most complaint made by the student, but what about other stakeholder's opinion mainly lecturer?

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### 1.0 Introduction

Due to their huge difference in properties, joining dissimilar materials, particularly aluminum and steel has always been a problem. As the joining process of aluminum and steel is difficult when using conventional fusion welding, researchers and manufacturers turn to solid-state welding method such as friction stir welding (FSW) to create the aluminum and steel joint. Although FSW of dissimilar low melting temperature metals and alloys have already been established, FSW for high melting temperature materials such as steel and low melting temperature materials such as aluminium alloys are still very much in progress.

### 2.0 Literature Review

Previous research employed different techniques in joining aluminum and steel utilizing the developed FSW. Table 1 summarize techniques that were developed and improvements made.

**Table 1** FSW techniques of aluminum and steel joint from previous research

Reference	FSW of Aluminum and Steel		
	Problems in typical FSW	Solution Technique	Findings
(Bang et al., 2020)	Lack of plastic flow and excessive tool wear	TiG-assisted hybrid friction stir welding (HFSW) (Weld line preheated to improve the plastic flow and reduce the plunging force on the FSW tool)	HFSW with 20A TiG current produced perfect weld joint without internal or external defect
(Thomä et al., 2020)	Defects and lack of steel particle in stir zone deteriorate weld joint strength	Ultrasound enhanced friction stir welding (USE-FSW)	No weld defects at the stir zone More uniform interface Higher volume fraction of steel particles Increase in particle size
(Lyu et al., 2018)	Difficult to join materials with thicker cross sections and low fracture load	Double sided friction stir spot welding	Maximum fracture load 4.76 kN higher than single sided FSSW
(Fei et al., 2016)	Steels and aluminum alloys did not soften simultaneously	Laser assisted friction stir welding (LAFSW) (Strength and hardness of steel reduced by focusing high intensity laser beam in front of rotating tool to preheat the steel work piece)	Sound weld was produced as flow material is accelerated around the tool pin
(Ibrahim et al., 2018)	Nanopores and cracks on the surface	Friction stir diffusion cladding (FSDC) (Tool pin is plunged into the upper cladding material while barely penetrating the bottom material and then traversed along the cladding path until the entire surface is covered)	Defect free surfaces were achieved using FSDC at rotation speed 500 rpm and welding speed 50 mm/min
(Aval and Loureiro, 2019)	High heat input during conventional FSW	Reverse dual rotation friction stir welding (DR-FSW) (Dual rotation tool with lower shoulder rotation speed)	DR-FSW exhibits tensile strength superior to conventional FSW and reduce the amount of intermetallic compounds but does not prevent their formation
(Wang et al., 2019)	Thick IMC layer reduces joint tensile strength	Friction stir scribe welding (FSS) (Small offset cutting tool (scribe) at the tip of FSW tool pin)	FSS significantly reduced heat input and IMC layer thickness at Al/Fe interface
(Yasui et al., 2018)	Welding a 3D shape	Friction stir girth welding. (composed of 3-axis FSW system, a rotating jig for materials, and a support roller)	Friction stir welding successfully fabricated 3D shaped weld between AA6063 and S45C
(Chen et al., 2017)	Keyhole defect is left at the weld centre causing stress concentration and reduction of spot weld effective connection area	Keyhole refilled friction stir spot welding. (after FSSW process is done, the tool plunges into base materials again but with smaller depth and travel along circular path surrounding the keyhole)	Keyhole refilled FSSW can effectively refill the original keyhole by aluminum and increases joint shear force by 56.33% compared to conventional FSSW
(Derazkola et al., 2020)	Intermetallic compounds significantly decrease joint strength	Underwater friction stir welding (UFSW)	Low temperature USFW decreased void formation and IMC layer thickness

### 3.0 Conclusions

Aluminum and steel joints have attracted major interest from various areas due to its vast advantages and industrial applications. However, joining aluminum with steel provides a challenge due significant difference in thermo-mechanical properties between both materials as well as aluminum lack of weldability tolerance. Friction stir welding provides a reliable alternative to conventional welding methods in joining dissimilar materials like aluminum and steel. Proper selection of friction stir welding parameters is essential to produce welded blanks with good mechanical properties and free from defects.

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