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Recent Publications

Book- Ahmad
Baharuddin Abdullah
and Ahmad Razlan Yusof,
*Glosari Bergambar
Tempaan Logam*,
Penerbit UMP, In Press.

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 teaching and learning (T&L) still become the main issue to highlighted. Everybody aware that, for most of the undergraduate students in most of the universities in the country, all face to face lectures are replacing with online teaching, synchronous or asynchronous. There are pros and cons for both and student manipulation in terms attendance is still the main issue. For asynchronous methods, the recorded lectures may help students who have internet problem. There is still a concern on what will happen to our generation if this issues prolong and online teaching may become a nightmare to those who are lacking and have issues especially internet facilities or in other words, a digital gap. It's become a national news when one of the students in East Malaysia, who have to stay on a tree in order to get good internet access to sit for the examination. There are many unreported cases happen in the country actually. It is admin that, this situation (changing from face to face to a full online teaching) happens too fast and most of us not ready. A parent not even imagine themselves to teach their kids a lesson or assisting them in their homework. Even parents more excited in submitting the works via group created. A teacher even ready the material for an online classes and even not equip with adequate facilities and knowledge to run an online class. An administrator not even think that the available facilities cannot cope with the demand for online class and assessment to avoid lagging and buffering and more seriously during examination. The government not even expected this situation will prolong and affected so many people. Note that, online T&L is the future method in education. Therefore, no choice, the government need to find the way to solve this issue in providing fair education for all.

Congratulation

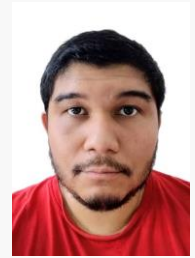
On the 18th June 2020, one of our member Adha Fahmi bin Pauzi has successfully passed his Master viva defense. Due to Covid19 pandemic, the viva was conducted fully online using WebEx. The title of his thesis is "Experimental evaluation of aluminum alloy tailor welded blanks fabricated using friction stir welding (FSW) process". Congratulation to him for this achievement.



New Member

MFRL Bulletin would like to welcome new member, who joined the group recently. Mr. Muhammad Zulkhairi Rizlan. He is a self-sponsor student and in the process of finding for any fund to sponsor his study. The details are as below;

Name	Muhammad Zulkhairi Rizlan
Research Title	Optimization of Friction Stir Welding Parameter between Aluminum and Mild Steel.
Main Supervisor	Associate Professor Ir. Dr. Ahmad Baharuddin Bin Abdullah
Start	July 2020



(PhD)

Recently reducing vehicle weight become new requirement. This is due to fuel consumption and environmental concern. Friction stir welding (FSW) is one of the technique to produce Tailor Welded Blank purposely to reduce vehicle weight by combining different material and thickness. Most of the current works are on characterization of the welded blank. His project is on optimization of friction stir welding of aluminum and steel. Zulkhairi's work will focus on formability aspect of the welded blanks based on few evaluation criteria including springback pattern, forming limit diagram and drawability. His project is fully experimental and optimization will be performed using Taguchi Method and ANOVA.

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1.0 Introduction

Sheet metal forming is one of most popular process in manufacturing sector. Due to high flexibility in demands, industry nowadays more focus on producing low production quantities, design customization, low cost, complex geometries and the most importantly the quality (Reddy & Cao, 2008; Pathak, 2017)). One of the processes that can meet all these criteria is incremental sheet forming.

Incremental sheet forming can be divided into single point (SPIF) and two-point incremental forming (TWIF) (Nimbalkar & Nandedkar, 2013). One of the major advantages of SPIF is the process is die less, more flexible and less tooling cost. Basically, in the SPIF, a forming tool movement controlled by a CNC machine or robot arm, push downward incrementally the clamped sheet metal and the process is continue until final profile obtained (Koh et al., 2016). This process involves concentration force resulting from spinning of forming tool act on the sheet metal and friction forces occurred between the contacted surfaces produced the heat, thus, it facilitates forming of the required shape. Figure 1 show the schematic diagram of the mechanism and basic parts involve in SPIF, which is further describe afterwards.

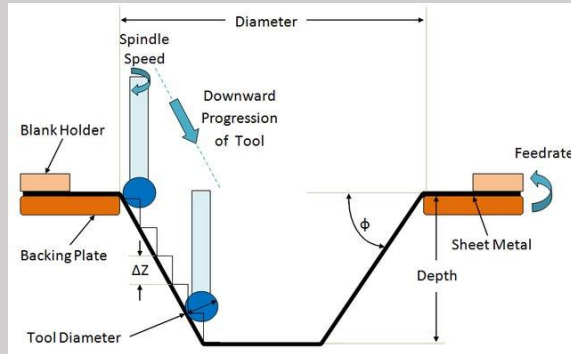


Fig. 1 Working principle of SPIF (Beravala et al., 2015)

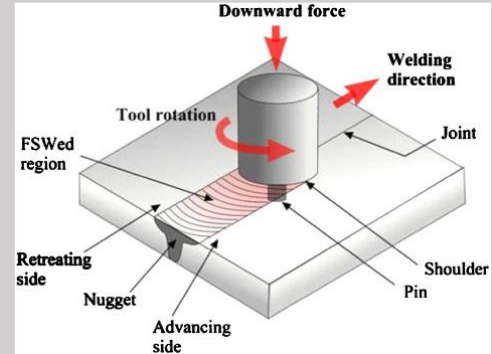


Fig 2. Basic principle of FSW process (Zhang et al., 2012)

In the SPIF process, several parts are involved during the process setup. Clamping fixture or blank holder is used to clamp and hold the sheet metal during the progression of the incremental process. While, the forming tool with hemispherical tip is designed and attached to CNC machine or robotic arm. CAD/CAM program is used to create 3D design and trajectory before transfer to CNC/Robotic code. In most cases, lubricant is need to be used to reduce the resulting heat effect due to contact between spinning of forming tool and sheet metal and to prevent forming tool wear and improve surface finish of sheet metal. Based on the literatures, several parameters are important to be considers such as toolpath/trajectory, tool diameter, tool rotation, sheet metal (types and thickness), forming speed (feed rate), step size and lubrication. Consistence with awareness on utilization of a blank that is structurally strong but lighter in weight through combination of dissimilar material with different thickness (Ebrahimzadeh et al., 2018).. This can be achieved using Friction Stir Welding (FSW), aim is to produce new material with different characteristics and forming behavior compared to parent material.

2.0 Friction Stir Welding (FSW)

FSW is a one of the solid state welding techniques, which joining two pieces of sheet metal without melting them. Heat sources is resulted from friction between the rotating tool and the sheet metal (Maji et al., 2019). FSW consists of several elements in this process such clamping system, tool and machine that can rotate the tool as shown in Fig. 2. In order to achieve a good result, certain parameters need to be controlled including tool rotation speed, feed rate, tool angle and plunge depth. Resulted joint most likely behave differently due to heat such as created soft zone within the welded zone (Sevvel & Venu, 2014).

3.0 Springback

In producing a product that consist complex geometry, accuracy in dimension and tolerance is critical. Especially in sheet metal process, the main issue is springback. Phenomena of springback will contribute defect in dimensional accuracy on the final part. In SPIF process, springback occurred after forming tool through the toolpath, due to plastic-elastic characteristic of sheet metal, the formed sheet metal tries to recover back to original shape and known as local springback. Effect of springback is very significant when the sheet metal is unclamp and remove from holding fixture (Edwards et al., 2017). Because of the springback issues depends on certain factors like degree of wall angle, tool speed, geometric parameters, material thickness and others factor, it's very difficult to determine accurately (Neveux et al., 2016). Previous investigations depicted that the effect of the springback on the final product is significant and need to be considered. Effect of springback is very small and effected a little change from the whole product dimension. The relationship is, increase the wall angle, the smaller springback will be occurred. (Wei et al., 2019). An increase in step size results in reduced springback and heating of the specimen subsequent to forming while remaining fixed is a viable method of reducing springback (Zhang et al., 2016). The springback effect found at the thicker material compared with low springback effect on thinnest material (Neveux et al., 2016). This finding is relevant to the blanks produced from the FSW.

4.0 Research Direction

The main aim of the review is to identify the gap for a new research mainly on the issue of springback pattern on similar and dissimilar material and thickness blanks produced using Friction Stir Welding in the Single-Point Incremental Sheet forming (SPIF) process. To date, investigation that related to the effect of springback on welded blanks of dissimilar material with different thickness still lacking. With some references and information from previous researchers, hopefully this research will contribute some useful information for the others researchers and guideline at the production floor.

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