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Recent Publications

Published

NM Yusop, AB Abdullah
2019 *IOP Conf. Ser.:
Mater. Sci. Eng.* 670 (1),
012079

AN Saquib, HMT
Khaleed, IA Badruddin, A
Algahtani, MF Addas, AB
Abdullah, AG Athani, S
Kamangar, TM Khan
2019 *Mathematics* 7 (11),
1026

Active Grant

RU Grant

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

PRGS Grant

Title: Prototyping of
hybrid machine., 2019-
2021.



Preface



Happy new year to our audient. New year comes with new challenges, new experience and off course new KPI. For year 2019, the group had achieved most of the set target. For year 2020, as usual research and publication become the main focus and more emphasis will put on these two. Research and publication mostly rely on the student, undergraduate as well post-graduate. Alhamdulillah, few new students will come this year and hoping that they may contribute to the group KPI. The group also will put more effort on industrial collaboration, for consultation project as well as research project in terms of research contract or joint publication. Few new industrial partners will be identified and visited this year for any potential collaboration. While relationship with the existing industries partnership will be further strengthen.

Congratulation Azam

January 13th, 2020 became memorable day to one of our members, Noor Azam Jaafar. This is because on that day, he passed his PhD viva-voce with minor correction, Alhamdulillah. As coordinator of the Metal Forming Research Lab, I am very proud of him and it's a good opening for us in 2020. Hope this will motivate others to complete their study as soon as possible. Congratulation to him.



Participation in 2019 Conference

Puan Zarirah, our Research Officer (RO) had presented a review paper on 3D metal additive manufacturing via welding technique at IGNITE2019. IGNITE is a yearly joint conference between Universiti Sains Malaysia (USM) and Toyohashi University of Technology (TUT) and this year is the 5th time.



In other conference, Mr Mohd Fadzil Jamaludin presented a paper from Metal Forming Research Lab (MFRL), USM entitled "Effect of laser power and speed on the joining strengths of dissimilar AA5052-H32 and AA6061-T6 aluminium alloys welded using low power fibre laser" at the 1st International Conference in Advances in Manufacturing and Laser Processing Technology (AMLPT 2019).



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3D METAL PRINTING VIA WELDING – POTENTIAL AREAS FOR EXPLORATION

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3D metal printing via welding gets a lot of attention recently. Its offer many advantages compared to other 3D printing technology including reduction in lead time, cost saving via reduced wastage and show great improvement in design approach ¹. 3D printing of metal parts utilizing the welding operation is a near net manufacturing and requires additional process before finish or net part can be produced. Typically machining is the preferred method for its flexibility in gaining various profile and shapes, that capable to be performed on any machining facilities. Unfortunately machining requires longer time and it will not improve the strength of fabricated part. Another alternative is forging process, as the process faster and capable to strengthen the part integrity. This article will list few potential applications of 3D welding in component manufacturing.

1.1 Part Repair

Part damage become most critical issue to the industry, either to repair or to replace the broken part. Part replacement is the easiest but burden due to additional cost needed. Part repair is not preferred due to reliability of the part after repair. Nowadays, 3D printing can solve this problem via 3D welding. As shown in Figure 1, the broken teeth of a gear can be rebuilt using this technology. The profile of the teeth finally obtained via machining. This approach will shorten lead time and at the same time, cost saving.



Figure 1: Steps involve in gear repair ²

1.2 Reduce Waste

Typically forging involves multi-stages process. This will increase the tooling cost, which usually contribute the highest to the total cost. Cut or eliminate some of the stages may save a lot and this can be achieved via 3D printing technology. As shown in Figure 2, a blade for AUV application generally requires four stages and it produced large amount of waste. By introducing additive manufacturing via welding, the blanking stage can be eliminated, while the scrap after shearing also minimum.

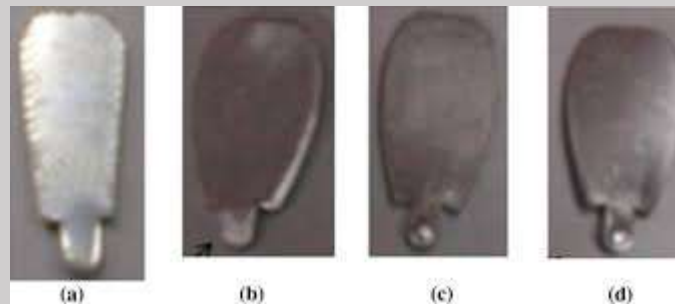


Figure 2: Current stages in producing AUV blade, (a) blanking, (b) shearing, (c) embossing and (d) twisting ³

1.3 Complex Part Fabrication

Parts with complex profile usually add cost to the manufacturing, most likely on the tooling cost. Via 3D welding and additional machining, these types of parts can be produced at lower cost. As illustrated in Figure 3, a twisted part can easily be produced utilizing metal arc welding operation.



Figure 3: 3D welding utilizing gas-metal arc welding ⁴

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