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**Recent Publications**

1. AB Abdullah et al., Diff. Found. Maters App. 35, 15-23, 2024.
2. SSM Noor Ariffin, AB Abdullah, et al., Proceed IMechE, Part J: J Eng Tri., 16(1), In Press, 2024.

**Active Grants**

**FRGS Grant**

Title: Investigation on the effect of hot forging on the deformation behavior and microstructural response of Wire Arc Additive Manufacturing (WAAM) of high strength low alloy (HSLA) steel components, 2022-2025



**Preface**

For the last few weeks, the Metal Forming Research Laboratory had received extremely high students flow in completing their projects.

- a) Final year projects – involving 3 students
- b) Tooling design – involving 25 students
- c) OEL project for lab course – involving 3 students

As usual, tooling design will dominate the space. Luckily this session only involved 5 groups. This time, students are required to design, fabricate and test a compound die to produce an ear bracket.

During the project they will learn by doing. All theories gained from the courses attended will be utilized in the project. From CAD modeling, tolerance, part assembly, hands-on experience via fabrication, planning, project management, costing and evaluation.

The course also focus on sustainability issues. The student must ensure, they are using the least material, machined using the simplest methods and shortest time. They must ensure less material is wasted and complete the task in the most efficient way. Even though it is challenging but, the students enjoy the process.

**Welcome to New Interns**

Recently MFRL received two internship students from Politeknik Sultan Muazam Shah (POLIMAS) and International Islamic University Malaysia (IIUM). Hopefully they gain as much experience and knowledge during the internship.



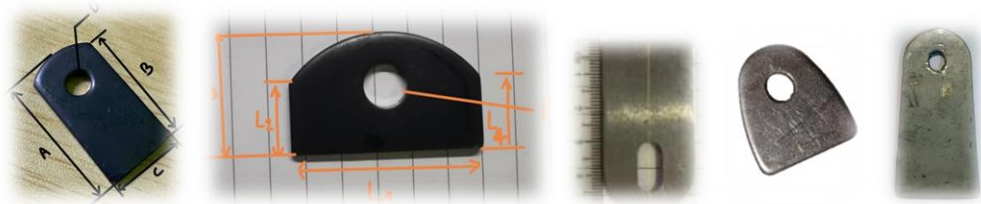
Name: Faris  
Duration: 10 weeks  
Organization: IIUM



Name: Amirun  
Duration: 20 weeks  
Organization: POLIMAS

Both will be assigned a suitable job scope according to the level of study. Hopefully, they may gain as much as possible knowledge and experience during the internship. To date 10 students from various organizations has attended the internship at the lab.

**Photos about the Tooling Design Project**



Product to be produced



**Contact Details**

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## Defect Assessment on Tooling Design

By Ahmad Baharuddin Abdullah

### Tooling Design - Misalignment Issue

In this article, I would like to share a few examples of the misalignment issue observed during the course. In the course, students are required to design, fabricate and test their tooling. As mentioned in the previous writing, puncher-die misalignment is one the major issues faced by the students during their trial. In our study, misalignment can be divided into four types, which can be found in our previous research publication;

Reference 1: (<https://link.springer.com/article/10.1007/s00170-021-06595-5>) and

Reference 2: (<https://www.inderscienceonline.com/doi/abs/10.1504/IJMPT.2017.080565>).

One of it is the axially unbalanced puncher or die. For this project, it's difficult to ensure alignment without any accessories like guide pin or dowel. As a result, these images illustrated the consequences.

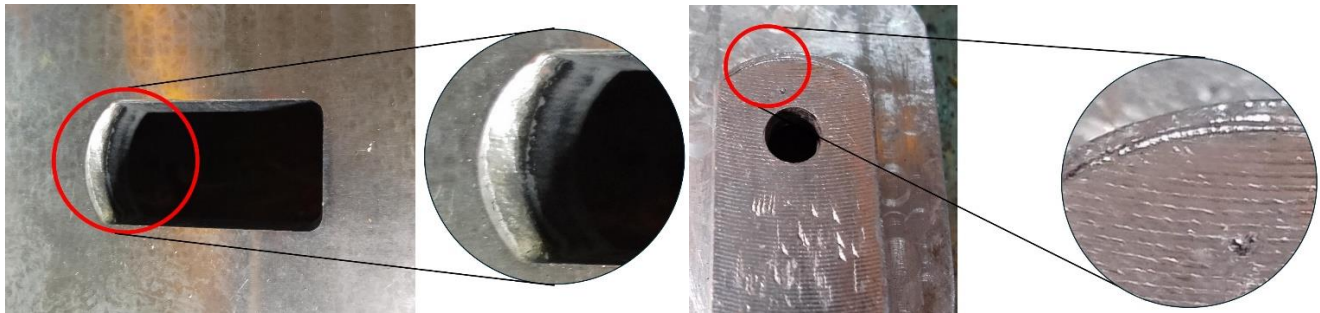


Figure 1: Die/puncher worn issues

In both cases, upper section of the part cannot be blanked successfully due die/puncher severe worn.

### Observation

During trial, we can know either the tooling working as intended or not. Good design and nice 3D modeling not necessarily free any issued during the fabrication. Precise and good tooling machining and assembly still cannot confirm the tooling will work correctly during the trial. Therefore, progressive improvement thru out the process is crucial. In this article, we will discuss one of the problems that may occur during the trial, i.e. the product not well cut even though puncher-die mark can be seen. There may cause of the raised issue. Below are figures illustrated the said issue.



Figure 2: Observation and suspected causes.

There are many solutions, however before that, causes of the defect need to be understood first. In the next writing, a few solutions for some of the issues will be addressed.