

Evaluation of Axial Flow Impeller Fabrication Process by Wire Arc Additive Manufacturing and Machining

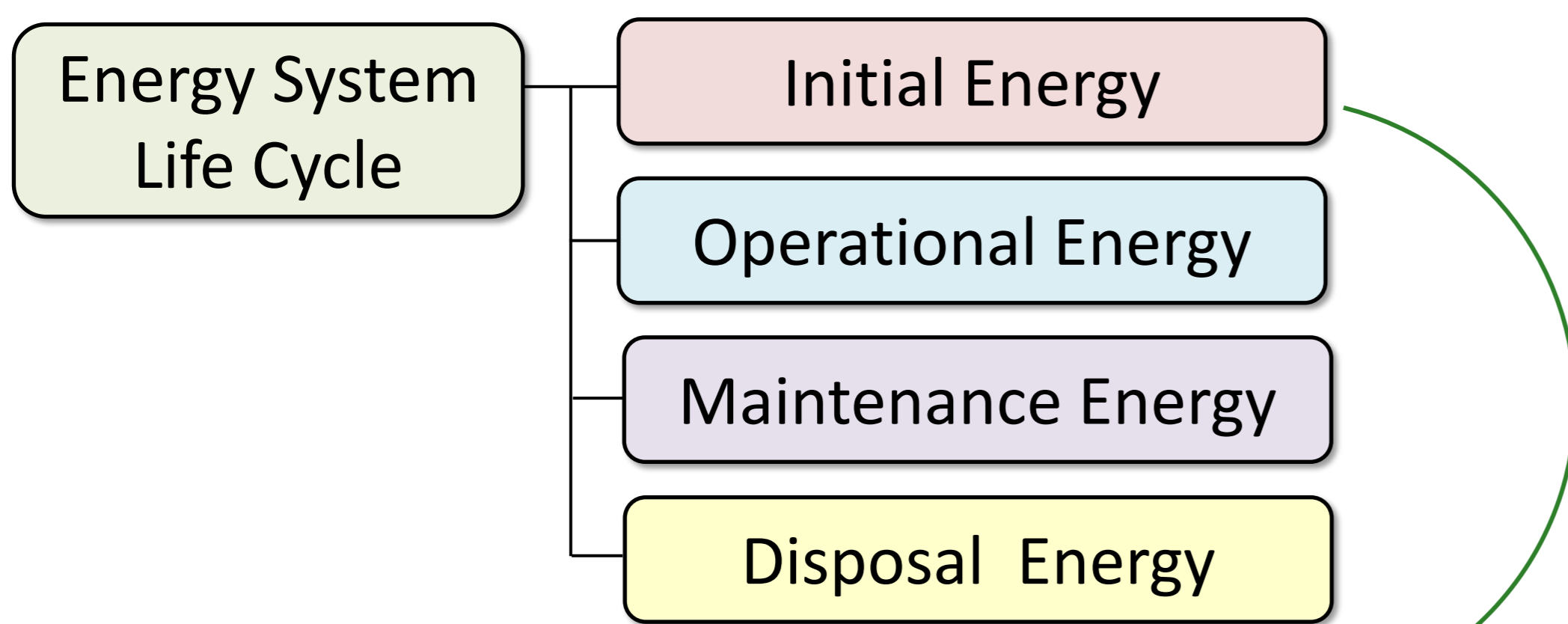
Shinichiro EJIRI, PMP, Nikkiso Co., Ltd., Tokyo, Japan

shinichiro.ejiri@nikkiso.co.jp

INTRODUCTION & AIM

How to design a sustainable society?

One solution is to build an eco-friendly energy lifecycle.



Research Target : Turbomachinery fabrication

Is tradition fabrication process most eco-friendly?

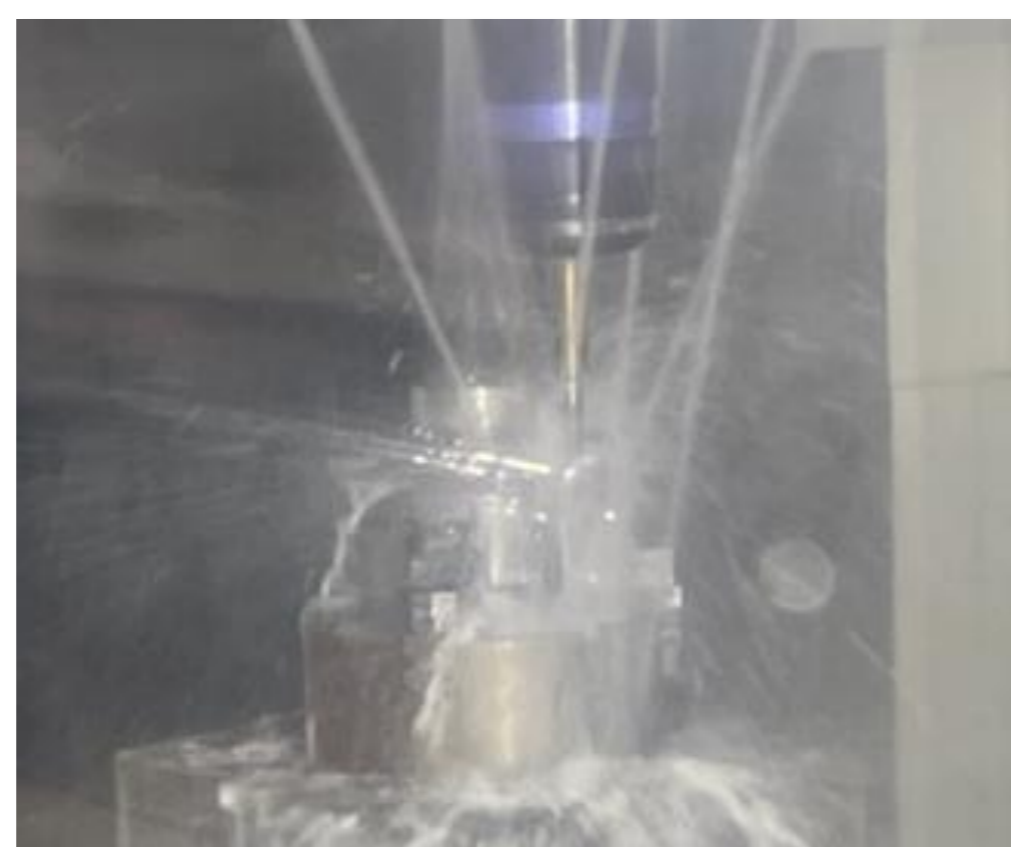
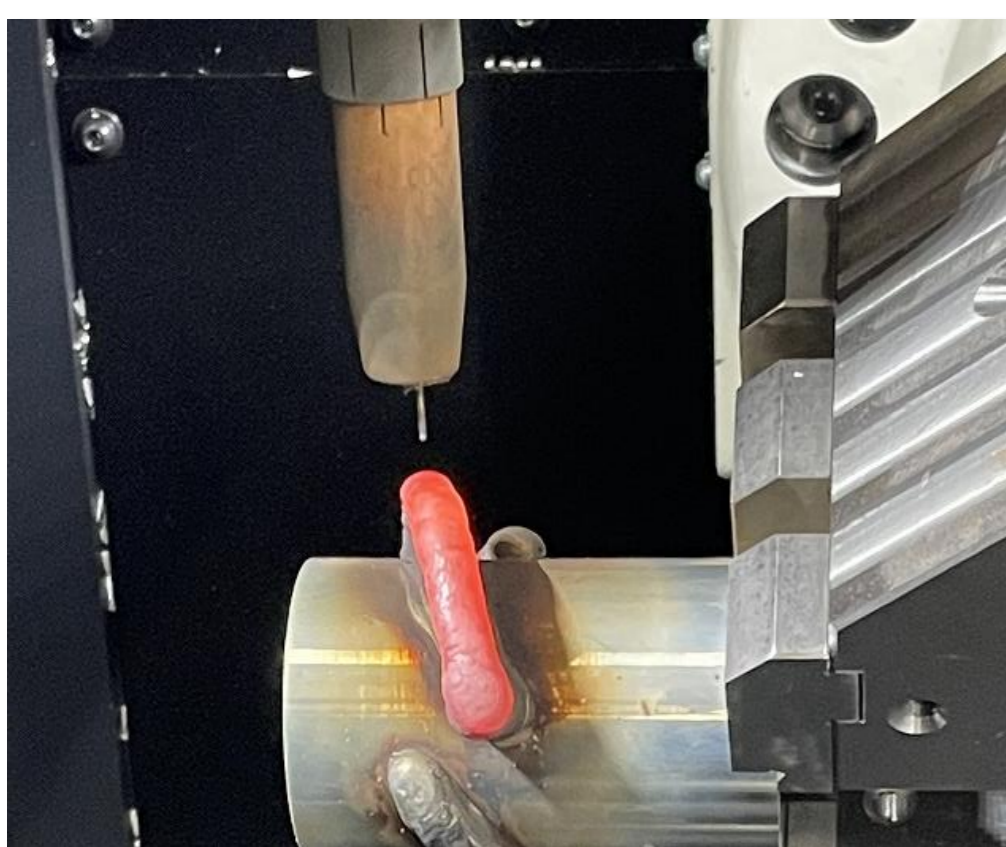
The answer is case by case.

However, applying additive manufacturing to parts of the fabrication process may be one solution to build an even more eco-friendly system.

Evaluate to fabrication process include Wire Arc Additive manufacturing (WAAM) for an impeller, a key component of turbomachinery.

METHOD

Fabrication Process^[1]

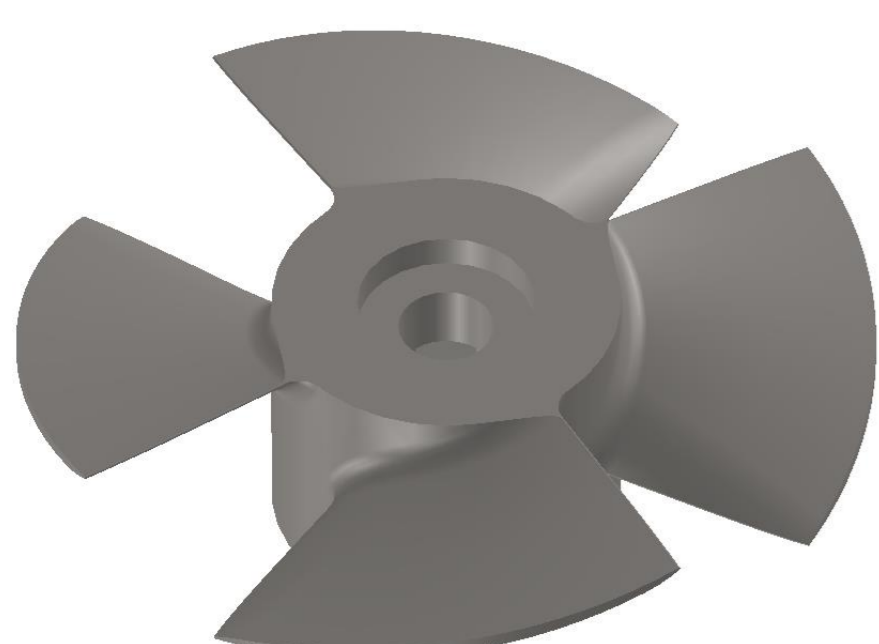


WAAM



Machining

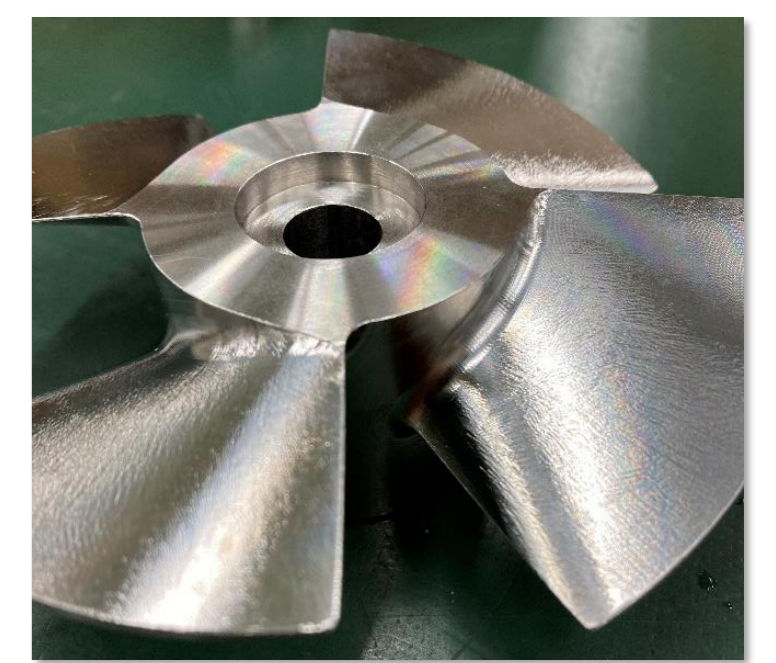
Test Model: Axial Flow Impeller



Number of blades		4
Tip diameter	[mm]	125.3
Hub diameter	[mm]	51
Hub length	[mm]	40
Material		SST

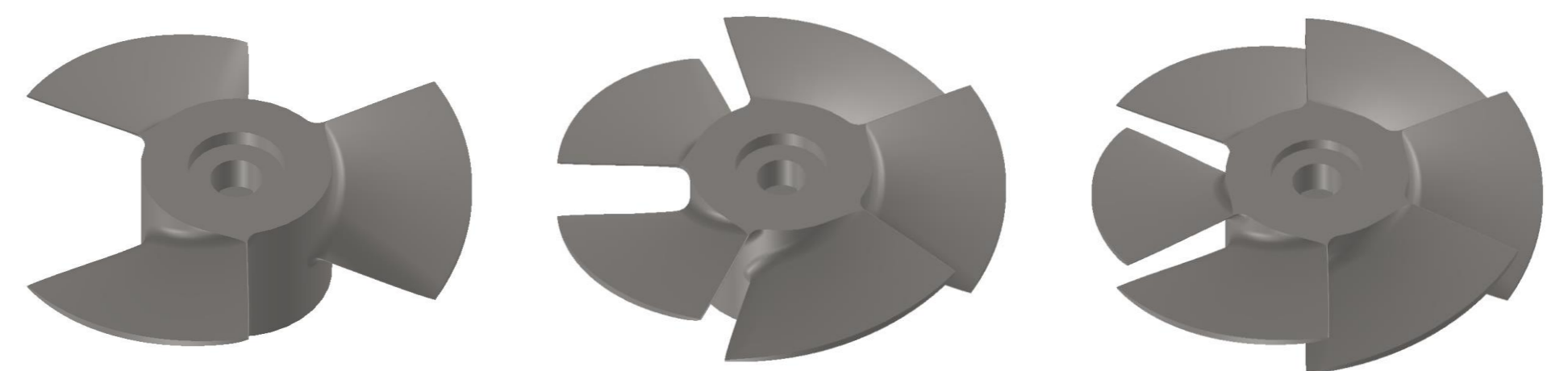
RESULTS & DISCUSSION

Fabrication Result

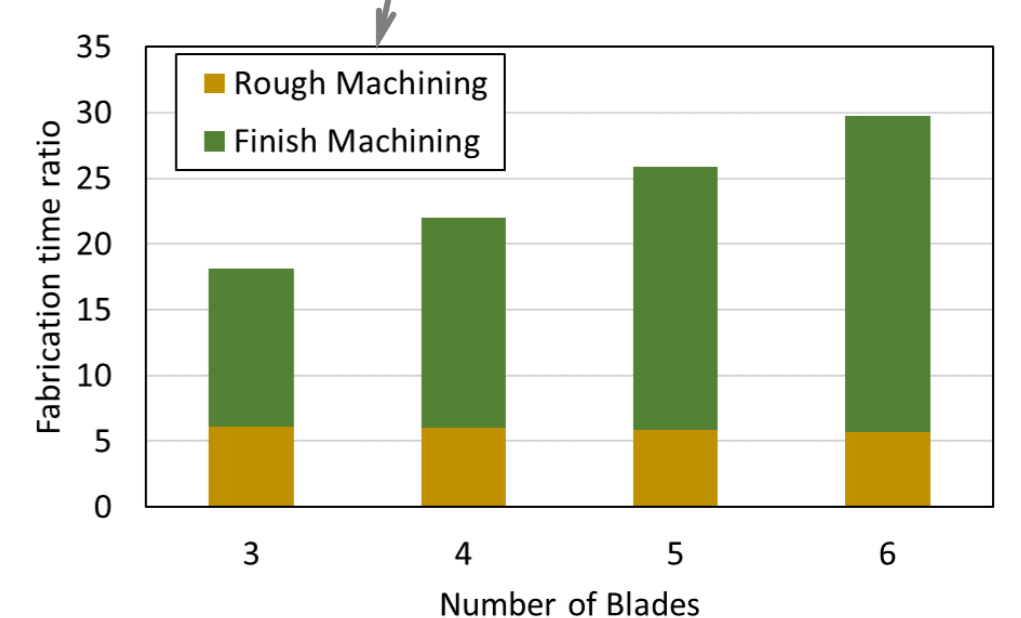
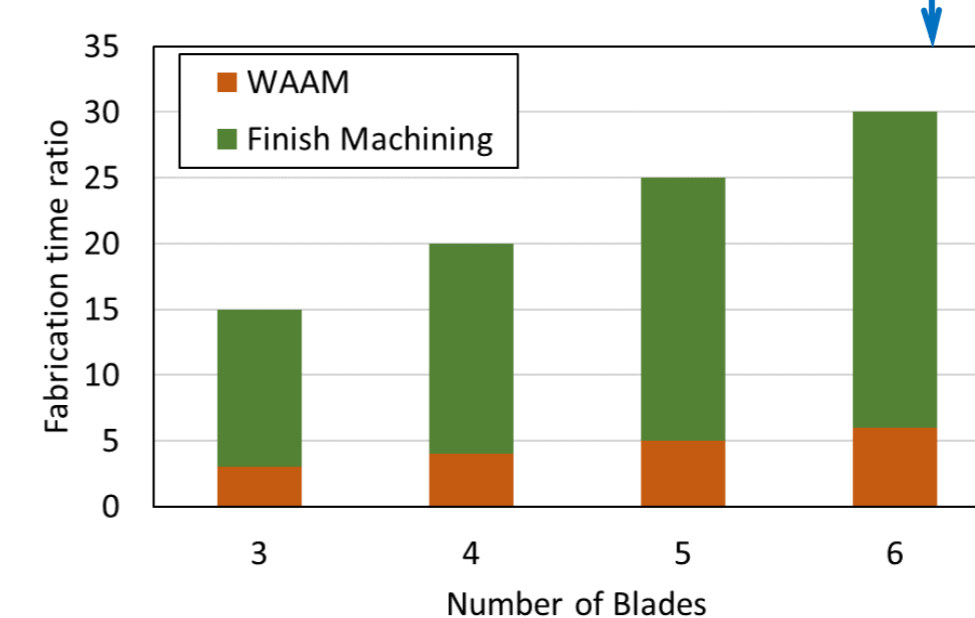
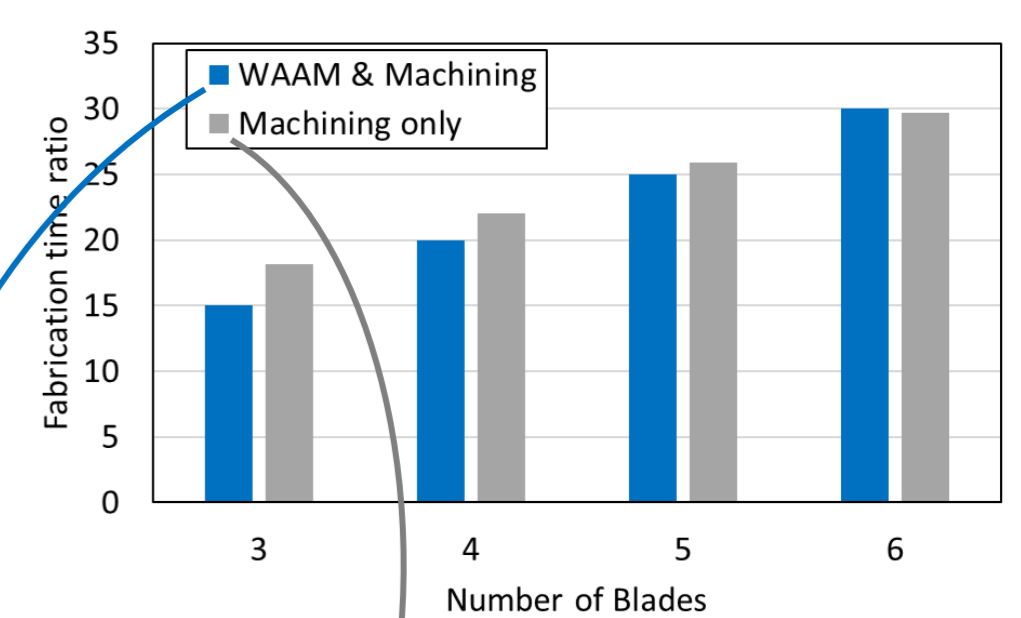
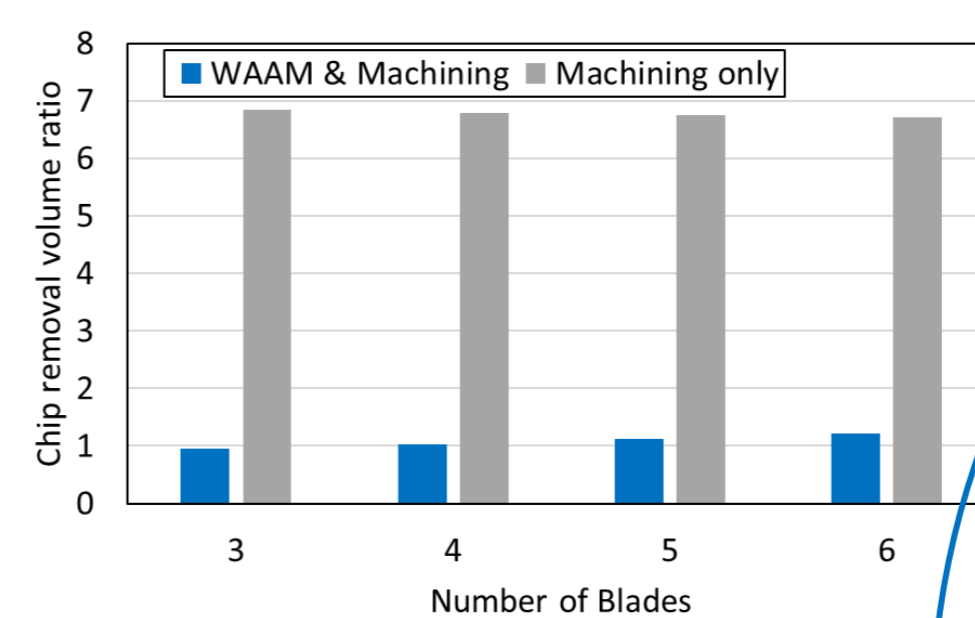


Evaluation of Fabrication

Additional design axial flow impeller Change number of blades



Comparison between Include WAAM & Tradition Method
Fabrication process include WAAM has an advantage with chip removal volume, but in terms of fabrication time, it depends on impeller shape.



NOTE: Tradition Method is machining from round bar.

CONCLUSION

Fabrication process include WAAM are more eco-friendly systems than traditional fabrication process.

FUTURE WORK

To further clarify the industrial advantages of WAAM, a study will be conducted on the fabrication process for difficult-to-machine materials.

REFERENCES

[1] S. Ejiri *International Journal of Fluid Machinery and Systems*, 2023, 16-2, pp.184-191.