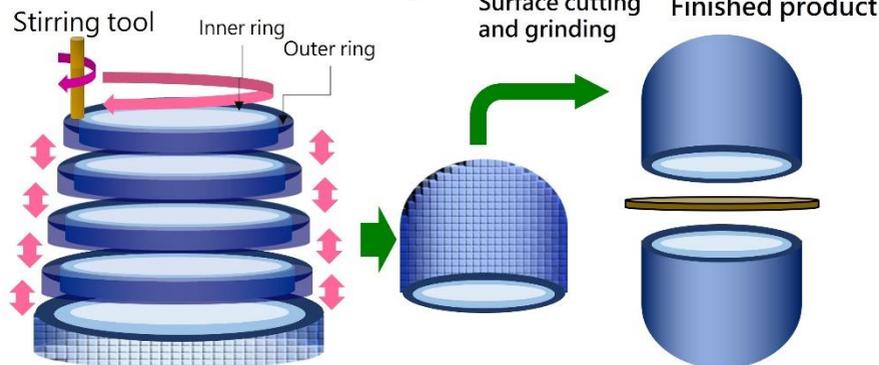


## Introduction

- In response to the development of high-tech industries, many products with simple shapes and single materials can no longer meet the structural development needs of engineering design. When the metal process requires 3D surface modeling and the combination of dissimilar materials, which requires expensive metal lamination equipment or is cumbersome, it seems that only the processing process can solve the problems such as heat effect and poor structure.
- 4D (3D+Dissimilar) Printed Solid State Process is a process in which the product is formed into multiple heterogeneous workpieces through pre-analysis and design, and then in the form of solid-state process, the process of dissimilar material bonding and friction stir lamination manufacturing. The products formed by the combination of different metal materials can complement the shortcomings of a single material, which not only reduces the thermal effect on the metal material but also maintains the mechanical strength of the material.
- This technology provides an innovative process for low-cost 3D-shaped metal products that can meet various characteristics at the same time. Compared with CNC machining, it can reduce the processing material by 40%. Compared with expensive 3D electron beams or laser lamination equipment, it can reduce the cost by 80% or more.

### Friction stir additive manufacturing



## Awards/Patents

- Stir Welding Components and Inhibit Stir Welding Processing Method (Patent No. I723841), a total of 6 Patents in Stir Welding Processing Methods issued in R.O.C and the P.R.O.C.
- R&D 100 (2022 Global Top 100 Innovation Award )

## Industrial Applications/ Case Studies

Industrial services are based on the fuel tanks of space satellites and the reflectors of 5G/6G antenna measurement systems, assisting domestic industries in moving towards advanced fields such as 5G and satellites, replacing imports, and entering the international supply chain. ◦



4D (3D+Dissimilar) Printed Solid State Process  
MIRDC product manufacturing specifications:  
Length 1.5M\*Width 1.5M\*Height 0.5M

Dissimilar material bonding satellite fuel tank