

HiDepAM – Hybrid laser MIG to increase the deposition rate of WAAM

Aim:

Investigate how laser can be used to stabilize MIG WAAM (Wire plus Arc Additive Manufacturing) of Ti-6AI-4V and increase its deposition rate.

Goals:

- Use a focused low power fibre laser to stabilize MIG (Metal Inert Gas) welding deposition of Ti-6Al-4Al.
- Use a defocused high power laser to stabilize and modify the weld bead shape of MIG Ti-6AI-4V deposition
- Increase the deposition rate of Ti-6AI-4V when compared PTA (Plasma

Challenges:

- Arc and weld bead wandering
- Spatter formation.
- High aspect ratio weld bead (height/width) loss of resolution

Transferred Arc) WAAM deposition.

WAAM PTA wall



WAAM MIG wall



3.5

20

15

10

LASER POWER DENSITY (KW/CM²)

Low powered laser:

Laser was used in its focal plane and focused under the welding wire:



High powered laser:

Laser was defocused and was also placed under the welding wire:



Low power laser stabilized the weld bead. The weld bead shape is not suitable for WAAM process:

- High contact angle
- High reinforcement (lower resolution).

Non 5 mm _aser stabilized stabilized wall wall

Conclusions:

hybrid

- Hybrid laser CMT can stabilize the arc wandering phenomenon characteristic of the Ti MIG deposition.
- The hybrid process can be applied to a single bead and also multiple bead depositions (WAAM part building).
- Hybrid laser CMT can increase the deposition rate of Ti-6AI-4V up to 2 kg/h and change the weld bead shape obtaining a weld bead with a lower contact angle and aspect ratio.

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