Literature Review Summary – Key Findings for Industry

Laser Cutting of Fibre Reinforced Polymers

TWI Core Research Programme

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Industrial need

Laser processing has significant potential for cutting of fibre reinforced polymers (FRPs), given that it is a non-contact, precise, low heat-input, high-productivity and highly automated process. Currently, however, laser machining of FRPs is not commonly used by industry. This report provides a review of the recent R&D of the processes for laser cutting of FRPs, highlighting the most successful procedures and identifying research needs.

Key Findings

- Technologies currently employed in cutting composites include milling, abrasive water-jet cutting, electrical discharge machining, ultrasound machining and laser cutting.
- Compared to other methods, laser cutting provides a narrow kerf, a high production rate and automation capability, though can give thermal damage at the cut edge and produces fume and dust.
- Laser cutting of carbon fibre composites provides greater challenges than glass or aramid fibres.
- Many studies have investigated methods of reducing the thermal damage or heat affected zone (HAZ), whilst retaining a high production rate. To date the most promising results, in terms of cut edge quality, have been seen using high power lasers, with high speed multiple pass scanning methods.
- By comparison, single-pass, gas-assisted laser cutting results in a wider HAZ, but is better suited to long cuts and large parts than a multiple-pass technique.
- Short pulse (picosecond and nanosecond) and UV laser systems provide very good cut edge quality, but slow processing rates.

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