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Literature Review Summary – Key Findings for Industry

Laser Cutting of Fibre Reinforced Polymers

TWI Core Research Programme

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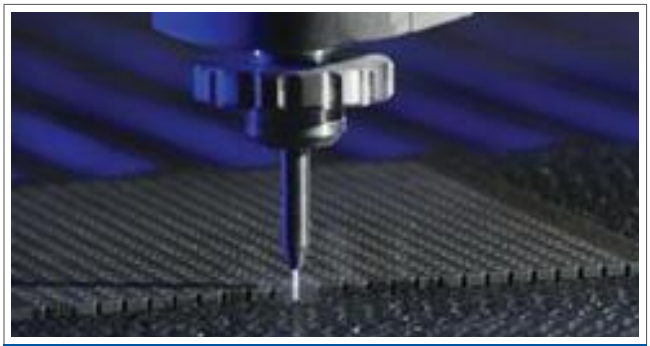
Industrial need

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.

Lamborghini's 'Sesto Elemento' uses carbon fibre reinforced plastic (CFRP) panels.



Laser cutting and drilling of CFRP.

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