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MODELING OF LIGHT SCATTERING THROUGH THERMOPLASTIC COMPOSITE PART DURING LASER WELDING PROCESS

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The increasing amount of thermoplastic composite parts is observed in different areas such as aerospace, marine or automotive industries due to their light weight and mechanical performances. In order to achieve the complex shape of the part different joining techniques are applied. Among the available possibilities for composite assembly, the Transmission Laser Welding (TLW) offers coupling of materials in an accurate, fast and localized method. However, the presence of fiber reinforcement decreased the propagation of laser beam energy due to their refraction properties. Laser beam scattering through the composite part needs to be modelled [1, 2]. The laser beam propagation through the microstructure of weaved composite part is considered in the present work. Change in local energy divergence is evaluated and observed numerically using ray tracing method.

Obtained results are compared with experimental data in macroscopic level. Good matching between the results is observed. The influence of the fiber reinforcement geometry and properties is detected and examined on the propagation of laser beam energy.

Presented outputs show the necessity to take into account the influence of fibers refraction properties and their type of weaving before the composite assemblage in order to optimize welding process and to obtain material joining with a high quality.

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