Title: Improving Energy Efficiency in Friction Assisted Joining of metals and polymers

Authors: Francesco Lambiase, Alfonso Paoletti, Valentino Grossi, Silvio Genna

PII: S0924-0136(17)30353-9
DOI: http://dx.doi.org/doi:10.1016/j.jmatprotec.2017.08.005
Reference: PROTEC 15340

To appear in: *Journal of Materials Processing Technology*

Received date: 28-5-2017
Revised date: 29-7-2017
Accepted date: 3-8-2017

Please cite this article as: Lambiase, Francesco, Paoletti, Alfonso, Grossi, Valentino, Genna, Silvio, Improving Energy Efficiency in Friction Assisted Joining of metals and polymers.Journal of Materials Processing Technology http://dx.doi.org/10.1016/j.jmatprotec.2017.08.005

Improving Energy Efficiency in Friction Assisted Joining of metals and polymers

Francesco Lambiase[12], Alfonso Paoletti[12], Valentino Grossi[1] and Silvio Genna[23]

[1] Department of Industrial and Information Engineering and Economics, University of L'Aquila, via G. Gronchi 18, Zona Industriale di Pile, 67100 (AQ), Italy

[2] CIRTIBS Research Centre, University of Naples Federico II, P. le Tecchio 80, 80125 Naples (NA), Italy
[3] Department of Enterprise Engineering, University of Rome Tor Vergata, Via del Politecnico 1, 00133 Rome, Italy

[*] Corresponding author:

F. Lambiase

francesco.lambiase@univaq.it

Monteluco di Roio, 67040 (AQ), Italy

Tel. N.: (+39) 0862 434343

Fax N.: (+39) 0862 434303

Abstract

The influence of the clamping frame material in Friction Assisted Joining of polymer-metal sheets is investigated. An experimental campaign was conducted by varying the clamping frame material (steel and wood) and the heating time. The process was applied to join Al-Mg aluminum alloy and Polyvinyl Chloride sheets. Thermal analysis and energy measurements were conducted during the process. The morphology, fracture surface and strength of the joints were analyzed. The clamping frame made of wood enabled different advantages to be achieved, including reduction of the energy loss towards the clamping frame, faster heating of the materials being joined, and more uniform distribution of the temperature over the joining area, which resulted in increased mechanical strength. Under optimal conditions the joint efficiency approached 97%.

Keywords: Friction Assisted joining; direct-joining; joining; process efficiency; laser texturing; Thermal analysis; Energy analysis;