Stiffness characteristics identification in the case of industrial robot machining for wind blade composite material

C. Bisu[1,*], D. Anania[2], M. Zapciu[3] , C. Opran[4]
[1]*National University of Science and Technology POLITEHNICA of Bucarest, Department of Robotics and Manufacturing Systems, 313 Splaiul Independentei, 060042 Bucharest, Romania, claudiu.bisu@upb.ro.*
[2]*National University of Science and Technology POLITEHNICA of Bucarest, Department of Robotics and Manufacturing Systems, 313 Splaiul Independentei, 060042 Bucharest, Romania, anania.dorel@upb.ro.*
[3]*National University of Science and Technology POLITEHNICA of Bucarest, Department of Robotics and Manufacturing Systems, 313 Splaiul Independentei, 060042 Bucharest, Romania, miron.zapciu@upb.ro.*
[4]*National University of Science and Technology POLITEHNICA of Bucarest, Manufacturing Engineering Department, 313 Splaiul Independentei, 060042 Bucharest, Romania, constantin.opran@ltpc.pub.ro*

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Abstract.
The global production of wind energy has increased significantly representing a basic component in the energy industry and the blade materials need an intelligent recycling and a sustainable transformation. The blades manufacturing using plastic materials reinforced with fiberglass (GFRP) are found in many applications, considering their superior properties. For this purpose, the transformation of blade after the end of operation into furniture represents a sustainable solution in the current context of renewable recycling and reducing pollution. It is known that robots have a limitation of dimensional precision but the use in the proposed application respect the conditions in terms of precision and surface quality. Even in these conditions the dynamic behavior and the identification of the stability characteristics represent an important objective in view of an effective machinability with minimum costs.
In this work, an investigation of the stiffness characteristics of the robot is proposed to obtain the positions with the good level of stiffness for contour milling of a prismatic part. In a first stage, the authors are interested in identifying a flexible solution, with a low level of vibrations, taking into account the system of: robot-tool (RT)/part-device holder (PDH)/cutting process (CP)
For this purpose, an experimental measurement protocol is proposed based on the determination of the natural frequencies in the case of a Mitsubishi RV-E2 robot followed by testing under contour milling conditions. The results reflect the importance of determining the dynamic characteristics in different positions of the robot in the context of eliminating the negative effects of robot operation and maintenance.