

# Step-NC Compliant Approach for Setup Planning Problem on Multiple Fixture Pallets

Stefano Borgia<sup>1,2</sup>, Andrea Matta<sup>1</sup>, Tullio Tolio<sup>3</sup>

<sup>1</sup> Dept. of Mechanical Engineering, Politecnico di Milano,  
Via La Masa 1, 20156, Milano, Italy

[stefano.borgia@mecc.polimi.it](mailto:stefano.borgia@mecc.polimi.it), [andrea.matta@mecc.polimi.it](mailto:andrea.matta@mecc.polimi.it)  
<sup>2</sup> MUSP Laboratory (Machine Tools and Production Resources),  
Loc. Le Mose, 29100, Piacenza, Italy

<sup>3</sup> Institute of Industrial Automation and Technologies - ITIA,  
National Research Council of Italy – CNR,  
Via Bassini 15, 20133, Milano, Italy  
[tullio.tolio@itia.cnr.it](mailto:tullio.tolio@itia.cnr.it)

**Abstract.** Given the current market dynamics, production system design plays a fundamental role in companies success. These activities are highly critical as many economical and technological issues must be considered. System configuration is a broad problem that involves different topics concerning workpiece, fixture and machine. In this paper an approach for the resolution of the Setup Planning problem on machining centers based on a STEP-NC compliant data structure is presented. The aim of the approach is to shorten the time needed for the process planning activity, automating some time-consuming activities without losing solution accuracy. In the proposed approach a CAM software tool is used for setting geometric and technological data regarding the product. Using this structure a method for the solution of the setup planning problem based on kinematic analysis and mathematical programming is proposed. The proposed approach has been tested on real cases.

**Keywords:** Pallet Configuration, Production system configuration, Setup planning, STEP-NC.

## 1 Introduction

The market segment dealing with the production of mechanical components is affected by both manufacturing requirement complexity and environment turbulence. According to changes in product features, production systems need to be properly configured or reconfigured to efficiently tackle new production requirements. From the industrial standpoint, the system configuration problem is highly critical as many economical and technological issues must be considered. System design can be time consuming and expensive, since qualitative and quantitative aspects are analyzed. Therefore, there is the need of supporting tools to make the procedure of system configuration more efficient, in order to reduce the time to obtain a good solution, and more effective, in order to increase the chance of designing the best configuration [1].