



## Milling Machines Setup Process Characterization in the context of Mould Making Industry

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**Abstract:** The competitiveness in the mould making business is huge and a rising trend will be observed during the next decade. The need for flexibility and agility in production systems where the mould are manufactured is mandatory. These needs must be materialized in the delivery time reduction and ability to continuously reduce costs keeping the manufacturing process and moulds quality and reliability at a world class manufacturing level. One of the important waste in mould making companies is the time spent in the Setup process. The ability to reduce the Setup time only to the execution of the absolutely necessary operations is imperative (avoiding wastes like waiting, transports, handling, cleaning, etc. with the machine stop). Furthermore, the required internal operations must be continuously revised to allow as low execution time as possible.

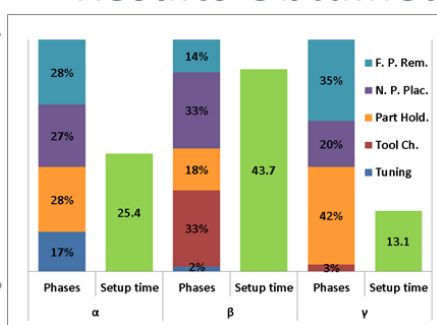
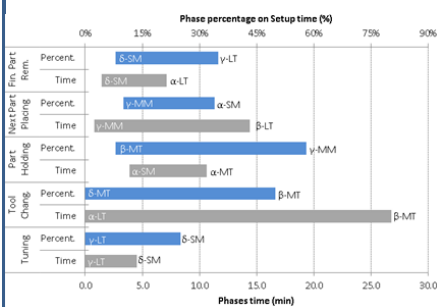
In this paper the results of measuring the milling machined Setup process in several mould making companies are presented and discussed. The typical Setup phases are classified and characterized and a few types of Setup process are identified. This classification permits a benchmarking analysis with the data collected. A methodology is proposed to reduce systematically the Setup times by suggesting specific solutions to improve each of the types of Setup.

Through the use of Setup phases and type of operations classification the methodology permits a systematized analysis of the Setup process.

Setup phases	Description
Finished part removing	Removing of finished part or special tool from the machine
Next part placing	Placing of next part or special tool on the machine
Part holding	Fix the next part or special tool to the machine
Tool Changing	Replace the processing tool (the item that performs the operation)
Tuning	Setting programmes, processing parameters adjusting and tests

Operations	Tasks involving
Positioning	parts and tools placing and removing
Adjusting	parts or special tools aligning and attaching
Tool Shifting	replace or prepare the processing tool
Programming	program loading and parameters setting
Cleaning	part/special tool and/or machine cleaning
Transport	tools and materials transportation
Operator Movement	Operator movements not involving transport (free hands)
Final Tests	fine tuning of process parameters by parts producing

### Results Obtained



By the definition of types of Setup and taking advantage of the systemized characterization of the Setup performance is possible to build up benchmarking analyses. This can be especially important for a process like Setup that is not usually considered as principal in a company and is assumed as specific of a company and even of an equipment.

Therefore a higher level of monitoring, the possibility of using indicators to assess the performance, the availability of benchmarking information and the dissemination of good practices will foster the overall productivity of the mould making sector related with the Setup process.

