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Computer-Aided Choice Of Machining Process

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Abstract:

Efficient manufacturing method does not just happen. They are carefully planed. Typical steps taken to plan and coordinate the process and their elements must be chosen efficiently.
It is obvious that this study requires a good deal of skill and experience on the part of machining process. Once all techniques and methods of machining process are reviewed and all fundamental factors which affect machining process are surrounded, a methodical approach of a computer-aided choice processing system has been developed in order to facilitate an ingenious choice of the most economical machining process without any rebuff. Otherwise all the requirements and specifications issue from the process of design must be satisfied.
Because of the complexity of cutting phenomena, it was more reasonable to make this approach by steps in which a number of concepts are used to provide for each part a partial algorithm, and joined together all the obtained algorithms (about a hundred) in order to obtain a global one. In the basis of this algorithm, a package system capable to display the most compatible machining process with a detailed description has been developed.

Keywords: manufacturing / machining process / computer-aided / cutting phenomena / algorithms / factors / parameters.

1- INTRODUCTION

Shaping metals into useful products, needs to methodical choice of the most economical and compatible machining process with all its items for acceptable quality. However, all the specifications and requirements of the finished product

resulting from the process of design such as surface finish, dimensional accuracy …, must be satisfied. If any one of these requirements is not respected, the finished product is then rebuffed.

To satisfy these criteria, the factors and parameters that are assigned machining process must be all surrounded. It is then necessary to process a perfect knowledge of the principles of manufacturing process and handle all the used equipment.

The aims of this study is to emphasize on the main criteria within an cutting operation that may be varied to change the cost and results, and to show

How scientific and economic principles are applied.

FIG.1 : basic scheme

2- METHODICAL APPROACH

When all the methods and techniques has been reviewed and all the fundamental factors which affect machining operation has been characterized, a computer-aided choice processing systems have been developed to facilitate the optimum choice. When the data relative to the requirements of the finished product are introduced, this program based on the algorithm cited above must display the chosen machining process and the characteristics of the used equipment.

Because of the complexity of machining process, such an algorithm is very difficult to set up. It is more reasonable to develop it by parts, and joined these parts together to form a global algorithm. With this consideration in mind it may be possible to study independently each machining process taking into account the main criteria which depend the optimum choice leading to the diagram of decision illustrated in figure 2.

Each one of these processes is itself subdivided into several parts. As an example, an approach of computed-aided choice in turning process can be divided into the following parts:

- Methodical choice of machine tool (dictated by work piece sizes and dimensions, quantity production, accuracy and surface finish).
- Methodical choice of cutting tool geometry and materials (depends upon physical and mechanical characteristics of the work piece, size and shape of generated surface, cutting accuracy,…).
- Methodical choice cutting conditions (Vc, a, p) (depends upon work piece size and shape,, quantity production, geometry and materials of cutting tool, cutting accuracy, type and kind of machining operation,…).

- Methodical choice of accessories and attachments (depends upon geometry and materials of cutting tool, cutting accuracy,...).
- Methodical choice of measuring and gauging (depends upon cutting accuracy, shape of generated, quantity production,…).

For each choice cited above, an algorithm has been developed and joined together in order to lead to a global algorithm which provides automatically the most economical machining process without any rebuff.

As illustrated in figure 3, methodical choice of feed in finish turning operation is treated. When a finishing cut is to be taken, the appropriate feed will be that which gives an acceptable surface finish. In this case the choice of feed is in the hands of the designer would specified the surface finish requirements.

Two distinct criteria can be used in choosing cutting feed for finish turning operation: surface finish and nose radius of cutting tool (fig.

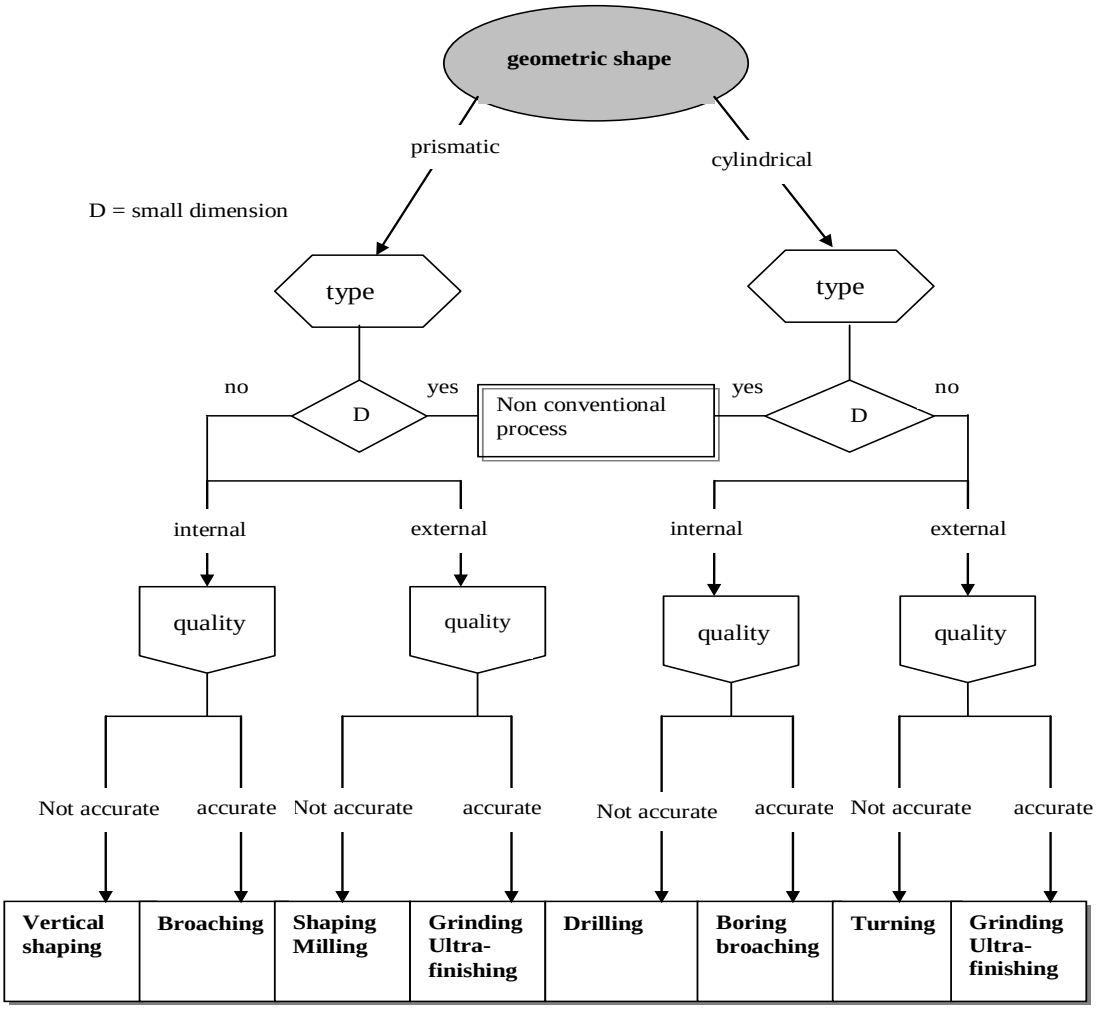

FIG.2: **Decision algorithm of machining process**

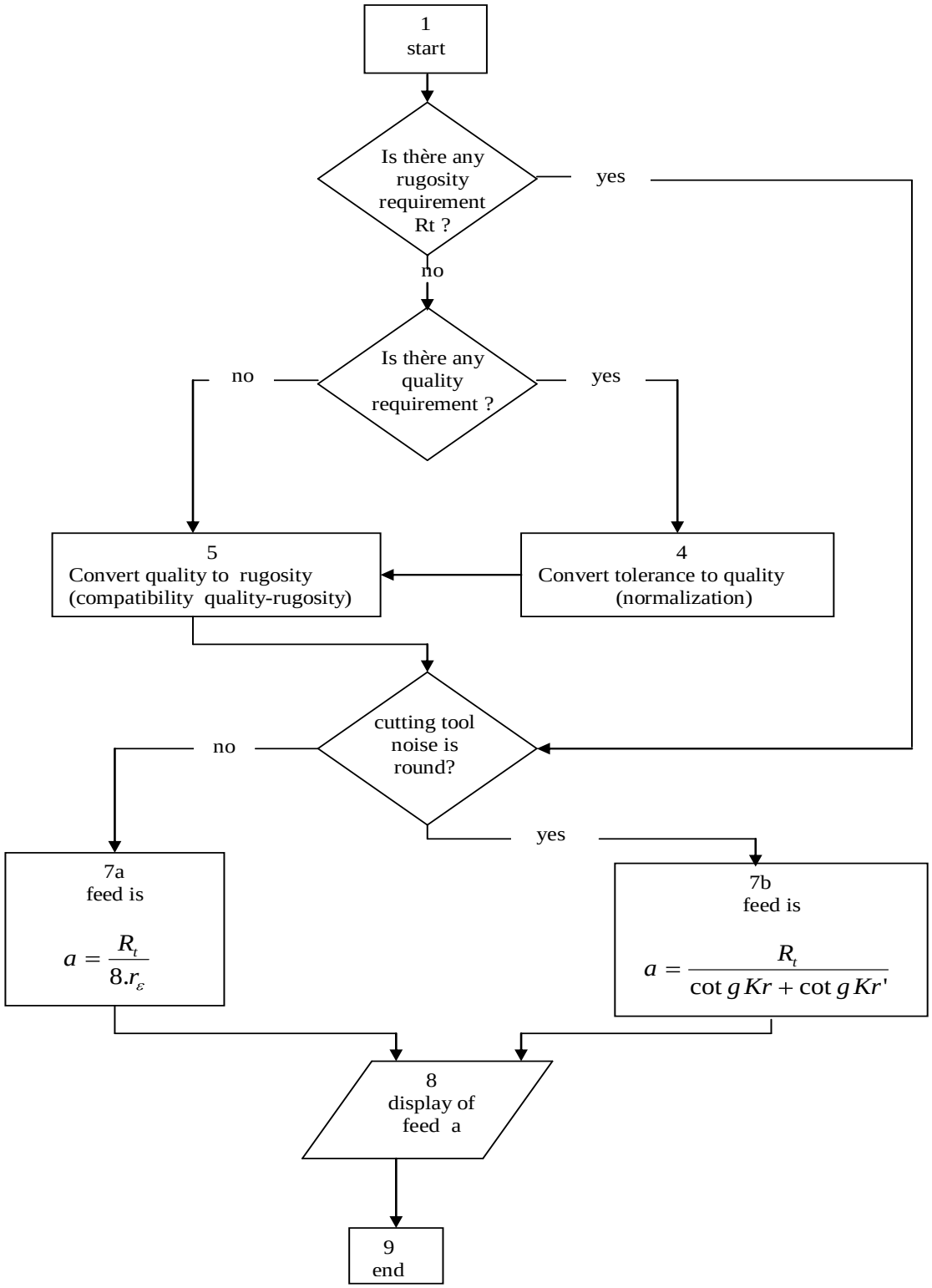

FIG.3 : Algorithm of feed choice in finish turning operation

One part of the algorithm of cutting tool choice in longitudinal turning operation

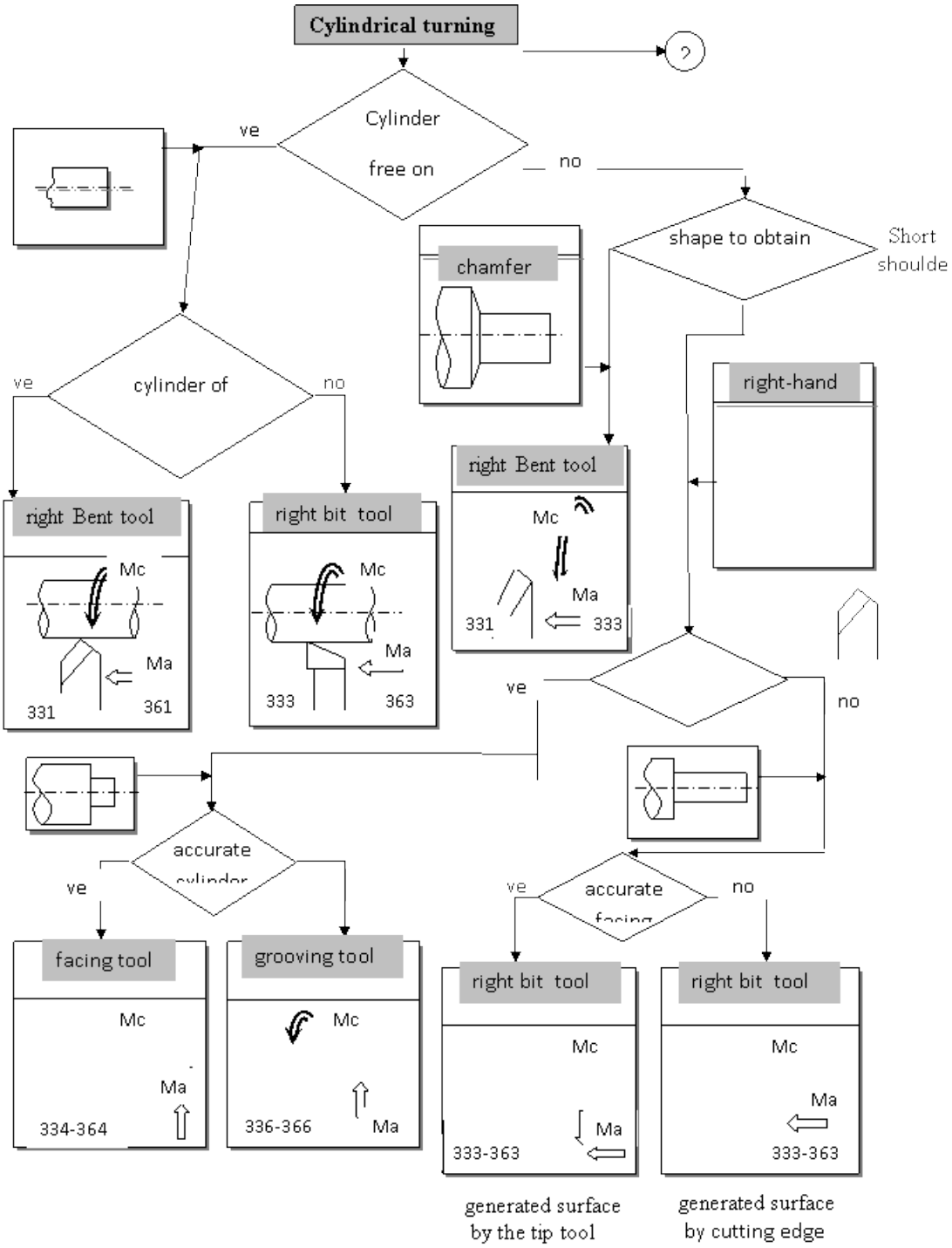

FIG.4: **algorithm of cutting tool choice in longitudinal turning operation**

One part of the algorithm of cutting tool choice in internal turning operation

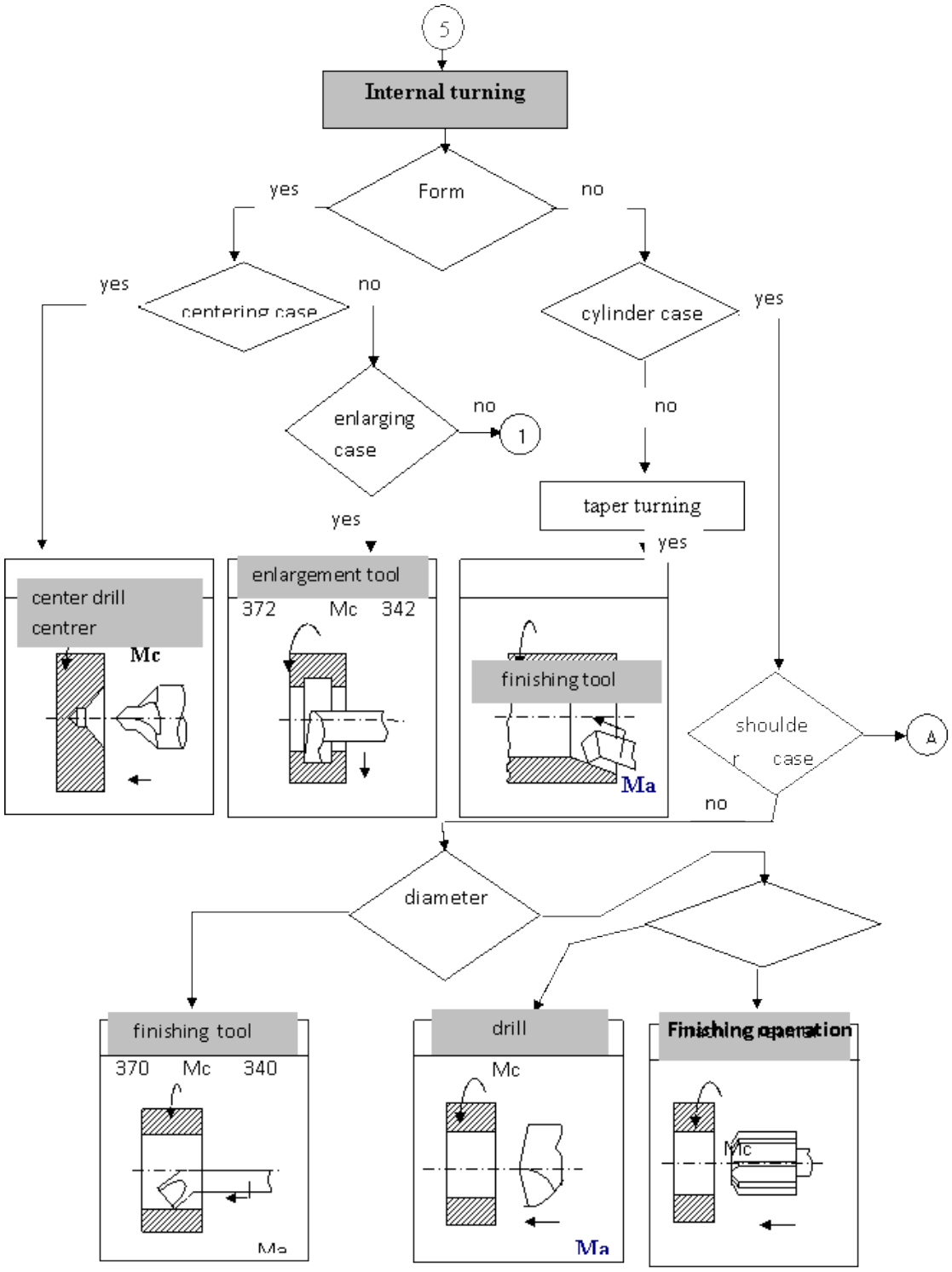

FIG. 5: the algorithm cutting tool choice internal taping operation

One part of the algorithm of cutting tool choice in internal taping operation

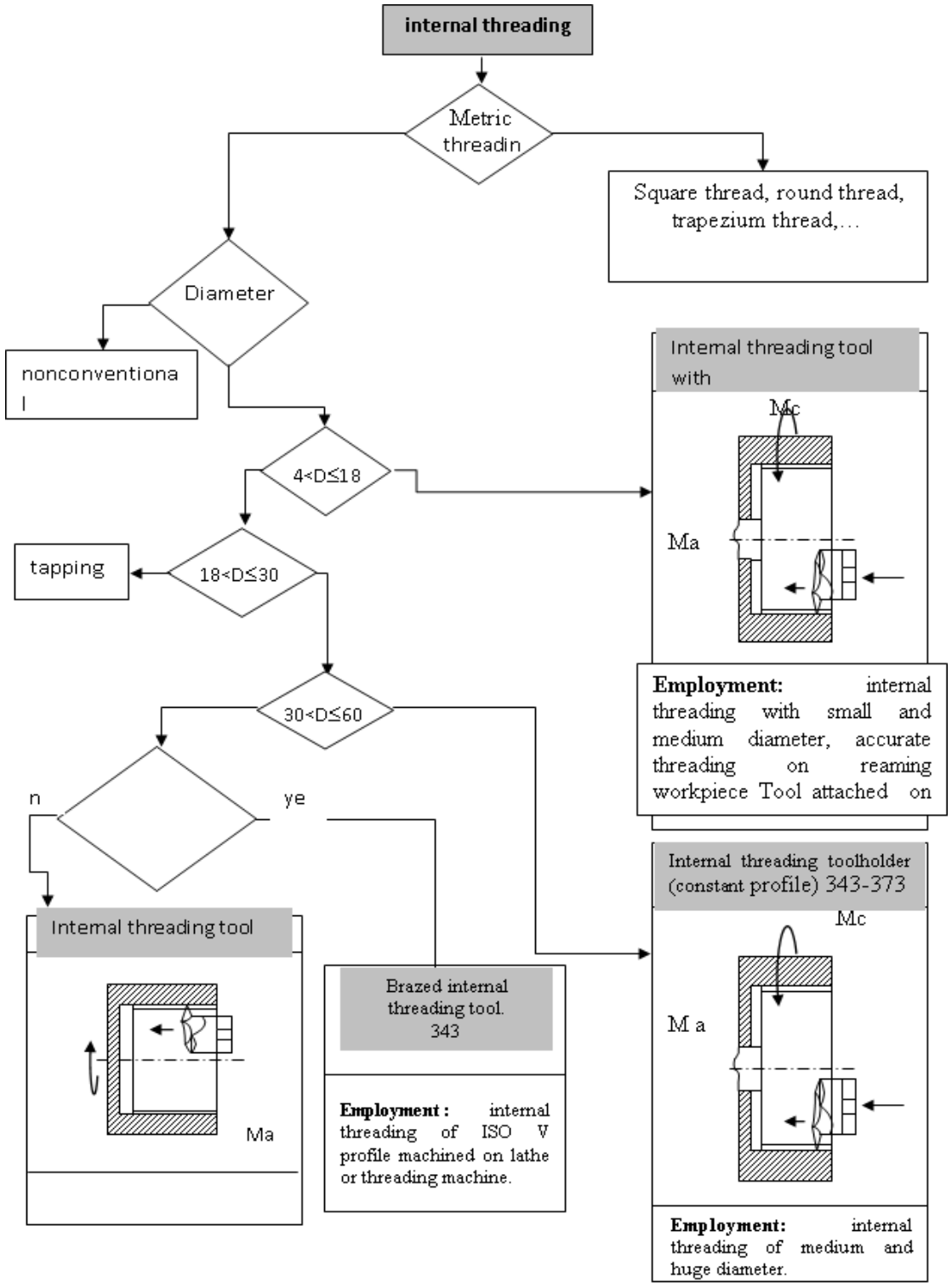

FIG.6: **algorithm of cutting tool choice in internal threading operation**

3- CONCLUSION

Today, machining process optimization become incontestable for designing and machining reliable and cheaper products.

Because of increase of complex product, competition tension, evolution of customer requirements, regulation and norms, an ingenious choice of machining process and work conditions became necessary and touched almost all manufacturing industry.

This study depends on a perfect knowledge of machining process and fundamental factors, which affect quality and productivity. In order to adjust an automatic choosing method for the most compatible machining process without any rebuff, an obligation to collect maximum information on cutting methods and equipment, and to identify main influence factors on quality and productivity was necessary.

Such an analysis is conducted in an iterative manner and is refined step by step along this study. The obtained package allows the validity of machining choice and specification of all the used equipment.

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