Design of Conic Clamping System as a Different Version

Ali Emre Zobaroğlu
Demisas Dokum Emaye Mamulleri Sanayi A.S., Yenimahalle, Ataturk Bulvari No:67 Bilecik/TURKEY
e-mail: emre.zobaroglu@demisas.com.tr

Abstract： Conic clamping system is a modular quick-change tooling concept that offers three systems in one; quick-change tool holders for turning centers minimize setup and tool change times and significantly increase machine utilization, conic system integrated directly into the spindle increases stability and suitability for all jobs in multi-purpose machines. The conical clamping system, which is a modular system for machining centers, offers numerous extension and reduction adapters, allowing the assembly of tools with different lengths and design features, independent of machine interfaces. Modularity means there will be less need for expensive special tools with long lead times. In project scope, it is planned to minimize the tool change times of the conical clamping system, which will be used in the machining of the project part on lathes. With this study it is aimed to assembling/disassembling of tool holder in quick way instead of keeping it fixed in the system.

Keywords: machining; clamping system; tool; cutting insert

1 Introduction

In many industrial sectors, lathes are used to perform operations such as cutting, processing, etc. of workpieces made of hard materials, especially metal. In each turning operation on lathes, different cutting tools and different attachment devices belonging to these cutting tools are used. One of these attachment devices is the lathe toolholder, which has a cutting insert attached to it that has the function of shaping hard materials in the desired shape. Lathe toolholders are used to attach cutting inserts
to tool holders and are designed in a structure that allows different types of cutting inserts to be adapted.

The connection of the cutting insert to the lathe tools used in the known technique is provided by bolts. In standard turning operations, when the cutting insert connected to the tool becomes dull, the lathe must be stopped, the connection bolt of the cutting insert must be removed, the insert slot must be cleaned with air and the unused corner of the insert must be turned or if there is no solid corner left, a new cutting insert must be taken and reconnected. As mentioned, during the changing of the cutting insert, problems such as the bolt used as a connecting element falling and being lost during the disassembly/assembly process, the bolt's mouth and/or socket being damaged as a result of wear, and the operator having to make an offset adjustment in the amount of wear before production since the cutting insert will be worn during operation are experienced. While the falling and loss of the bolt during the mentioned process creates bolt costs, the deterioration in the bolt mouth and/or socket causes the cutting insert not to remain sufficiently stable in the socket where it is placed and causes vibration during the process. In this case, it returns to the business as a faulty product. In addition to all these since the bolt assembling or disassembling process performed manually by the operator requires force and time, there is a loss of both time and labor in shaping the workpieces.

In the robot-fed systems used in current lathe operations, more than one toolholder is connected to the working lathe. In case the cutting inserts connected to these tools become dull, the operator performs an insert change. When all robot-fed lathes are considered, tool change times negatively affect the production efficiency of businesses. In addition, the fact that the cutting inserts are changed on the lathe causes the operator to have difficulty while performing the operation and to get tired quickly. In this case, time and labor losses occur. As a result, due to the negativities and deficiencies mentioned above, a need for innovation in the relevant technical field has emerged.

2 Experimental procedure

In the current system (Figure 1), instead of changing the cutter, the cutter is left fixed on the machine and the machine is stopped for the insert change, which causes loss of time in this process. In addition, when it is considered that there is more than one cutter on the machine, the loss of time for the insert change increases.

For these reasons, a system was needed where we can take the insert change outside the machine and perform the tool disassembling and assembling process quickly. For these reasons, it was decided to work to increase efficiency and reduce costs.

The VDI tool holder shown in Figure 2 is the standard holder that comes with the machine. In these holders, a conical clamping slot and a channel slot for the poka yoke have been opened to the toolholder according to design (Figure 3).

Figure 1 Mounting a tool holder to a standard VDI holder

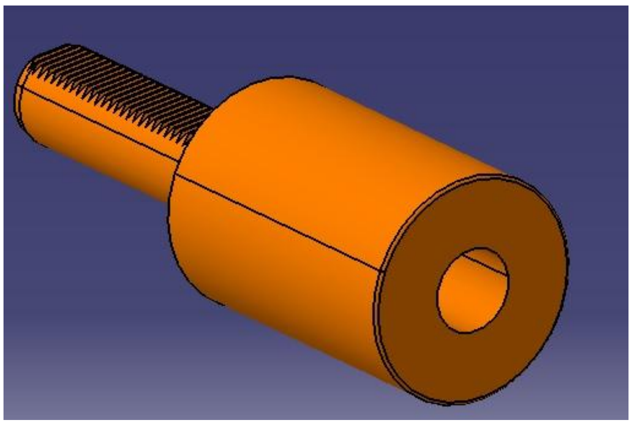

Figure 2 Standard VDI holder

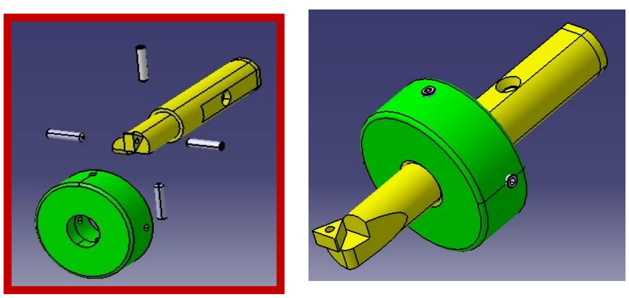

Figure 3 Clamping toolholder to standard VDI holder

The new system has been adapted to the designed quick disconnect-attach tool holder body (VDI holder). The system designed by opening only the channel slot and the slot where the conical tightening will be made has been adapted. In this way, insert changes can be made without stopping the machine by increasing the number of tool holders.

3 Result and discussion

The design is particularly related to the positioning wedge that ensures that the carrier body is always connected in the same position on the *X*-*Z* axis within the VDI body in order to ensure that the cutting insert change is done outside the machine, to speed up the removal and installation of the cutting insert and to eliminate the need for offset adjustment, the conical tightening bolt that ensures that the positioning of the carrier body on the *X*-*Z* axis within the VDI body is with the same precision at each lathe tool change, the wedge bolt that mounts the said positioning wedge on the VDI body, the limiting cover that connects the carrier body to the VDI body by ensuring that it is the same length at each lathe tool change, and the lathe tool holder that contains at least four setscrew bolts to ensure that the carrier body is fully centered within the VDI body.

4 Conclusion

As a result of the study, it was planned to reduce the time losses caused by the insert change by making the tool change fast. The new system was adapted to the quick disconnect-attach tool holder body (VDI holder) to be designed. Only the channel slot and conical clamping were made and adapted to the system. In this way, the number of these tools was increased and it was possible to make the insert change outside the machine without stopping the machine. In addition, savings were made in investment costs.