

SHRI VISHWAKARMA SKILL UNIVERSITY

Fundamentals of CNC

Automatic tool changer (Unit-4)

An **Automatic tool changer** or **ATC** is used in computerized numerical control (CNC) machine tools to improve the production and tool carrying capacity of the machine. ATC changes the tool very quickly, reducing the non-productive time. Generally, it is used to improve the capacity of the machine to work with a number of tools. It is also used to change worn out or broken tools. It is one more step towards complete automation

Basic types of ATC

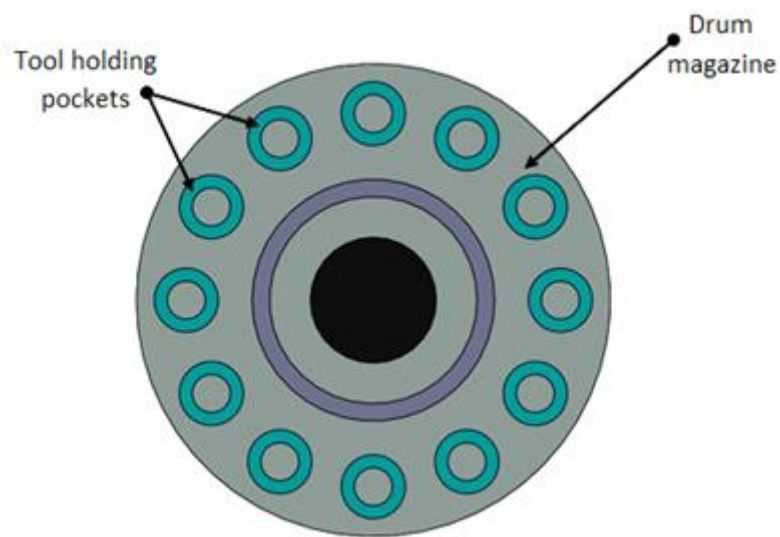
1 Disc or drum type

2 Chain type

Disc or drum type

1 The disc type tool magazine rotates to get the desired tool in position with the tool change arm. Larger the diameter of the disc/drum more the number of tools it can hold. It has pockets where tool can be inserted. In case of drum type magazine which can store large amount of tools, the pockets are on the surface along the length. It carries about 12 to 50 tools. If the number of tools are less the disc is mounted on top of the spindle to minimize the travel of tool between the spindle and the disc. If the tools are more then, the disc is wall mounted or mounted on the machining center column. If the disc is column mounted then, it needs an

additional linear motion to move it to the loading station for tool change.



2. Chain type magazine

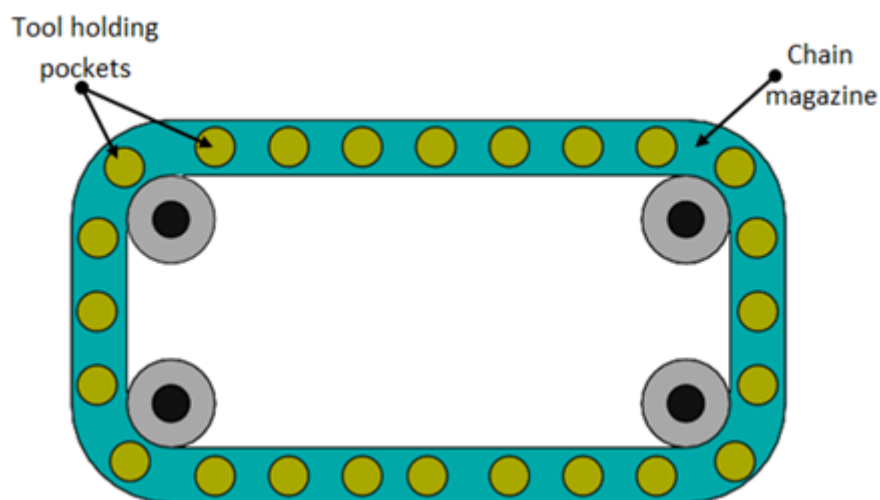
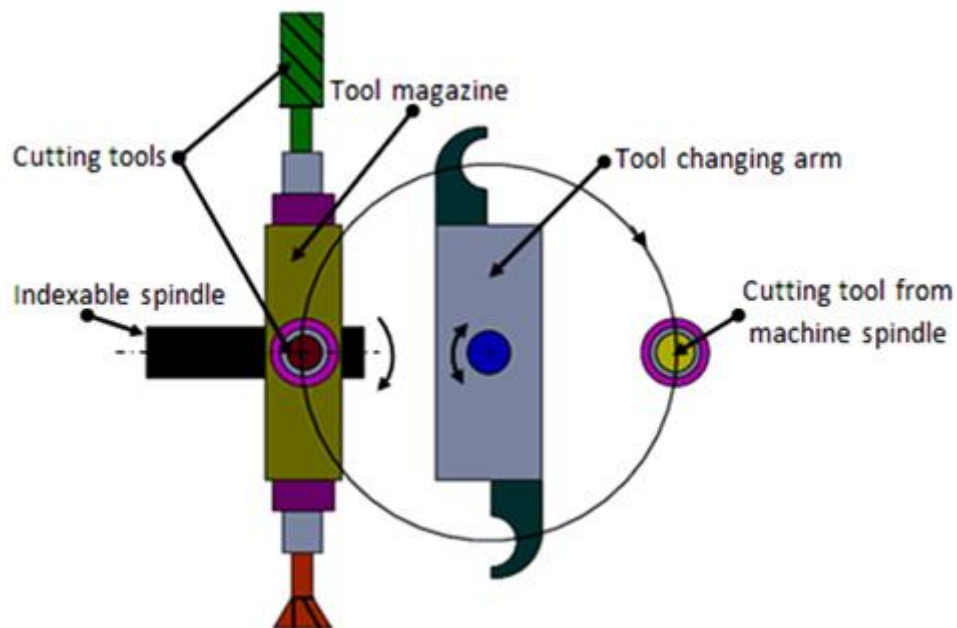


Fig. 4.6.3 Chain magazine

When the number of tools is more than 50, chain type of magazines are used. The magazine is mounted overhead or as a separate column. In chain magazines the tools are identified either by their location in the tool holder or by means of some coding on the tool holder. These types of magazines can be duplicated. There can be two chain magazines: one is active for machining and the second magazine is used when the duplicate tool is needed since the active tool is worn out.

Working of Automatic Tool Changer



The tools from the magazines and spindle are exchanged by a tool changer arm.

The tool change activity requires the following motions:

- a. The spindle stops at the correct orientation for the tool change arm to pick the tool from the spindle.
- b. Tool change arm moves to the spindle.
- c. Tool change arm picks the tool from the spindle.
- d. Tool change arm indexes to reach the tool magazine.
- e. Tool magazine indexes so that the tool from the spindle can be placed.
- f. The tool is placed in the tool magazine.
- g. The tool magazine indexes to bring the required tool to the tool change position.
- h. Tool change arm picks the tool from the tool magazine.
- i. Tool change arm indexes to reach the spindle.
- j. New tool is placed in the spindle.
- k. Tool change arm moves back to its parking position.

Advantages of automatic tool changer

- Increase in operator safety by changing tools automatically
- Changes the tools in seconds for maintenance and repair
- Increases flexibility
- Heavy and large multi-tools can easily be handled
- Decreases total production time

Functions of ATC

The use of automatic changers increases the productive time and reduces the unproductive time to a large extent. It provides the storage of the tools which are returned automatically to the machine tool after carrying out the required operations, increases the flexibility of the machine tool, makes it easier to change heavy and large tools, and permits the automatic renewal of cutting edges

Stages of tool change

Tool selection – Tool to be used as per operation to be performed is to be mounted in tool magazine so that required tool is selected from the tool magazine

Tool transfer – Tools are transferred from tool magazine to spindle & vice versa with the help of tool changing arm.