From NC to CNC machining: the technology that changed the factory system

The birth of NC machine tools

After World War II, the U.S. Air Force invented a method to improve the precision of manufacturing methods. John Parsons, the president of *Parsons Works* of Traverse City, Michigan, developed a manufacturing technique involving servocontrols, (sometimes abbreviated to 'servo') which are self-regulated mechanisms. The servo control system was a device driven by positional data input into a computing device, used to correct the performance of machinery. The new method sped up manual processes and increased precision.

From 1949 to 1952, Parsons worked with the *Massachusetts Institute of Technology* (MIT) to create a machine capable of numerically controlling milling machines. At the time, the electronics industry had not created support systems to integrate the new machines with this new technology, however, in 1952, a three-axis numerically driven milling machine was successfully completed. By 1964, over 35.000 numerically controlled machines were in use throughout the US.

Evolution of NC machine tools

The NC machines of the 1950s and 1960s employed vacuum tubes and mechanical relays as their primary controllers. At the time, the controllers were "point A to point B" locators that functioned along two axes. Today's high-density integrated circuits are capable of creating three-dimensional shapes in a vast range of designs and dimensions and sophisticated CNC machinery can even automatically monitor the quality of the work. This level of automation highlights the difference between these two similar programming methods: while NC controllers worked within the parameters of direct, simple tasks, CNC programming enables machinery to analyse data and adapt to changing circumstances.
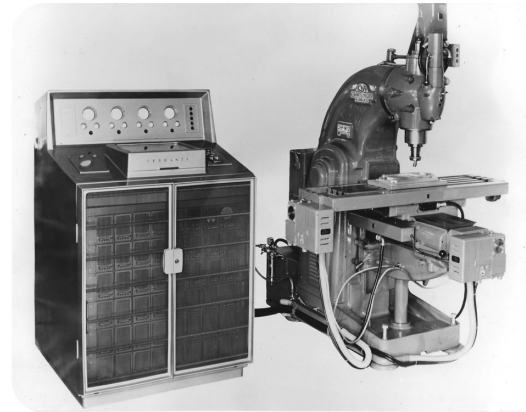
The first European NC machine tool invented in the UK in 1956.

Advantages of CNC machines

Some of the benefits provided by the most recent types of CNC machines include:

- ability to manage complex manufacturing processes with greater accuracy;
- semi- or fully automated quality control;
- shorter CNC machine set-up and integration times resulting in greater productivity;
- computer-controlled networks which can reduce the number of machines required for a specific task;
- increased adaptability and a wider range of machining tasks.

to highlight: *mettere in luce*
milling: *fresa*
relay: *relè*
to speed up: *velocizzare*
vacuum: *vuoto*

A relay is an electrically operated switch that is used when several circuits must be controlled by one signal.

1 📄 **Chose the correct answer.**

1. A servocontrol is…
  a. a manufacturing method.
  b. a self-regulated mechanism.
  c. a computing device.
  d. a machine tool.

2. When was the first three-axis, numerically controlled milling machine created?
  a. In 1952.
  b. In 1948.
  c. In 1950.
  d. In 1964.

3. Between the 1950's and the 1960's, what kind of NC controllers were in use?
  a. Locators along two axes.
  b. Circuits capable of creating three-dimensional shapes.
  c. Fully-automated quality controls.
  d. None of the above.

4. Which of the following statements is NOT correct?
  a. In 1948, the electronics industry could not integrate the machines with the NC technology.
  b. Between the 1950's and the 1960's NC machines employed vacuum tubes and relays as their primary controllers.
  c. NC controllers worked within the parameters of direct tasks.
  d. CNC programming cannot adapt machinery to changing circumstances.

2 📄 **Fill in the gaps with the given words.**

system • iron • leader • flowers • automation • tanks • solving • aided • manufacturing • control

John T. Parsons

John Parsons' first memory was of shaping a piece of **1.** .... at the age of 3. Parsons was able to recognize metals by their smell – the way some people can distinguish **2.** .... Parsons' career spanned 60 years of creative problem **3.** ...., as he sought to affect and improve all phases of manufacturing, from new materials to new ways to consider the factory **4.** .... Parsons, with his friend Frank Stulen, envisioned a new concept of **5.** .... that involved metalworking using numerical **6.** ...., which was the precursor of today's computer **7.** .... manufacturing. Together, they were the first to use computer methods to solve machining problems, specifically, the curves of helicopter rotor blades. For 40 years, he worked at Parsons Corporation, which became a world **8.** .... in the production of helicopter blades and they also produced the fuel **9.** .... for the Saturn rockets that took astronauts to the moon. Parsons's breakthroughs in computerised manufacturing led to the development of Computer Numerical Control (CNC), which controls the **10.** .... of machine tools and tool processes. CNC continues to be used for all of the processes that can be carried out on machine tool platforms.

Adapted from: *https://nationalmedals.org/laureate/john-t-parsons/*

3 🔤 **Translate these terms into English.**

1. Migliorare: ....

2. Produzione: ....

3. Automazione: ....

4. Controllore: ....

5. Meccanismo: ....

6. Precisione: ....

7. Integrare: ....

8. Adattare: ....