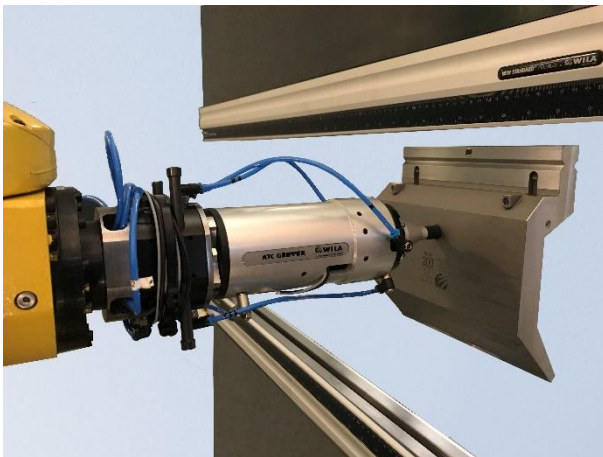


WILA is a company that manufactures tooling for press brakes, such as tools, clamping's, and crowning's. Their mission is to increase press brake productivity. It does this by continuously improving their products, to achieve higher precision, increase durability and allow for more flexibility in the bending process. One way WILA can further innovate is by adopting the smart industry innovations, such as automations.

WILA has had an Automatic Tool Change System or ATC since 2006. Since then, automation in the sheet metal bending industry has increased. The last few years WILA has seen a rise in the sale and use of its ATC system, which shows the rising interest in press brake automation. The ATC system consists of tooling with a special adapter and a gripper. The gripper is mounted on a robot arm. The gripper can pick up tools by inserting its nose inside the adapter. To release upper tooling from the press brake clamping the gripper can activate the tools fall prevention mechanism: the Safety-Click.



*WILA ATC gripper with ATC tooling, mounted on a robot arm.*



*Safan-Darley R-Brake automated bending cell using the WILA ATC system.*

WILA sees the possibility of further development of the ATC concept and is interested in an analysis of the current ATC system and possible new concepts to examine the potential of a new development project. This thesis focuses on the ATC tooling and the ATC gripper. Tool storage solutions, clamping's and other elements of an automated bending cell fall outside of its scope.

This report analyses the current ATC system: what are its strengths and which areas can be further improved. This analysis is used to form development goals. These goals are used to guide concept development and selection for an ATC gripper, tool pickup locations and ways to activate the tools Safety-Click. The best concept is further developed, to illustrate its workings, define dimensions, perform FEM simulations and a cost estimation.

The WILA ATC is compatible with most WILA tooling. It is a flexible solution which has many features, such as placing tools upside down or backwards, while still operating the Safety-Click. It has improvement potential in four areas: tool cost, system reliability, gripper reparability and sensor integration.

These areas are constrained by one design choice: the want to pick up tooling from a non-standardized location to allow many tooling contours, and the resulting use of pneumatics to remotely activate the Safety-Click. This want is the core of the current ATC concept. Therefore, to further improve the ATC system a new ATC concept is necessary.

To guide a new concept development, four development goals are drafted from the analysis:

1. Define a new tool pickup location and geometry, that is cheaper to produce, is standardized across tools, while retaining core tool compatibility and tool functionality.
2. Design a Safety-Click mechanism that can be activated from the front and back mechanically, without adding complexity or cost to the tooling.
3. Develop a gripper that is strong and precise enough to manipulate tooling, while being easy to repair after a collision.
4. Develop a gripper that can confirm an action is performed, using sensors within the gripper.

A new ATC concept is the result of the concept development.

This concept has an ATC tool geometry that is compatible with almost all WILA tooling, while lowering production costs and has a more standardized pick-up location.

The Safety-Click can be activated with minimal added cost and complexity.

The gripper is much stiffer than the current ATC G8 nose, while being easier to replace.

Sensors are integrated into the gripper. These measure the gripping of tools and the activation of the Safety-Click with a reliable method and without adding costs to tooling.

Further development of the new ATC concept will be needed, to refine gripper and tooling dimensions, develop a tool storage solution and validate the concepts functionality.

Overall, the new ATC concept could help WILA customers with their automation needs, by providing a cost effective and more reliable automatic tool changer system, which works with tool types they are already familiar with.