

Robotic Stacker

The work included the complete automation of the system and the insertion of a robotic stacker divided in four anthropomorphic robots from KUKA. The system processes small L types merchant bars and flat profiles, and allows the expansion of the product range mainly with angles from 25x25mm to 60x60mm in size and width from 3 to 7 mm. The project was developed with 3D simulation to verify cycles and interferences with existing machines.

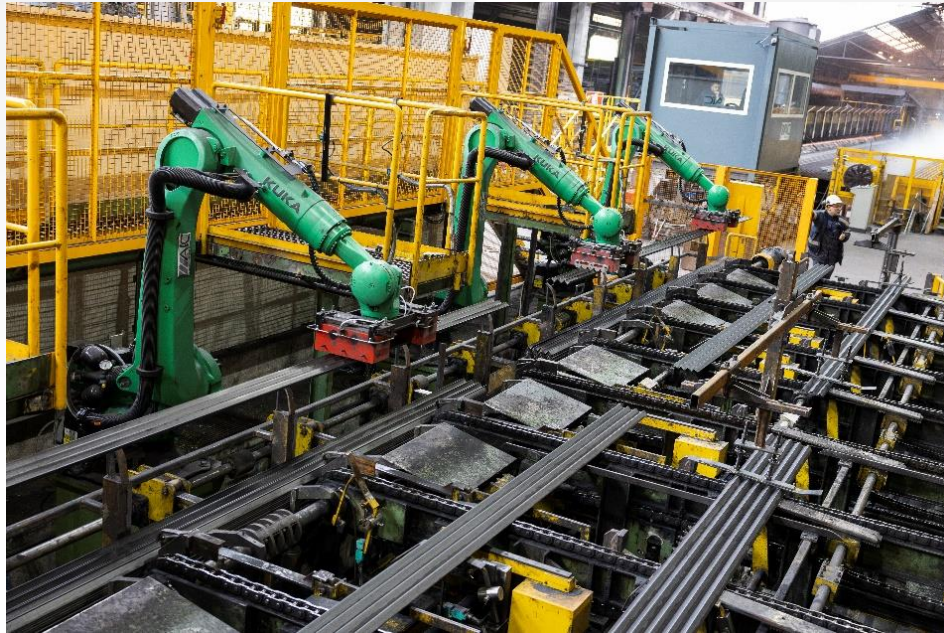
The end tool of the Robotic Stacker was studied and designed by AIC, and this is equipped with electromagnets and interchangeable profile alignment combs. With this tool the system can handle from 1 to 6 bars each cycle. The system makes it possible to neatly stack steel profiles from 4.5 to 13 meters in length. The single robot can handle a product from 4.5 m to 6 m, it is also possible to have two robots working per layer, as well as to stack two parallel layers. Single-layer processing with three robots is possible for products from 6 to 8.5 m while keeping one robot stationary for energy savings. From 8.5 to 13 meters all four robots can work synchronized. It is possible to do single stacking with 4 robots or double stacking with robots used in pairs. The system is also able to operate without one of the four robots.



A special feature of the system is that it is able to shift from one profile to another: the set-up of the machine is very simple and fast to change, in 7 minutes a single operator is able to reequip the robot for a new profile. The system is very flexible, and depending on requirements it is possible to stack from above and below the profiles or alternatively stack it in a mixed way, this flexibility is useful to reduce stacking cycle times and to form tidier packs.

AIC integrated the bar stackers into the existing structure in order to allow the robot to pick up the layers in a straight and reverse way. In order not to modify mechanically the existing machine, the bar stackers were designed independently in the electrical axis. The robotic solution chosen by the customer made it possible to reuse the existing plant in its entirety with only the integration of the robots for the formation of the unprocessed profile bundles. The addition of bar stackers allowed the reverse layer collection without invasive modifications. This allowed the project to be completed in just 6 weeks of downtime.

AIC GROUP – CRAFTING EVOLUTION



For this project, AIC installed an automation PLC and an integrated safety PLC on a Rockwell platform, with supervision plus Ignition recipe book. AIC also participated in the design of the electrical cabinet layout. All the drives are ABB, interfaced to the plc with Ethernet IP network, all the nodes are aimed at optimizing the plant installation, furthermore, local boxes were used to control the machines for man-machine interface with Ethernet IP nodes.

The control software, specifically developed for the Rockwell-S PLC, manages not only the advanced processing lines, but also the sequences of the robotized stacker, ABB drives, the profile pick-up magnets, a new straightener, both packers (the classical and the robotized one), two binding machines, the weighing system and the pack evacuation part.



The project was originally designed to make angular products, but after seeing the reliability of the system AIC made some adjustments so that the machine could also be used for flat products that weren't planned at the beginning. The system is particularly flexible to handle different processed products, the stacker can switch between flat and angular products, and there is no need to reprogram the robot to change processes. By using complex control algorithms, the system monitors the picking and depositing of the correct layer of bars and stops automatically if it detects any anomalies. Depending on the stacking recipe, the robot automatically and dynamically adapts to pick up and deposit the various layers.



This system requires rare and limited maintenance apart from an annual overhaul. This is a clear advantage over most stackers that have complex mechanical components and require extensive and constant maintenance. The stacking phase can be interrupted several times by the operator in case of an intervention, the system memorizes the stage it has reached and when work resumes, the process starts again from where it left without the need to reset the cycle. In the event of a magnet or on-board accessory failure, the system is guaranteed to be replaced and restarted and the robots can also be controlled manually in case tests need to be carried out.

This system makes tidier packs than in traditional stacking and it also allows a very low energy consumption; in fact, all drives are regenerative so that the recovered energy is used when it would normally be lost. The power of the magnets is also modulated according to the size of the product for the sake of energy saving.

The solution optimizes the workflow, reduces downtime and improves the quality of the finished product, but most importantly the productivity is optimized to 30 tons per hour and the cycle per layer stays under 10 seconds.

About Companies:

AIC Group is a technological partner with extensive experience and deep know-how and stands itself as a global power control supplier and system integrator designing, manufacturing, and implementing automation systems, process control, and mechatronic solutions for both greenfield and revamping projects. Focusing on the steel and metals industries for long and flat products, the Group provides cutting-edge technical solutions by handling complex project schedules and thus establishing satisfactory and remarkable partnerships through its 6 international offices.
More than 45 years of modernization for endless reliability processes.

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