# Editorial

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**Digitization and other advances in the field of robotics and AGV development are making highly flexible intralogistics and production concepts possible. While the move towards digitally networked production lines calls for a radical rethink, it also offers unique opportunities, not least due to the demise of the fixed assembly line.**

Over the decades, robotics has undergone constant development. Robots have become faster, and higher-specification machines have even made the leap into cleanroom environments. Image processing has enabled them to master bin- picking tasks. With the dawn of Industry 4.0, a new dynamic came into play. The debate about relinquishing rigidly structured, inflexible solutions gained momentum and, for the first time, digitally networked production concepts were sketched out that opened up a new dimension of flexibility.

The surprising aspect of this is that many of the requisite ultra-flexible automation components have either already been available for some time or can be adapted to new production environments with minimal effort and expense.

Driverless transport systems, which have been in use in industry for many years now, serve as a prime example. Only recently have AGVs (autonomous guided vehicles) – upgraded with the latest navigation technology – taken on a key role in digitally networked production that dispenses with conveyor systems. There was therefore no shortage of individual systems for the implementation of ultra-modern intralogistics and production concepts; rather lacked was the digital technology that turns components into solutions.

The absence of holistic, digitally networked solutions also hindered the speedier application of collaborative robotic solutions. Human-robot collaboration (HRC), – the prospects for which have been considerably hyped in recent years – has only made relatively slow progress in industry. The number of HRC systems sold has remained well below expectations until very recently. It is only now, with the integration of HRC workstations into the smart factory, that cobot sales are starting to pick up momentum.

**Automotive industry bids fond farewell to the assembly line**

In certain pioneering sectors, such as the automotive industry, the digital transformation has already allowed the realization of completely new production concepts. This is where we are seeing the gradual demise of the assembly line that has dominated automobile production for more than 100 years. The future belongs to the digitally networked interaction of stationary and mobile robots, cobots and AGVs which, by virtue of their unlimited flexibility, grant new freedoms in production.

The significance of this is demonstrated by leading car manufacturers. In their state-of-the-art assembly lines, fixed conveyor technology has been replaced here with highly flexible transport solutions involving AGVs. Car bodies are conveyed on driverless transport systems at variable speeds. They can be decoupled from the assembly line flow and redirected to assembly stations where various tasks are performed. In this way, individually equipped variants and derivatives can be assembled. In complete model changes, it is only necessary to reprogram the robot and AGV rather than to dismantle the entire production line.

**Prospects for the repatriation of production**

This breakthrough is currently also finding its way into other sectors. Ongoing digital transformation will lead to completely new business models, because producers can diversify more easily than ever before. In the smart factory, different products can be assembled on the same line - all because the traditional production line no longer exists. Instead, AGVs and AMRs (autonomous mobile robots) roam between production islands and automated cells in which conventional and collaborative robots work side by side with humans.


Figure 1: Today’s production with autonomous mobile robot and man-robot interaction

Such highly flexible intralogistics and production logistics offer ideal solutions to today’s production technology challenges: Small batch sizes, individualized products, frequent model changes, and the assembly of different products simultaneously pose no problem

for the smart factory. And given the opportunities all of this affords, cost/benefit analyses of returning production from the Far East to Europe or “onshoring”, accelerated by the coronavirus crises, will shift the balance in favour of domestic production. We can safely assume that there will be changes to the supply chains in some industries, notably automotive, medical/pharmaceutical and photovoltaics.

**Stäubli as an all-round solution provider**

In order to position itself as a complete solution provider for digital production lines and factories, Stäubli decided early on to focus its product portfolio on this growth market. Our product range has been expanded beyond an already broad offering of standard kinematics to include innovative AGVs, AMRs as well as POWER cobots for human-robot collaboration.

With the introduction of the TX2 six-axis series in 2015, the course was irreversibly set for digitally networked production. Robot machine data is logged constantly and can be made available to higher-level control systems via OPC UA. This has created the basis for deployment of the machines in digitally networked production lines. All subsequent robot generations, such as the recently launched four-axis TS2 series, work on this principle.

Stäubli TX2 six-axis robots continuously log around 2,000 items of data, including operating temperatures in each axis, speed and acceleration values, torque levels and much more. With the Stäubli Optimize Lab tool or a higher-level production system, users can obtain an overview of the load profile of their robots and the individual axes at any time. In this way, overloads can be avoided by eliminating disturbance variables before damage occurs. In addition to performance monitoring, the data can of course also be used for highly economical predictive maintenance concepts.



Figure 2: TX2-90 6-axis robotic arm

Figure 3: New TS2 SCARA robot range with a fully encapsulated design

By putting a lot of sophisticated safety technology on board, Stäubli has successfully adapted its advanced six-axis robots for human collaboration while retaining their full

performance capability. Going by the name of TX2touch, they rank among the world's fastest cobots. The TX2touch has mastered all HRC levels and also forms the base unit for Stäubli's HelMo mobile robot systems. In this case, the robots are mounted on a self-steering mobile platform supplied by Stäubli WFT.


Figure 4: Collaborative robot line POWER cobot TX2touch-90

**Entering a new world of mobility**

The acquisition of WFT, the technology leader in AGV manufacturer, at a time when the internal flow of materials is undergoing a profound change, has been one of the most important strategic decisions in Stäubli's recent history. Upon acquiring WFT, Stäubli became a full-range supplier, capable of offering integrated solutions for production as well as intralogistics. This naturally includes much more than a mobile platform for mobile robots.

Intralogistics in the digitally networked factory must be highly automated and highly flexible in equal measure - and this can only be achieved with driverless transport systems. Stäubli WFT has various types of AGVs in its product range, as well as AMRs and collaborative AMRs which are capable of revolutionizing intralogistics, an area of activity which up to now has been only minimally automated. This will facilitate integrated Industry 4.0 solutions that take flexibility and productivity to new levels.

All Stäubli AGVs and mobile platforms share one unique characteristic: They feature patented drive technology that guarantees maximum precision. Even the largest AGVs with a load capacity of up to 500 tonnes can be moved autonomously with an accuracy of a few millimetres. Users in aerospace, automotive and other industries around the world can attest to its merits.

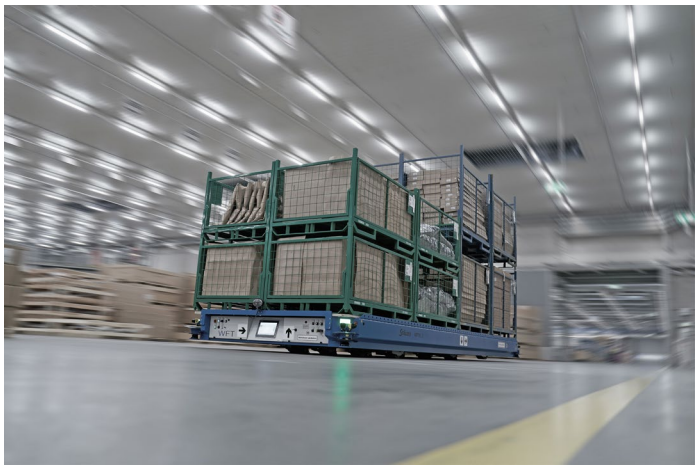

Figure 5: AutoBox, moving pallets indoor, Stäubli WFT

**A future that holds fundamental changes**

Stäubli offers both indoor and outdoor solutions, as amply demonstrated by AutoTrailer, a mobile platform that allows factory operators to dispense with the use of diesel trucks on their premises. This mobile platform is able to position itself under a parked semi-trailer, hitch up effortlessly by means of an integrated sensor system and take it to its destination. AutoTrailer uses laser navigation to find its way around outside the factory buildings without the need for guidelines or markings.

Transportation by means of these electric vehicles has the advantage of being not only considerably more environmentally friendly but also safer, because it eliminates the need for so many individual truck rides taking place on the plant premises. In addition, the loading and unloading of hundreds of semi-trailers can be better coordinated by a mainframe computer, which also eliminates wait times for truck drivers – thus combining cost efficiency with sustainability.

Many other innovative solutions incorporating artificial intelligence point the way to a future in which production will radically change at a phenomenal pace. Factors such as labour costs and production location will play a far less important role in the future, while aspects such as delivery capability, sustainability, ecology and a lower carbon footprint resulting from shorter transport routes are increasingly coming into focus. For a currently debilitated Europe, these predicted changes could be the first rays of sunshine on the horizon.