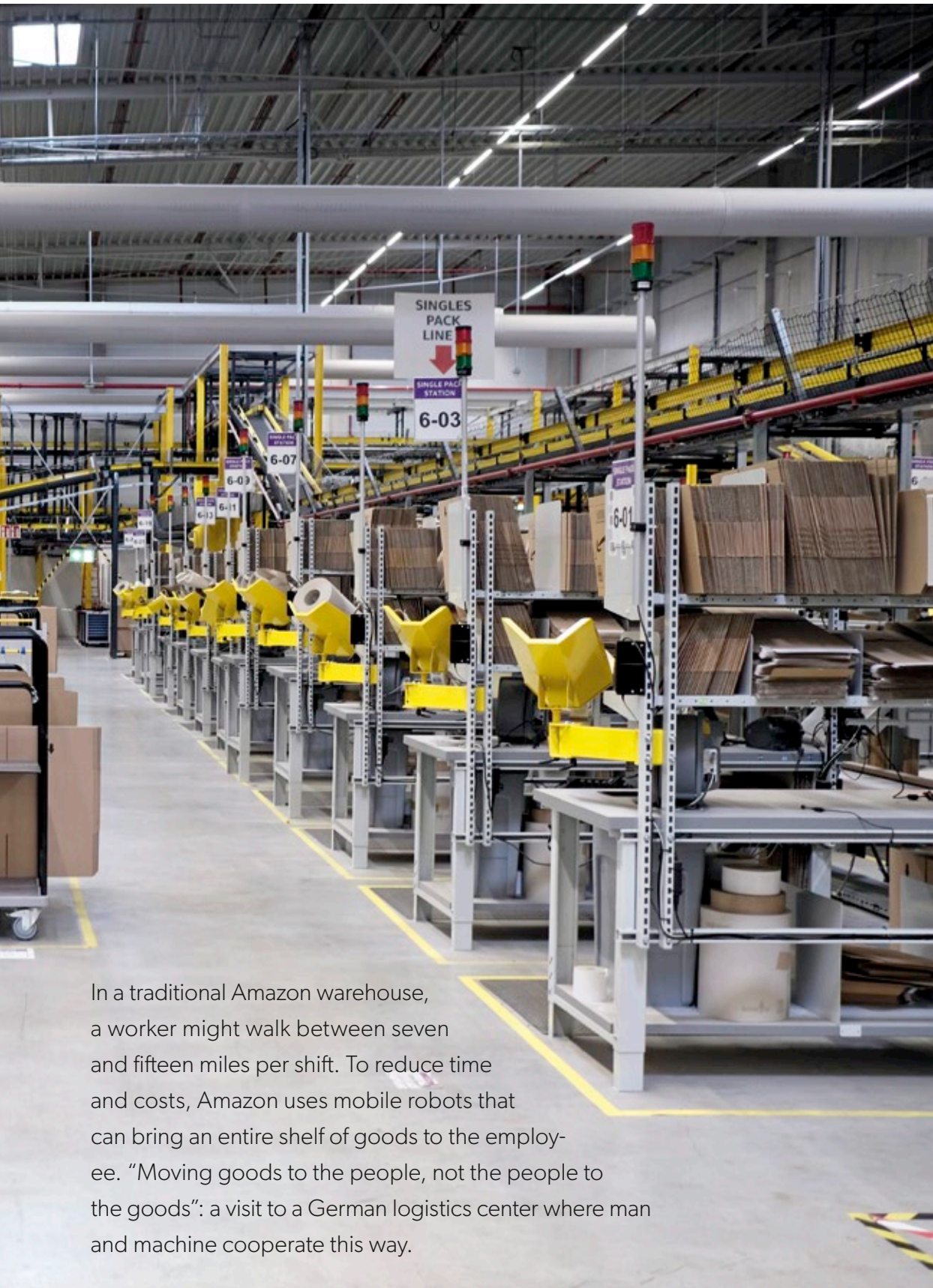➔ ESSENTIALS:
A random storage philosophy
and intelligent automation shape
the warehouse of the future

# HOUSE OF SMARTS

SINGLES
PACK
LINE

SINGLE PACK
STATION

6-03

6-07

6-01

In a traditional Amazon warehouse,
a worker might walk between seven
and fifteen miles per shift. To reduce time
and costs, Amazon uses mobile robots that
can bring an entire shelf of goods to the employ-
ee. "Moving goods to the people, not the people to
the goods": a visit to a German logistics center where man
and machine cooperate this way.

SHIELDED BY A HUGE black grid, massive robot shelves in bright yellow pass each other on straight tracks, turn around with a twist and precise accuracy, just like dancing – robot choreography. Then, they line up in small groups, wait to get filled, only to drive back into the corridors, moving away from the swarm. A few hundred of them are in use, here at the Amazon logistics center in Winsen/Luhe near Hamburg: a hub of 64,000 square meters, operated by the online retailer since the end of 2017.

The robots are called AGVs, short for Automated Guided Vehicles.

As unspectacular as their name is their appearance: a machine on wheels, 16 inches tall, that resembles more an oversized vacuum cleaner, which slots underneath the tall upright shelves and carry their loads in a geometric choreography – true to the motto, "Move the goods to people, not the people to the goods." These AGVs – manufactured near Boston, at the Amazon Robotics headquarters in North Reading, Massachusetts – each weigh 145 kilograms and can move 340 kilos.

As of today, Amazon employs more than half a million people around the world, not counting subcontractors and seasonal workers, while 100,000 robots are on duty inside its warehouses worldwide.

## QUEUING LIKE KIDS AT AN ICE CREAM SHOP

On the other side of the grid, a group of workers – the "stowers" – fill the yellow shelves with products. Like a row of children at an ice cream shop, the robots queue up to take the shelves and push them

**Where Robots meet Random meet Employees**
The core of Amazon´s efficiency? Its automated shelf-moving warehouse robots, as well as the way the company organizes inventory – with complete randomness: "It is always a reasonable interaction between man and robot"

**Before a worker** places something on a shelf, he scans a barcode on both the product and the shelf allowing the computer to keep track of where every item is located
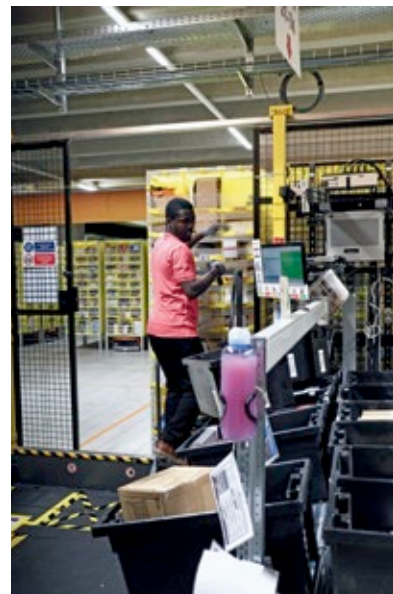


away again to the human "pickers" who, following the instructions on the computer screen, remove objects from the shelves and place them in plastic containers. These then disappear on conveyor belts for "packers" who pack the products in the carton intended for the client.

A traditional warehouse employee typically spends most of his or her time walking around the warehouse to gather all of the items for an order. "Transport robots reduce the processing time for orders. The higher parallel processing speeds up the processes. Nowadays, it is sometimes only minutes, when before, hours were necessary," the company says. Robotics also enables better use to be made of storage space allowing more products to be stored: the greater density of shelf space means more stock under one roof, which simply provides better choices for customers.

**Moving goods to the people**
It's an organic shelving system without permanent areas or sections: "the product's characteristics and attributes are irrelevant"



A benefit made possible by the company's inventory management system, based on a so-called "random storage philosophy": "The product is separated from the customer order," explains Norbert Brandau, Amazon's site manager in Winsen. "As we have the articles distributed randomly and according to the broadest possible mathematical distribution in the pods, the system can process summarized customer orders in the shortest possible time," Brandau continues, admitting that the inventory at warehouses with robots is stored using the same strategy as in Amazon's non-robotized warehouses.

### EFFICIENCY GAINS BASED ON ORGANIZED CONFUSION

At Amazon's automated warehouses, the workers scan the item, place it on one of the shelves – wherever there is free space – and scan the shelf so the computer knows where the item is located. Chaotic or random storage is a bit like organized confusion, but what's bringing order to the chaos is the unique barcode associated with every product that enters the warehouse. "It's an organic shelving system without permanent areas or sections; the product's characteristics and attributes are irrelevant," says Brandau, "leading to efficiency gains of 30 to 50 percent, for example, in picking."

For Tye Brady, Chief Technologist at Amazon Robotics, these efficiency gains are made possible by a "marching army of ants that can constantly change its goals based on the situation at hand," he explained to the US network PBS in May 2018. Brady calls the place where the robots are built the "nursery." "They'll be built, they'll take their first breath of air, they'll do their own diagnostics. Once they're good, then they'll line up for robot graduation, and then they will swing their tassels to the appropriate side, drive themselves right onto a pallet, and go direct to a fulfillment center."

The more robots Amazon adds to its fulfillment centers, the more jobs are created, Brady continues. "The robots do not build themselves. Humans design them, humans build them, humans deploy them, humans support them. And then humans, most importantly, interact with the robots." The company claims that humans still provide irreplaceable skills in the fulfillment centers, like dexterity, adaptiveness, and common sense.

"A plant like ours has a permanent workforce of 1,600 employees, and we hire additional staff for certain peaks," says Norbert Brandau. If Amazon covered the Christmas season with robots alone, it would be impossible to use the machines in a meaningful way from Q1 to Q3 of the following year. "It is always a reasonable interaction between man and robot," the site manager concludes. ✖



**Inside Amazon's** logistics center in Winsen, near Hamburg: the greater density of shelf space means more inventory under one roof, which means better selection for customers