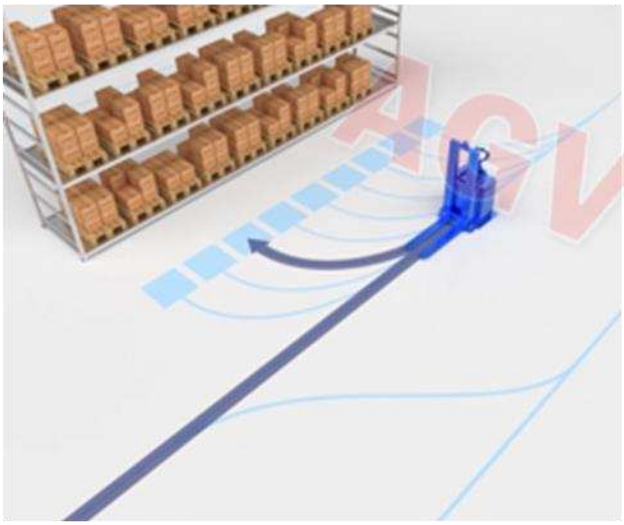
What are the differences between AMRs and AGVs?



AGV VS AMR

There's a new sheriff in town, AMRs or Autonomous Mobile Robots have arrived at the Logistics Automation world. There's a lot of literature in internet about differences between AGVs and AMRs. But, is there any relevant difference?

Beware of those claiming that AMRs (or AGVs) are the best and only solution! They are probably selling "their" solution.

Let's discover differences between AGV and AMR.

What is an AMR and What is an AGV?

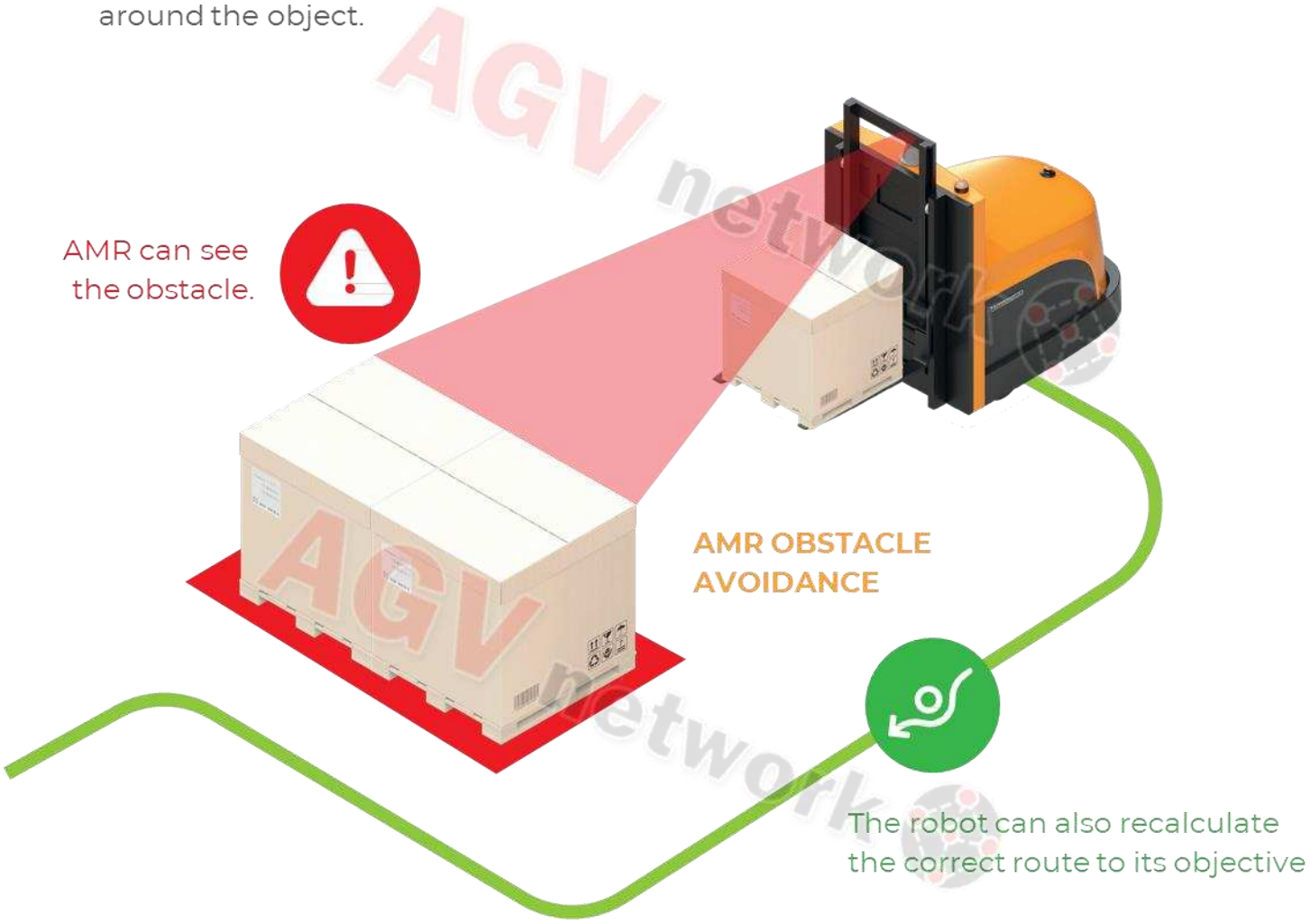
AMR VS AGV

AMR	AGV
Autonomous	Automated
Mobile	Guided
Robot	Vehicle

What is an Autonomous Mobile Robot (AMR)?

An AMR is a Mobile Robot with Natural Navigation able to redefine routes or paths and avoid obstacles.

An AMR doesn't require predefined fixed paths. It can define its route on-the-fly. If an obstacle is detected, the AMR adjusts its path to navigate around the object.



Natural Navigation means that the robot maps the environment and is able to navigate and localize itself just "watching" this environment without any hardware (tape, reflectors, etc)

There are several navigation technologies under in the «natural» umbrella: SLAM with LiDAR Sensors, Vision SLAM, Ultra Wide Band, Vision Navigation based on cameras, GPS, etc

NDC S Platform

Build & Operate AMRs with Ease

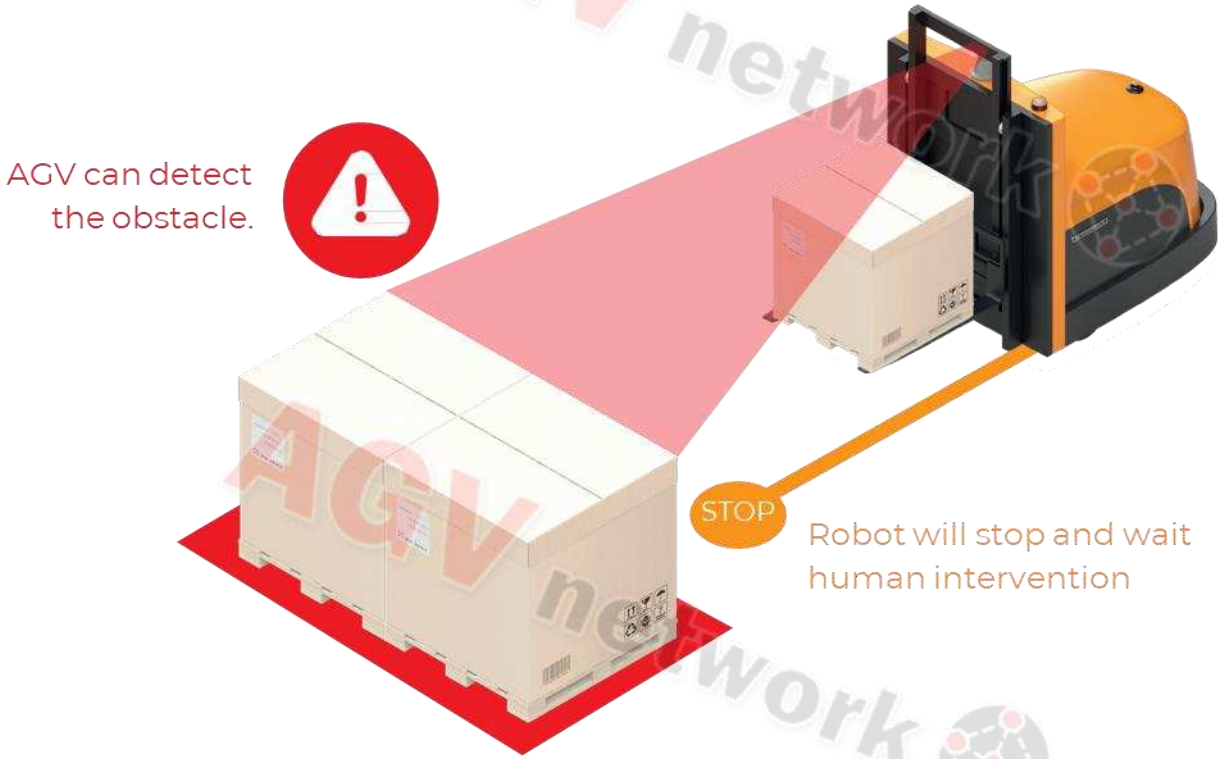
Build and operate AMRs with ease - Introducing the NDC S platform.

The NDC S platform is developed for customers who want to build an AMR that fits their customer's needs. We provide the software for a SLAM-based vehicle that can handle dynamic environments and that can be installed within a few hours.

What is an Automated Guided Vehicle? What are AGVs?

An AGV navigates automatically along given tracks (physical or virtual, magnetic tape, reflectors triangulation, etc). AGVs stick to that path and cannot abandon it.

In the case that the AGV safety sensors detect an obstacle, the AGV stops and waits for the obstacle to be removed.



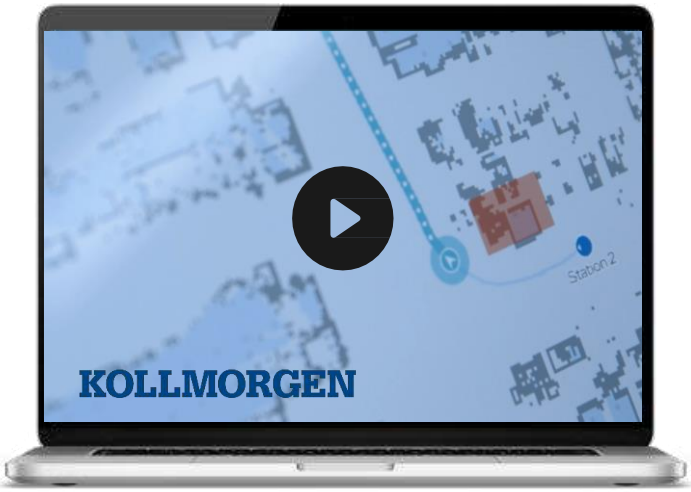
Video:
What are AGVs? by KOLLMORGEN

An AMR is Autonomous and an AGV is Automated

Automatic Guided Vehicles follow a given route, they can follow many routes, but these routes must be defined. These paths can be made by magnets on floor, magnetic tape, virtual path made by laser triangulation.

AGVs can decide the best route to destination. AGV Systems can decide to assign a mission from A to B using corridor X, corridor Z or corridor W depending on corridor occupancy or expected time to destination ... but if decided, they do not rectify their trajectory on-the-fly because of external obstacles.

AMRs instead, are not obliged to follow a route and are able to autonomously decide the best path. In some applications, this feature is great to ensure that load is delivered to destination in time.



Video:
Build and operate AMRs with ease by KOLLMORGEN

Are AMRs more flexible than AGVs? Yes, they are!

AMRs offer the possibility to change routes easily and effortless. Tipically, you can drive manually the robot, it maps the environment and creates a path... and that's all.

If you want to change an AGV magnetic route, it is very easy but it would require some more job.

If you want to change an LGV route or add new picking or delivery destination... you'd probably can't do anything by your own and you'll need supplier full support.

AMRs are extremely flexible and allows multiple destinations and tracks without any effort during the implementation.

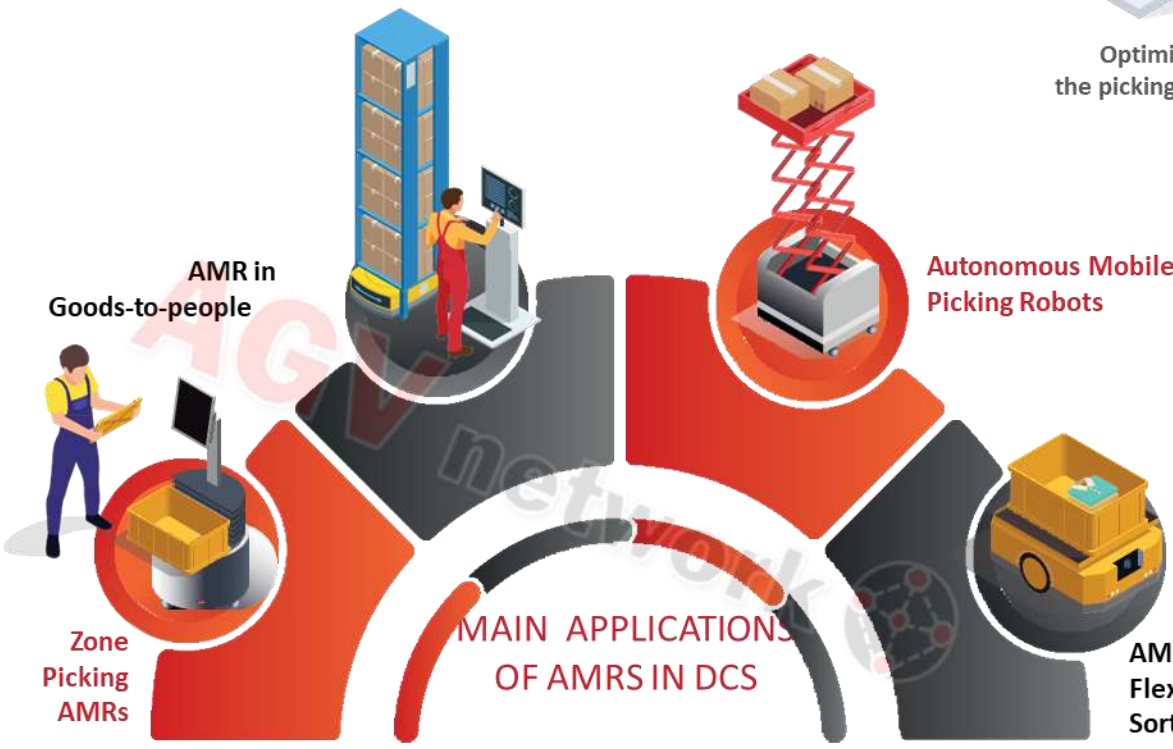
The point here is: Do you always need this flexibility?

There are some applications where AMRs are simply awesome and where AMRs are more flexible and convenient (for example ecommerce, parcel management, etc)

Collecting orders represents near 55% of DCs operating costs.

AMRs Minimize the pickers' collection time.

Optimize the picking route.



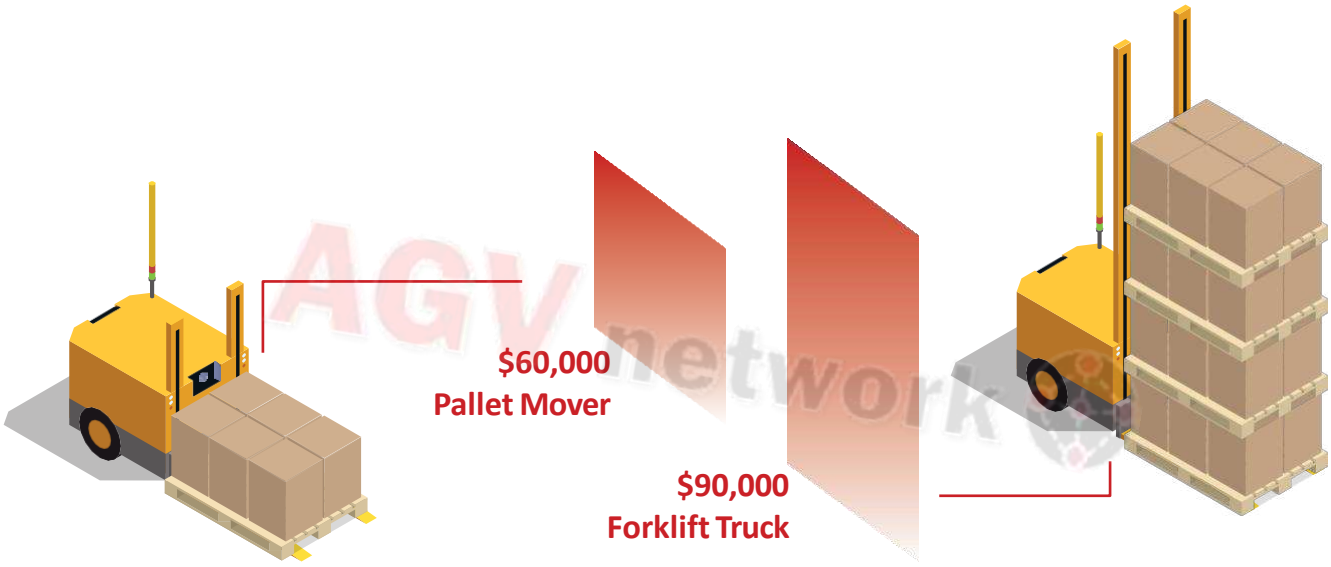
Are AGVs more expensive than AMRs?

How much does an AMR cost? How much does an AGV cost?

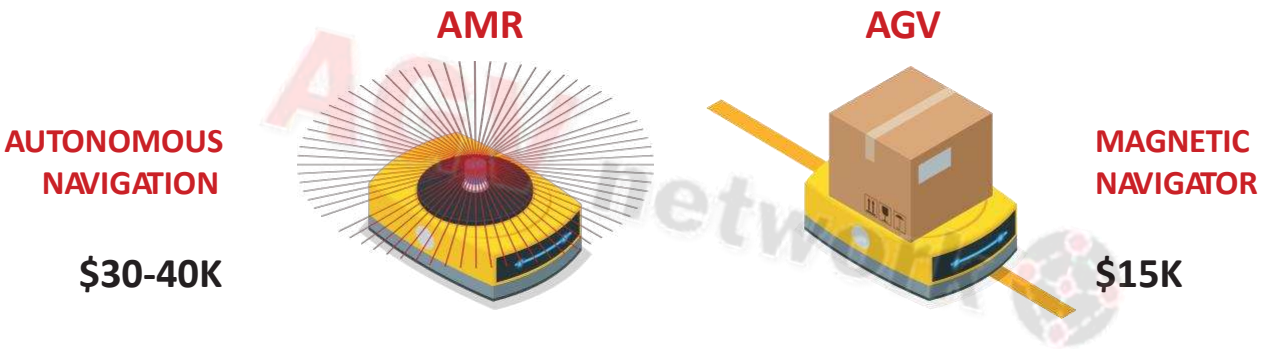
The cost highly depends on the type of mobile robot and the type of agv navigation system.

AMRs require performant (and expensive) sensors for navigating. Moreover, they need good controllers able to manage all the info received from these sensors.

If we had a sophisticated LGV, probably the price difference would not be relevant because LGVs also require the same sensing and processing capability.



If we had a small platform AMR, the vehicle could cost around 30,000 $ or 40,000 $. You can find this kind of AGV with magnetic navigation at around 15,000 $ (even less).



On the other hand, AMR installation is faster and cheaper

Are AMRs safer than AGVs?

Not at all. Both AMRs and AGVs are safe. They both use the same safety rated equipemt to avoid collisions and ensure the required safety level.

ISO 3691-4:2020 EU Standard	ANSI/ITSDF 56.5-2019 American Standard	ANSI/RIA R15.08-1-2020 AMR Standard
Industrial Trucks - Safety Requirements And Verification - Part 4: Driverless Industrial Trucks And Their Systems	Safety Standard For Guided Industrial Vehicles	Industrial Mobile Robots - Safety Requirements - Part 1: Requirements For The Industrial Mobile Robot
$200	**$35**	**$225**

As explained, AMRs are able to adapt and decide their route (probabilistic approach) while AGVs do always follow a deterministic route.

Deterministic (AGV) navigation, is predictable and causes less scary feeling, because staff knows exactly where the agv is moving and do not have to be afraid of any unexpected movement behavior.

Of course, if required, AMRs can disable the autonomous path decision in defined areas.

Video:
AGV Safety Systems by KOLLMORGEN

Where do AMRs perform better?

AMRs are suitable for applications having multiple and variable destinations, such:

Autonomous picking: Autonomous Mobile Picking Robots

In Hospitals, for example UV Disinfection Robots

Warehouse applications, especially in ecommerce and parcel industry.

Autonomous Floor Scrubbers

Comparison table. AGV vs AMR

AMR vs AGV comparison table	Automated Guided Vehicle (AGV)	Autonomous Mobile Robot (AMR)
Navigation	Infrastructure: wire guidance, reflective markers, Radio Frequency ID, etc. Magnetic tape, Laser Guidance, etc	Trackless Natural Navigation. All sensing is done onboard. Identifies the environment on-the-fly.
Obstacles	Obstacles stop AGVs	AMR goes around obstacles and finds what the best path according to its internal map
Flexibility	It is more complex to add new routes or destinations.	Easy to remap and define new destinations and goals
Vehicle cost	AGVs tends to be simpler thus less expensive than AMRs.	AMRs are more expensive because of more accurate sensors and more sophisticated control software.
Installation and Commissioning cost	More complex, need more time and requires infrastructure cost (magnetic tape, wire, reflectors, etc)	Fast and easy to install. Lower cost compared to AGVs.
Reliability	AGVs stick to a path. AGVs are more reliable than AMRs.	Natural navigation is more sensitive to environment variations. The robot could lose its position.
Safety	B56.5-2019 in US / ISO 3691-4:2020 in UE	ANSI/RIA R15.08-1-2020

AMRs represents a huge opportunity in certain applications but not for all the applications. Every single project must be analysed and understood. You have to be sure if it is technically and economically convenient to use AMRs or AGVs.

www.agvnetwork.com

https://www.kollmorgen.com/en-us/products/vehicle-controls/

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