Flexibility through nesting

Building the factory of the future

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2017
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- Introduction to AECOM
- Automated Guided Vehicles (AGVs), autonomous technology concepts and nesting principles
- Autonomous processes and optimisation
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AECOM in numbers

500+
Offices

150+
Countries

85,000
People

US $19bn
Annual revenue

Ranked #1
Design Firms list for 6th consecutive year
...in a diverse set of markets...
Automated Guided Vehicles (AGVs)
Automated Guided Vehicles (AGVs)

- AGVs are independently operated battery powered vehicles guided along defined pathways.
- They can rationalise manufacturing processes in various scenes, such as conveyance between processes, parts supply to production lines and cellular manufacturing lines (assembly on AGVs).
- They are used in the logistics industry for transportation purposes.
AGVs and autonomous technology
AGVs and autonomous technology
Autonomous AGVs: unloading and supply

COMPONENTS IN

GOODS INWARD

EMPTY OUT

LEAVE

Material logistics line supply

= AGV / Truck
How to build products differently using nesting technology
AGVs and nesting vs. traditional conveyor lines in the production environment.

Swarm intelligence is an emerging field of biologically inspired artificial intelligence based on the behavioural models of social insects and animals such as ants, bees, wasps, termites, fish and birds etc. Can be used to develop self learning systems.

Source: iml.fraunhofer.de
AGVs and nesting vs. traditional conveyor lines

**FIFO**
- 1 Path – not flexible
- Conveyor sequence – in line process or pass through with no added value

**HIVE - NESTING**
- Infinite flexible paths
- Self learning algorithms based on output / efficiency
- Pull or force to free process at any capable process stage
- Product powered by itself (integral AGV platform)
- Cells may also move to product for parallel accessible processes

Hyper connectivity
Autonomous systems from a process point of view
Reactionary systems + steering system

Process steering
Higher order organisation monitored and steered

Artificial Intelligence

Human Intelligence

Reactive system
Decision of lower level complexity performed automatically
Multiple levels of process complexity
Layers/levels of complexity

Steering process
Strategic decision-making on production direction

Macro processes
Higher order system upholding efficiency for process output given current parameter, influences micro-processes

Micro processes
System upholds maximum efficiency for single hives at current state, input into autonomous systems

Interaction
Self-driving, minimal decision making, reaction on input
Optimising autonomous system processes through data sharing
Data encapsulation

Communication
Sharing of information through complicated setups and processes

Goal
Accessible knowledge for all involved stakeholders

Encapsulation
Crucial process information confined to each site
Connecting the dots

Knowledge and information shared through a central system

Process optimization achieved at one site is distributed to all other sites.
Data – a sharing culture?

Secure computing
Computations are performed on encrypted data

Data encryption
Content and origin of information unreadable to all but the owner

Encryption Space
Data – a sharing culture?

Readable
Plain text data of any kind

“g(x)”

Encrypted
Unreadable, encrypted and secure data/information

More Math

Readable
Plain text results unencrypted

“g(x)”

Encrypted
Results from encrypted data

Encryption Space
Conclusion of a nesting production
Conclusion of a nesting production

- Builds on existing technologies
- Requires autonomous equipment and systems
- Allows flexibility
- Uses hyper-connectivity
- Multi-level process management
- New business avenues
New business model with autonomous technology

- Technology as a service
- Renting technology
- Reduced CAPEX
- Maintenance by technology provider
- Increased flexibility
- Increased return on investment
Thank you

About AECOM

AECOM is built to deliver a better world. We design, build, finance and operate infrastructure assets for governments, businesses and organizations in more than 150 countries. As a fully integrated firm, we connect knowledge and experience across our global network of experts to help clients solve their most complex challenges. From high-performance buildings and infrastructure, to resilient communities and environments, to stable and secure nations, our work is transformative, differentiated and vital. A Fortune 500 firm, AECOM companies have annual revenue of approximately US$18 billion. See how we deliver what others can only imagine at aecom.com and @AECOM.

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