Mechanical meets digital – the future of intralogistics

Presented by:

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CTO FlexQube Group
MECHANICAL MEETS DIGITAL

THE FUTURE OF INTRALOGISTICS

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WHAT IS LOGISTICS

RIGHT AMOUNT...
OF THE RIGHT MATERIAL...
IN THE RIGHT CONDITION...
AT THE RIGHT PLACE...
IN THE RIGHT SEQUENCE...
IN THE RIGHT TIME!
**WHAT YOU WILL LEARN**

1. Introduction to the speaker and sponsor
2. Main challenges for the factory of the future?
3. What types of flexibility are important?
4. Intralogistics that support the future factory?
5. Digitalisation and industry 4.0
SPONSOR INTRODUCTION
SPONSOR INTRODUCTION

BUILDING BLOCKS

DESIGNONDEMAND™

CUSTOMIZED CART

PLATFORM

CASTERS

TOW BAR

HANDLE BAR

TOP STRUCTURE
TREND 1- MASS CUSTOMIZATION

2000 MASS CUSTOMIZATION

1800 CRAFTSMANSHIP

1900 MASS PRODUCTION

PRODUCT PRICE

“Deliver products that best meet customers needs with the efficiency of mass production”
TREND 2 - CHANGE IS THE ONLY CONSTANT

Advances in technology, increased competition and changes in legal, regulatory or industry requirements force firms to change in response. What’s more, these occurrences now take place on a more frequent basis.
TREND 2 - CHANGE IS THE ONLY CONSTANT
MEGA TRENDS
CHALLENGES

1. MORE PARTS
2. MATERIAL KIT
3. CUSTOMIZED MATERIAL PRESENTATION
4. FREQUENT TRANSPORTS
5. FORK LIFTS ONLY USED IN WAREHOUSE
6. FLEXIBLE ASSEMBLY LINES
7. FLEXIBLE LINE SIDE
8. INTEGRATION WITH AGVs AND ROBOTS

MASS CUSTOMIZATION

WORLD
PEOPLE
TECHNOLOGY
CONSTANT CHANGE
AUDI CONCEPT FACTORY

TODAY

LINEAR

MODULAR

FUTURE?
THE FUTURE FACTORY IS FLEXIBLE

**Volume Flexibility**
Range of output levels that a factory can produce in an efficient way

**Mix Flexibility**
Range of different products and variants that can be produced in a factory

**New Product Flexibility**
Cost and speed to introduce new products into the system

**Automation Flexibility**
Cost and time to introduce automation
THE INDUSTRIAL REVOLUTION

INDUSTRY 1.0
Mechanization, water and steam power.

INDUSTRY 2.0
Electricity and mass production

INDUSTRY 3.0
Automation of single machines and processes

INDUSTRY 4.0
Digitalization of all physical assets and integration into digital ecosystems

BIG DATA
SIMULATION

AUGMENTED REALITY

INTEGRATION

IoT

CLOUD COMPUTING

ADDITIVE MANUFACTURING

COBOTS AND MATERIAL ROBOTS
## IoT WILL HAVE MAJOR IMPACT

<table>
<thead>
<tr>
<th>Category</th>
<th>Billions USD</th>
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<tbody>
<tr>
<td>Offices</td>
<td>150</td>
</tr>
<tr>
<td>Home</td>
<td>360</td>
</tr>
<tr>
<td>Vehicles</td>
<td>740</td>
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<tr>
<td>Shipping</td>
<td>850</td>
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<tr>
<td>Work Sites</td>
<td>930</td>
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<tr>
<td>Shop</td>
<td>1,200</td>
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<tr>
<td>Healthcare</td>
<td>1,600</td>
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<tr>
<td>Cities</td>
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<tr>
<td>Factories</td>
<td>3,700</td>
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</tbody>
</table>

**Source:** McKinsey
CARTS ARE ESSENTIAL

“logistics is the management of the flow of things between the point of origin and the point of consumption in order to meet requirements of customers”
MAKE YOUR BUSINESS FUTUREPROOF.

FUTURE CARTS

MODULAR CARTS  SMART CARTS  MOTORIZED CARTS  AUTONOMOUS CARTS

TODAY  FUTURE

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BIG DATA APPROACH

1. MEASURE

2. ANALYSE

3. ACT
BIG DATA COLLECTION

- Gyro
- Accelerometer
- Magnet
- Temperature
- Light

- Slope
- Tilt
- Turn
- Vobbling
- Obstacle

- Speed
- Vibration
- Load Shock
- Tow Bar Move
- Heavy Brake

- Path
- Distance
- Load On/Off
- In/Out
- Foot Brake
**INDOOR NAVIGATION**

*IntraNav Starter-Kit*
Analytics Types with IntraNav.IO (90 days trial)

**Analytic Base Modules:**
- Dwell time
- Zone retention time
- Geofencing for indoor areas / counter
- Zone counter
- Up time and utilization
- Csv data export

**Heatmap**

**Spaghetti Diagram**

*HERE Indoor Positioning*
Fast and accurate positioning indoors
SELF DRIVING VEHICLES

PERSONAL DELIVERY

AUTONOMOUS CARS

MOWERS

HOUSE KEEPERS

https://www.starship.wy/

http://www.robotictimorow.com/content.php?post_type=1892


THE AGV COMEBACK

1963
First “AGV” ever

1973
First AGV used in final assembly

Today
Increasing use of AGV
## AGV Integration Options

<table>
<thead>
<tr>
<th>Attach</th>
<th>Lift</th>
<th>Mount</th>
<th>Tow</th>
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</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Diagram" /></td>
<td><img src="image2.png" alt="Diagram" /></td>
<td><img src="image3.png" alt="Diagram" /></td>
<td><img src="image4.png" alt="Diagram" /></td>
</tr>
<tr>
<td>Simple</td>
<td>No noise from cart</td>
<td>Less complex robot design</td>
<td>Can pull several carts in train</td>
</tr>
<tr>
<td>No casters</td>
<td>Cart casters not in ground</td>
<td>All energy used for transport</td>
<td>Heavy weights</td>
</tr>
<tr>
<td>Agv only handle one load</td>
<td>Lift limits capacity</td>
<td>Custom mounting interface</td>
<td>Large equipment</td>
</tr>
<tr>
<td></td>
<td>More weight on robot during transport</td>
<td>Caster set up must align with robot</td>
<td>Custom mounting interface</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Caster set up must align with robot</td>
</tr>
</tbody>
</table>
CAN WE CREATE NEW ENTRY LEVEL TO AUTOMATION?

- TECH COMPLEXITY
  - FLOOR GUIDANCE
  - LASER GUIDANCE
  - AUTONOMOUS GUIDANCE
  - REMOTE CONTROL GUIDANCE

- FLEXIBILITY
OUR LONG TERM BELIEF

“The increasing need for frequent, flexible and fast material handling, in combination with disruptive driveline, battery and sensor-technologies will totally change the way we move material”

Per Augustsson
CTO

today cart and drive source are separated

tomorrow cart and drive source are combined
MODULAR AND SCALABLE

- Batteries
- Hub drive wheels
- Regenerative brake
- Sensors and connectivity
- Cameras
- Ultrasonic sensors
- WiFi
- FlexQube

MHI
THE INDUSTRY THAT MAKES SUPPLY CHAINS WORK®
SMART CART FEATURES

- Recognize humans
- Recognize carts
- Recognize signs
- Find open slot
- Distance detection
- Lane recognition
- Sound and light
  - Speed
  - Distance
  - Shock
  - Direction

MHI
The Industry That Makes Supply Chains Work®
FLEXQUBE 4.0 APPROACH

BIG DATA

DASHBOARD

MODULAR AND SCALABLE SMART Carts

REMOTE AND SELF DRIVE
NAVIGATION CATEGORIES

DISTANCE NAVIGATION

- High speed and long distance
- Navigation dependent on infrastructure and/or maps

LOCAL NAVIGATION

- Low speed and short distance
- Navigation only dependent on local objects within 3 meters
LOCAL AREA NAVIGATION

- Straight park
- Parallel park
- Behind park
- Line park
VIRTUAL TRAINS

- No tow tractor needed
- Remote control of leader cart
- 100 percent path tracking for all carts
- Any size and shape of cart
- Any length of train

FLEXQUBE
Industrial carts will never be the same

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