How digitalization of production processes becomes a breeze
Digitalization in production logistic
Digitalization in production logistic

Status Quo – Where is the customer today?

Just under half (49%) of companies using the Maturity Index are still at the “computerisation” stage in the structural area of “resources”. This means that they have yet to achieve widespread “connectivity” of their machines and equipment. The picture is similar in the structural area of “information systems”. 45% of companies have still not achieved extensive horizontal and vertical integration of their in-house systems.

Figure 4: Companies by average overall maturity stage; n=70 (source: Industrie 4.0 Maturity Center)

Figure 5: Distribution of overall maturity stages for the different company categories; n = 70 (source: Industrie 4.0 Maturity Center)

Figure 6: Distribution of companies’ maturity stages for the four structural areas; n = 70 (source: Industrie 4.0 Maturity Center)
Digitalization in production logistic

Status Quo – Where is the customer today?
Digitalization in production logistic
What are the topics and where can we enter?
Digitalization in production logistic

What is OEE?

- **OEE**

**"Six Big Losses"**

<table>
<thead>
<tr>
<th>Availability</th>
<th>Performance</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planned Downtime</td>
<td>Minor Stops</td>
<td>Production Rejects</td>
</tr>
<tr>
<td>Breakdowns</td>
<td>Speed Loss</td>
<td>Rejects on Start up</td>
</tr>
</tbody>
</table>

In a 480 minute shift:

- On a machine rated at 100 products output per minute
- Maximum output = 480 mins x 100 units = 48000 units

Shift info:

<table>
<thead>
<tr>
<th>Output (Good Production)</th>
<th>Speed</th>
<th>Planned downtime</th>
<th>Bottleneck loss due to B/down</th>
<th>Rejets (in process)</th>
</tr>
</thead>
<tbody>
<tr>
<td>32000 units</td>
<td>98 units per minute</td>
<td>82 mins</td>
<td>30 mins</td>
<td>1255 in 0 hr shift</td>
</tr>
</tbody>
</table>

Output (OEE) = 32000 / 48000 = 66.7%

480 mins x 66.67% = 320 mins, therefore Total Loss = 160 mins

**Six Loss Calculations:**

**Speed loss**

Max theoretical units possible at actual speed = 98 x 480 = 47040

= (32000/47040) = 68.03% - 66.67% = 1.36%

480 x 1.36% = 6.53 mins / 480 = (1.36%)

Planned downtime = 82 mins / 480 = (17.08%)

Breakdown = 30 mins / 480 = (6.25%)

Rejects = 1255 / 98 (actual running speed) = 12.81 mins / 480 = (2.67%)

Minor stops = 480-320-6.53-82-30-12.81 = 28.66 mins / 480 = (5.97%)

Total loss = 160 mins = (33.33%)

**OEE Calculations (Time in mins):**

- Production time = 480
- Time less availability loss = 368
- Time less performance loss = 333

<table>
<thead>
<tr>
<th>Availability Loss</th>
<th>Performance Loss</th>
<th>Quality Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planned downtime</td>
<td>Speed loss</td>
<td>Rejects on start up</td>
</tr>
<tr>
<td>Breakdowns</td>
<td>Minor stops (&lt;5mins)</td>
<td>Rejects in process</td>
</tr>
<tr>
<td>Total</td>
<td>Total</td>
<td>Total</td>
</tr>
<tr>
<td>112</td>
<td>35.63</td>
<td>12.81</td>
</tr>
</tbody>
</table>

Availability (368/480) = 77%

Performance (333/368) = 90%

Quality (320/333) = 96%

OEE = 0.77 x 0.9 x 0.96 = 66.7%
Agenda

1. Production logistics overview
2. How SICK can digitalize your processes
   a. Inbound/Outbound area
   b. Material flow
   c. Kanban
   d. One piece flow
   e. Mobile platforms
   f. Safe material flow
   g. Data integration
   h. Open space storage
   i. Robot loading
Production Logistics

Manufacturing process
Topics around Production Logistics
And the matching SICK solution portfolio

Material Data Management
› Identification, Handling Unit Management

Material Flow Optimization
› Identification, Localization, Analytics

Kanban
› Identification, Smart Shelf, Middleware

One Piece flow
› Identification, Robotics

Mobile Platform Navigation
› Mobile Platforms, Middleware

Safe Material Transport
› Mobile Platforms, Industrial Trucks

Data Integration
› Connectivity, Middleware, Analytics

Open Space Storage
› Localization, Picking

Flexible robotic Loading
› Robotics
# Topics around Production Logistics

And SICK highlight solutions

<table>
<thead>
<tr>
<th>Topic</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material Data Management</td>
<td>RFGS, MDA, AutoID</td>
</tr>
<tr>
<td>› Identification, Handling Unit Management</td>
<td></td>
</tr>
<tr>
<td>Material Flow Optimization</td>
<td>Asset Analytics, Reading Gate</td>
</tr>
<tr>
<td>› Identification, Localization, Analytics</td>
<td></td>
</tr>
<tr>
<td>KanBan</td>
<td>AutoID, SmartShelf</td>
</tr>
<tr>
<td>› Identification, Smart Shelf, Middleware</td>
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<tr>
<td>One Piece flow</td>
<td>PLOC, Auto ID</td>
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<tr>
<td>› Identification, Robotics</td>
<td></td>
</tr>
<tr>
<td>Mobile Platform Navigation</td>
<td>LIDAR LOC, Locu, MLS</td>
</tr>
<tr>
<td>› Mobile Platforms, Middleware</td>
<td></td>
</tr>
<tr>
<td>Safe Material Transport</td>
<td>Nano Scan, Visionary B, Docking</td>
</tr>
<tr>
<td>› Mobile Platforms, Industrial Trucks</td>
<td></td>
</tr>
<tr>
<td>Data Integration Middleware</td>
<td>Connectivity, Batch Reading HD, Asset Analytics</td>
</tr>
<tr>
<td>› Connectivity, Middleware, Analytics</td>
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<tr>
<td>Open Space Storage</td>
<td>Locu UC3, Locu UC4</td>
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<tr>
<td>› Localization, Picking</td>
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<tr>
<td>Flexible robotic Loading</td>
<td>Pallettizer, PLB, Safe Robot Speed</td>
</tr>
<tr>
<td>› Robotics</td>
<td></td>
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</table>
Master Data Management
Highlight applications and solutions

Why is it important
Many Logistic IT Systems use the material master data. The most relevant logistic features are:
› Reference ID
› Volume
› Weight
› Quantity

These features are sometimes not available or can be wrong in the material master database. These errors can root cause logistic problems (too big to handle, too little parts) or waste resources (too much space needed / too many parts).
Manually checking or editing these feature is non-value added work.

How can SICK help
SICK Systems can help checking or automatically editing material master data, single or multi feature based
› Auto ID Products
› Reading gate
› Master Data Analyzer
Master Data Management

Focus areas

- Master Data Analyzer
- Identification Solutions
- Reading Gate Identification Solutions

Webinar logistics
Material Flow Optimization
Highlight applications and solutions

Why is it important

The material flow within a production is often subject to optimization. The reason is, that a non optimized material flow generates non value add processes like inefficient transport or searching and also unnecessarily binds too much capital.

The first step to optimization is visualizing the current situation and generate transparence.

How can SICK help

SICK localization solutions give full transparence of the material flow including analytical tools

› Auto ID (esp. reading gates)
› Asset Analytics
Material Flow Optimization

Focus areas

Material flow analysis

Bulk auto ID of objects on
Material Flow Optimization

DEVELOPMENT STAGES AND OPERATIONAL BENEFITS

**Webinar logistics**

- **ENABLE VISIBILITY**
  - Real-time information for assets or materials
  - Continued tracking of physical transaction

- **GENERATE TRANSPARENCY**
  - No gray spots
  - Less searching

- **MAKE PREDICTABLE**
  - Estimated time of arrival (ETA) at transport unit level
  - Minimal idle time
  - Improved inventory management
  - Specific alert functions

- **PROCESS MANAGEMENT**
  - Automatic booking of receipts
  - Faster reactions to unexpected events
  - Reduce manual material postings
  - More efficient use of assets

**DATA FUSION** (APPLICATION 2)

**FULLY INTEGRATED** (APPLICATION 3)

**OPEN SPACE STORAGE** (APPLICATION 1)
Kanban
Highlight applications and solutions

Why is it important
Kanban is a scheduling system for lean manufacturing and just-in-time manufacturing. In its original form, Kanban cards are used to trigger replenishment within production. Often parts are stored in special Kanban shelves. When taking out a container with a specified amount of parts, the respective card has to be sent to the manufacturing unit.

Modern systems are working digitally connected using ID Systems like Barcodes or RFID in order to automatically start material replenishment.

How can SICK help
› Identification Solutions
› Auto ID reading gate
› Smart Shelf
Kanban
Focus areas

Identification solutions

Smart Shelf

Reading gate
One Piece Flow
Highlight applications and solutions

Why is it important

One piece Flow describes a production concept, that is widely used to cover the demands for a high flexibility down to batch size zero. The idea is, that a production “line” can manufacture products with a high variance. Often it is realized by generating a modular cell based manufacturing concept, which can handle different product variant with no or minimal set up times.

These concepts require the manufacturing cell to match the current product variant with the necessary operations. Hence each product has to be reliably identified in the manufacturing cell.

Another aspect is that these concept enable a 100% traceability in terms of quality control.

How can SICK help

› Auto ID Products
› Robot guidance
One Piece Flow

Focus areas

Robot guidance

Identification solutions
Mobile Platforms
Highlight applications and solutions

Why is it important
In high flexible production mobile platforms like AGV’s are one of the most important solution to reach the necessary flexibility. Fast, reliable and flexible internal transport is important. To coordinate all these autonomous driving vehicles in a production area it is key to know where these vehicles are driving and which route they are following. Here is SICK delivering different solution for localization and navigation.

In production area the environment could change very fast. A reliable localization and navigation of these vehicles is the challenge which has to be solved.

There are solution from line guidance systems with an fixed route or Lidar systems which are used for „free“ navigation in a closed production area.

How can SICK help
› MLS Magnetic Line System
› LiDAR LOC – VLS Virtual Line System
› UWB
Mobile Platforms

Focus areas

LiDAR LOC with Virtual line feature

Line Guidance

UWB-System LOCU
Mobile Platforms
Why is navigation/ localization important

ALLOW VISIBILITY
- Keep overview in large facilities or areas
- Check availability of assets or goods

CREATE OVERVIEW
- Allow Estimated Time of Arrival
- Decrease effort searching assets

ENABLE EFFICIENCY
- Eliminate manual material postings
- Enable inventory management
- Increase efficient use of assets

MANAGE AGILE PROCESS
- Enable agile navigation of assets

ALLOW VISIBILITY
ENABLE EFFICIENCY
CREATE OVERVIEW
MANAGE AGILE PROCESS
**Safe Material Flow**
Highlight applications and solutions

**Why is it important**
Material Transport means moving goods.
Movement can easily mean a hazard to people and material.
Not only on open space, but also at the interfaces between to predeceasing or following process steps like storage or machines.

**How can SICK help**
SICK offers assistance solution for trucks and safety solutions for mobile platforms and the interface between the mobile platforms and machines.

› Safety Laser Scanners in mobile platforms
› Mobile Platform Machine interface (Docking)
› Visionary
Safe Material Flow

Focus areas

- Driver assistance systems
- Safe AGV Docking
- AGV safety
Data Integration
Highlight applications and solutions

Why is it important
Information in only valuable if it can be used in the appropriate system. Data integration into customer systems. Systems like Production Scheduling, MES, PPS, ERP often need a feedback loop from the field in order to have life feedback and to operate dynamically.

How can SICK help
SICK offers a wide range of products systems and services to integrate sensor information into customer systems.
› Connectivity Products like TDC-E / SIM
› Middleware Batch Code reading ERP integration
› Asset Analytics
› Work-In-Process Tracking
Data Integration

Focus areas

Integration products

Integration into ERP

Work-in-Progress Tracking

AssetHub
**Data Integration**

Integration Products

- **Telematic Data Collector**
  - TDC-E

- **Sensor Integration Machines**
  - SIM200
  - SIM1000
  - SIM1004
  - SIM1012
  - SIM2500
  - SIM2000 ST-E
  - SIM2000 ST
  - SIM2000
  - SIM2000 ST
  - SIM4000 (PowerPC)
  - SIM2500
  - SIM4000
  - SIM2000

- **Ident Connection Boxes**
  - CDB6xx
  - CDF600
  - CDM4xx

- **Sensor Integration Gateways**
  - SIG100
  - SIG200

- **Sensor Integration Displays**
  - SIDxxx
  - SID120
  - SID70

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**Scalable portfolio for multi-sensor data acquisition and processing**

- Maximum performance thanks to the latest and powerful CPU architecture
- IoT gateway for vertical sensor data integration into the cloud

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**Status:** July 2020
Data Integration
Work-In-Process Tracking

How to use shop floor live data to optimize lead times? Do you suffer from uncertainties in your manufacturing lead times?

› Tracking items and material on shop floor
› Optimization of value stream
› Eliminate delays and errors
› Reduce rework procedures

Based on the solved data application WIP Tracking, SICK is offering customized digital solutions with following project scope:

› Digital Consulting Services
› Identification System (e.g. RFID)
› Data Integration Engineering
› Software-as-a-Service (SaaS) incl. cloud solution hosting on Azure, AWS
Open Space Storage
Highlight applications and solutions

Why is it important

Many goods are too big to be efficiently stored in warehouses or the material flow requires them to be easily accessible. This is why open space storages are widely found in production environments.

The disadvantage is that objects on open space storages can less easily be tracked and errors are more likely to occur due to a high rate of human interaction.

How can SICK help

SICK Localization System LOC provides different ways to improve the efficiency of open space Storage. A simple visualization of the objects' position will reduce searching. By using GeoZones, defined actions can be triggered like checking completeness of material in picking areas or automatic issuing of dispatch order in outbound goods area.

› Tag based localization of objects
› Automatic dispatch order
› Completeness check in preparation area
Open Space Storage

Focus areas

- Localization of Object
- Completeness check in picking
- Automatic dispatch order
Flexible Robotic Loading
Highlight applications and solutions

Why is it important
Robotic loading has become extremely popular, also driven by the availability of low cost collaborative robots. However, the increasing variety in manufacturing also requires loading robots to be flexible, efficient and safe at the same time.

How can SICK help
SICK offers a wide range of solutions for the flexible automation on robots
› Vison system for Paletizing / Depaletizing
› Vision system for bin picking
› Safe Robot Speed
Flexible Robotic Loading
Highlight applications and solutions

- Belt / Bin picking
- Palletizing / Depalletizing
- Safe robot speed
Thank you for your attention!