Digitalization in the Food and Beverage Industry

Frederic Tholence, ABB Corporate Research
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- business risks associated with the volatile global economic environment and political conditions
- costs associated with compliance activities
- market acceptance of new products and services
- changes in governmental regulations and currency exchange rates, and
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This presentation contains non-GAAP measures of performance. Definitions of these measures and reconciliations between these measures and their US GAAP counterparts can be found in the ‘Supplemental reconciliations and definitions’ section of “Financial Information” under “Quarterly results and annual reports” on our website at www.abb.com/investorrelations.
Introduction ABB Corporate Research
1000 day program
Digitalization within the FnB
Some examples digitalization for cleaning application
## ABB today – A global leader in power and automation technologies

<table>
<thead>
<tr>
<th>What (Offering)</th>
<th>Power &amp; Automation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>~40% of revenue</td>
</tr>
<tr>
<td>Automation</td>
<td>~60% of revenue</td>
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</table>

<table>
<thead>
<tr>
<th>For whom (Customers)</th>
</tr>
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<tbody>
<tr>
<td>Utilities</td>
</tr>
<tr>
<td>Industry</td>
</tr>
<tr>
<td>Transport &amp; Infrastructure</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Where (Geographies)</th>
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<tbody>
<tr>
<td>AMEA(^1) 37%</td>
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<tr>
<td>Americas 30%</td>
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<tr>
<td>Europe 33%</td>
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</tbody>
</table>

| ~ $36 bn revenue |
| ~100 countries   |
| ~135,000 employees |
| Single “A” credit rating |
| HQ Zurich        |

\(^1\) Asia, Middle East, Africa
Well positioned in attractive markets
Long-term market growth drivers intact

Power & Automation

Utilities
- Renewables
- Grid automation / digitalization
- Microgrids
- Smart upgrades
- Electrification penetration
- Energy storage

Power & Automation “for the grid”

Industry
- Productivity
- Energy efficiency
- Automation penetration
- Internet of Things, Services and People
- Power quality / reliability
- Emerging markets

Power & Automation “for the site”

Transport & Infrastructure
- Urbanization
- Data management
- Electric transport
- Energy efficiency
- Power quality / reliability
- Decentralized power generation

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# ABB Corporate Research Center, Sweden

## Facts & Figures

### People
- **250 employees**
- 50 nationalities
- 60% PhD
- 20 adjunct and affiliated researchers
- 80 diploma students annually

### SECRC Departments
- Automation solution
- Electrical systems
- Power devices
- Technology Consulting

### Facilities
- First research laboratory established 1916
- **Extensive laboratory facilities**
  - High voltage and high power labs
  - Cobot labs
  - ABB Lighthouse
  - Software, UX and communication labs
  - Electrical apparatus and motor testing labs
  - Mechanical test lab
  - High Performance Computing
  - Chemistry lab
  - Materials lab
  - and more...

### Visibility
- 180 scientific publications
- 115 patents first filings
- Several awards

### University collaborations
- **Sweden**
  - Chalmers University of Technology,
  - KTH Royal Institute of Technology,
  - Linköping Institute of Technology,
  - Uppsala University,
  - Mälardalen University

- **Internationally**
  - MIT, Stanford University,
  - Carnegie Mellon University and Rensselaer Polytechnic Institute U.S.,
  - Imperial College in UK,
  - MIT in Japan, etc.
# 1000 day program

<table>
<thead>
<tr>
<th>Picking, Packing, Palletizing</th>
<th>Electrical &amp; mechanical</th>
<th>Power distribution, protection &amp; quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>FlexPicker</td>
<td>Motors</td>
<td>MV &amp; LV SWG</td>
</tr>
<tr>
<td>PalletPack</td>
<td>Variable speed drives</td>
<td>Power protection &amp; quality (UPS, AVG)</td>
</tr>
<tr>
<td>RacerPack</td>
<td>Ultra-Kleen</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Transformers</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Control</th>
<th>Safety &amp; protection</th>
<th>Instrumentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control systems</td>
<td>Electric installation</td>
<td>Hygienic master</td>
</tr>
<tr>
<td></td>
<td>Machine safety</td>
<td>Volumetric laser scanner</td>
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<tr>
<td>MES</td>
<td>Motor control center</td>
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Sustainability Ties:
1) Use less electricity and energy and augment with renewable sources
2) Use higher efficiency transformers
3) Achieve better control and measurements, heating, steam
4) Save energy with variable speed and more efficient motors
5) Keep equipment running, reduce waste with protection class products
6) Ensure safety and accuracy with instrumentation
7) Keep food safe while reducing waste
8) Help humans with robots and automation
9) Communicate and control – wireless – less wiring
10) Trace product to keep people safe
11) Clean up power – power factor improvement, harmonic reduction
12) Ensure reliable power with UPS and power quality devices
13) Avoid costly downtime and achieve safer operation with modern switchgear
14) Identify the Culprits!!!!
Mega-shifts or industry trends lead to Increased opportunities

Food safety

**Challenge**

The average cost of a food safety recall is $10-30 MUSD, not including the cost to the company’s reputation.

In order to improve food safety by prevention instead of addressing problems after they occur, new legislation has been passed called the Food Safety Modernization Act or the FSMA.

The FSMA has changed the F&B business by increasing documentation and record storage, driving investments in technology to improve auditing and documentation and has increased auditing and inspections.

**Solutions**

**Stainless steel motors**

Stainless steel motors and gear reducers designed to meet the toughest demands for food production and processing.

**IP69K conduit & fittings**

Conduit and fittings for extreme temperature protection, corrosive and harsh environments and liquid ingress protection.

**Detectable ty-raps**

Cable tie designed to be detected easily by metal detectors, x-ray equipment and vision detection systems.

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ABB unlocks significant customer value through digital

Anti-microbial cable protection solutions
The next generation of cable protection for the food and beverage industry

https://youtu.be/i58SDKPkJ_cM
Mobile technologies change the way we interact

We are becoming a mobile first world

- Traffic to retail websites through mobile devices in 2015: 57%
- Expected global mobile penetration by 2020: 90%
- Expected growth in mobile advertising: 36%
- Forecast of global mobile payments in 2016: $520bn

Social media is here to stay

- It took radio 38 years to reach 50 million users...
- ...it took Twitter 9 months

Over 1.5 Billion users on Facebook in 2015

Studies have shown people are more likely to be influenced by social media

Viral marketing rapidly reach millions globally and accelerate innovation
Five main forces
That are shaping the future of consumer companies

1. Changing face of the customer
2. Patterns in personal consumption
3. Structural industry shifts
4. Evolving geopolitical dynamics
5. Advances in technology and innovation
## Five main forces
Most impact food and beverage manufacturing

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<thead>
<tr>
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<tbody>
<tr>
<td>Exploding middle class</td>
<td>Increase in convenience</td>
<td>Activist investors</td>
<td>Rising labor and commodity costs</td>
<td>Mobile world</td>
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<tr>
<td>Rich become richer</td>
<td>Focus on health and wellness</td>
<td>Direct-to-consumer models</td>
<td>Economic power shifts</td>
<td>Ubiquitous internet</td>
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<tr>
<td>Shrinking household size</td>
<td>Demand for personalization</td>
<td>Vertical integration backwards</td>
<td>Increasing governmental intervention</td>
<td>Big data for operations</td>
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<tr>
<td>Heightened quality concerns</td>
<td>Shift towards private labels</td>
<td>Continued consolidation</td>
<td>Economic interconnectedness</td>
<td>Artificial intelligence</td>
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<td>Aging population</td>
<td>Choice simplification</td>
<td></td>
<td>Climate change</td>
<td>3D printing</td>
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<tr>
<td>Urbanization</td>
<td>Sharing economy</td>
<td></td>
<td>Volatility of raw material costs</td>
<td>Digital profiles</td>
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<tr>
<td>Millennials taking over</td>
<td>Focus on shopping experience</td>
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<td></td>
<td>Internet of Things</td>
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<td></td>
<td>Demand for customization</td>
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<td>Virtual reality</td>
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<td></td>
<td>Buying local</td>
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<td></td>
<td>Wearables</td>
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<td>Autonomous vehicles</td>
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<td>Social media driven consumption</td>
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<td>Advanced and predictive analytics</td>
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<td>Advanced robotics</td>
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And can be addressed by focusing on cost, quality and flexibility.
These trends increase F&B challenges
Focus remains on cost, quality and flexibility

- Rising labor and commodity costs
- Climate change
- Volatility of raw materials costs
- New technologies
- Shift towards private labels

Deeper cost reductions required
Higher level of price competitiveness
Erosion of traditional benefits of economies of scale
Early adopters of new technologies increasing their competitiveness

Orange juice retail price in Germany is $1.26/L while in the US it's $2.02/L
These trends increase F&B challenges
Focus remains on cost, quality and flexibility

- Demand for personalization
- Heightened quality standards
- Buying local
- Focus on health and wellness

Enhanced traceability required from consumers “buying local”

Associated recall costs risk and authorities pressure

Quality to be a key differentiator in products

Personalized products requiring enhanced quality requirements

1. Cost reduction
2. Quality and traceability
3. Increased flexibility

Nestlé lost USD ~500 mn due to the 2015 Maggi noodles recall in India
These trends increase F&B challenges
Focus remains on cost, quality and flexibility

- Direct-to-consumer models
- Continued consolidation
- Vertical integration backwards
- Increase in convenience

Customization requiring flexible supply chains
Supply chains need to meet online delivery models
Increased complexity in transportation and distribution from new channels

1. Reduced cost
2. Quality and traceability
3. Increased flexibility

SOURCE: ABB Survey; Industry expert interviews; Press research.
Four key core technology areas

Needed to reach the next level of manufacturing

- Increased availability of data, connectivity and computational power
- Advanced analytics proliferation across all operations areas
- Improved human-machine interaction with augmented reality technologies
- Increased usage of robotics and 3D printing
How ABB Ability™ solutions deliver value

Digitally connected products and services providing expertise

- Together
  - Know more
  - Do better
  - Do more

- Collaborate
  - Analyze
  - Sense
  - Act

- Optimize
  - Automate

- Assess

>55% of ABB’s sales from software and digitally enabled devices

https://youtu.be/QerYlxzvtvM
The Food & Beverage industry is at the beginning of digitalization...
Awareness is growing

Leading players are talking about digital

"We are very seriously trying to transform our company to make it a digital company, but it's not just to put ads in social media”.

12.09.2016 – Marcos De Quinto, CEO of CCIB

"We don't just talk digital, we act digital (...). It's no longer a question of whether you implement digital or not, but how fast and big you should go”.

12.2016 – Pierre Lacour, CIO in Asia Pacific region

"As part of its digital transformation, Lacatalis has launched a new app aimed at its foodservice clients in Spain”.

09.06.2016 – Info Retail

"Because we have our own digital media channel, we gain more and more insights into the consumer journey, which means we constantly try to match the consumer's needs better than ever before”.

04.29.2016 – Luc Wong-Lun-Hing, Digital Innovation Manager

"We’re the only dairy co-operative in New Zealand offering smartphone apps to help our farmers to run their businesses and connect with the Co-operative, and we’re constantly enhancing our digital offering based on farmer feedback”.

06.09.2016 – Evelyn Seewald, GM Operations

“As part of its digital transformation, Nestle has launched a new digital hub in Barcelona that will generate 70 highly qualified jobs related to will be used for digital platforms that the group will use to communicate with consumers on a global scale”.

02.03.2016 – La Vanguardia
By 2022 two-thirds of factories will be digitized

This will open up many cost reduction opportunities

Digitalization use will significantly grow over the next five years

<table>
<thead>
<tr>
<th>Year</th>
<th>Digitalization Use</th>
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<tbody>
<tr>
<td>2016</td>
<td>26%</td>
</tr>
<tr>
<td>2022</td>
<td>68%</td>
</tr>
<tr>
<td>2026</td>
<td>80%</td>
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</table>

Automotive 41%
ABB unlocks significant customer value through digital

Example: ABB Ability™ smart sensor for motors—lower service costs & unplanned outages

**Challenge**

A single motor failure can cause the entire production to stop

Fixed time-interval maintenance schedules are used rather than actual condition based maintenance

**Solution & Benefits**

ABB Ability™ smart sensors: monitor the operation & health parameters for LV electric motors

Connected to ABB Ability™ or customer’s cloud

Battery operated, wireless communication with gateway

Pro-active condition based maintenance → lower service costs & lower risk of unplanned outages
ABB unlocks significant customer value through digital
Example: RobotStudio – lower service costs & unplanned outages

**Challenge**

German brewery **Rothaus**:
Keg system to handle its beer created a throughput bottleneck
It managed only 120 kegs / hr and could only manage the German DIN keg-size

**Solution & Benefits**

ABB robots load and unload the kegs and handle the pallets
RobotStudio was used to plan & configure the system
RobotStudio can also be used for remote maintenance via PC

The software checks the residue in the keg, capacity & pressure conditions, correct temperature & cleaning & rinsing agents.
The life cycle of each keg incl. maintenance work can be tracked by a RFID transponder
Digitalization in the cleaning process

Cleaning simulation software

Verification of tank cleaning parameters
Documented operating parameters including impact coverage
Avoiding investing in oversized installation
Optimization of CIP process (including geometry, T, t, type of soil, type of nozzle, pressure etc...)

Way to Digitalization

Simulation
Model Process
Draft
Control Data
Machine, Cleaning system
Cleaning sensor and actuators
Other example of digital solution for CIP cleaning in FnB
Diversey® CIPTEC

Real time monitoring system to assess the amount of soil or detergent during the CIP process

https://youtu.be/UpzYQ4q9mcI
Cleaning of processing machinery

Fraunhofer IVV

Servodriven Tank Cleaner

Mobile cleaning device

https://youtu.be/GrH9rF43ByM