Digitization in the Footwear Industry

The Company DESMA

- Location Bremen/Germany
- founded 1946
- 225 Employees
- 54 mio USD
- Sales (Exportrate >92 %)

- Machines, Automation and Molds for the industrial footwear production

Asia 34%
Europe 31%
South America 9%
North America 15%
GUS 5%
Oceania 6%
Market Development and Product Requirements

Global Footwear Production and Consumption

<table>
<thead>
<tr>
<th>Year</th>
<th>Shoe Production [billion pairs]</th>
<th>Population [billion]</th>
<th>Shoe Consumption [pairs/year/head]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>5</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>1970</td>
<td>10</td>
<td>15</td>
<td>3</td>
</tr>
<tr>
<td>1980</td>
<td>15</td>
<td>20</td>
<td>4</td>
</tr>
<tr>
<td>1990</td>
<td>20</td>
<td>25</td>
<td>5</td>
</tr>
<tr>
<td>2000</td>
<td>25</td>
<td>30</td>
<td>6</td>
</tr>
<tr>
<td>2010</td>
<td>30</td>
<td>35</td>
<td>7</td>
</tr>
<tr>
<td>2020</td>
<td>35</td>
<td>40</td>
<td>8</td>
</tr>
</tbody>
</table>

Total 2016 23.15 billion
est 2017 23.67 billion

Sources: DESMA market analysis 2016; based on numbers of WTO, UN, Footwear organisations, Material supplier
China dominates still by far the footwear industry!

Footwear and Textile Production in Asia

- Footwear av.
  - Cutting 50
  - Stitching 100
  - assembly 50
- 1200 pairs/8h
- ~80 workmin/pair
Trends – Developments - Keywords

Urban Production
- Decentralisation
- Reshoring
- Self Adapting Production
- Lead Time
- Mass Customization
- Sustainability
- Additive Manufacturing

Design for Manufacturing
- Fair Production
- Taylor made
- Smart Factories
- Industrial Revolution 4.0
- Internet of the things

Development of the Footwear Industry over 60 years

- Order lot Size
- Warehouse Inventory
- Product Variation
- Customer Influence

- 1960
- 1980
- 2000
- 2020
Challenges today and tomorrow

- rising labor cost
- shrinking lot sizes
- product quality level
- decentralized production hubs
- flexible systems
- automated production

- design for manufacturing
- retail entertainment
- logistic to consumer
- integrated design to production
- virtualisation and cyber physical systems
- high quality standardization
- knowing customer data

- speed to market
- rising import duties
- digitisation in products
Some Milestones on DESMA Digitization Path

- 1996 robotic off-line programming
- 1999 full RFID object tracking
- 2001 high performance PLC
- 2003 intuitive robot programming
- 2006 self programming robot
- 2010 self learning machine concepts
- 2014 Multi Touch HMI control
- 2016 Design to Manufacturing
- 2018 Consumer scan to production

Process Design for Production

- 2D sketch: consideration of all options of the final production process
- 3D design: ideally using parametric 3D design
- 3D meta information: position and kind of application + segment characteristic
- 3D production information: mold + last production, upper + sole production

We need a cyber physical description of the „end product shoe“ and the total manufacturing process
## PFC – DESMA xx-48923P

<table>
<thead>
<tr>
<th>S</th>
<th>Process</th>
<th>Equipment</th>
<th>Parameters</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Steaming</td>
<td>Equipment A1</td>
<td>110°C, 50gr/sec</td>
<td>Upper Series 10-48923P</td>
</tr>
<tr>
<td>2</td>
<td>Digitizing</td>
<td>Equipment B1</td>
<td>280 dpi, 100mm/sec, dia 12mm</td>
<td>Primer HB4523</td>
</tr>
<tr>
<td>3</td>
<td>Conditioning</td>
<td>Equipment B2</td>
<td>120°C, 3m/min</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Conditioning</td>
<td>Equipment B3</td>
<td>280 dpi, 80mm/sec, dia 11mm</td>
<td>Cement SB6387</td>
</tr>
<tr>
<td>5</td>
<td>Auto setting</td>
<td>Equipment C1</td>
<td>30mm/sec - press 3,7bar</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Delasting</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Production Line

- Equipment A1
- Equipment B1
- Equipment B2
- Equipment B3
- Equipment B2
- Equipment C1

### Production Line

1. Steaming
   - Upper Series 10-48923P
2. Digitizing
   - Primer HB4523
3. Conditioning
4. Auto setting
5. Delasting

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## PFC – DESMA xx-55251DI

<table>
<thead>
<tr>
<th>S</th>
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</tr>
<tr>
<td>2</td>
<td>Handover</td>
<td>Robot I6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Direct Inject</td>
<td>Equipment D1</td>
<td>45°C, 40gr/sec</td>
<td>DS Chem 22987-G</td>
</tr>
<tr>
<td>4</td>
<td>Conditioning</td>
<td>Equipment B4</td>
<td>5°C, 3m/min</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Delasting</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Production Line

- Equipment A1
- Robot I6
- Equipment D1
- Equipment B4

### Production Line

1. Steaming
2. Handover
3. Direct Inject
4. Conditioning
5. Delasting

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Adapting Production Lines

**Product A**

- I know the materials
- I know the max speed 1850rpm
- I know the cycle time 15sec
- I know the max temperature 120°C
- I know the final humidity 65% rel.
- I need speed m/min for 3m at 100°C
- I need pressure for 6sec pressing

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Adapting Production Lines Reconfiguration A=>B

**Product B**

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Coming Intralogistics and Service - Robotics

- Autonomous transport for decentralized, moving warehouse
- Machine transport for equipment warehousing for production line configuration
- Service robotic for production support for automatic maintenance

Individualization
Innovative Consumer Platform Fitstation

Personal Data → Biometric Analysis → Shoe Configuration

Consumer → fitstation → Production → Payment

Shipping → Delivery

Processing

A first, stabilizing layer is directly modeled onto a carrier fabric.
Customization, Data Collection and Service is Key

- brands need feedback about their products
  - miles – breakdown – service
- brands need to know, why products are used
  - when – where – how
- brands need to know the consumers
Driving Consumer Trends – Digitization in Retail

- 24/7 Retail
- Userfriendly Interfaces
- Speed2Consumer
- Exciting consumer Experience
- Brand-Consumer relationship
- Consumer-Centric-Products
- Individualization
- UserGroups
- Product-Reviews
- Uniqueness
- Loyalty programs
- Game-Retailing
- Self Adapting Products
- Taylormade
- Smart Textiles/Wearables
- Comfort
- On Demand economy
- ProductBundles
- Health+Performance
- Sustainability
- Portfolio: Heritage + Innovation

Market-Development to Shop - “ProduTainment“

- Increase the adventure for the consumer by mixing production with entertainment
**Shop-Production „Individual-Shoe“ - ProduTainment**

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**Current Shop Examples**

- NEW Balance made - Boston
- Adidas KnitForYou - Berlin
- Converse Blank Canvas - Boston
- Nike ID Studio - London
Data = Value

The world’s most valuable resource

Data and the new rules of competition

Activity Data Logging
3D Printing Frame Structures

3D Printing Individual Saddles
Example for *Shop-Production „Individual-Bike“*

Is Additive Manufacturing a Solution for Shoe-Production?

- 3D printing / AM is a general trend but not used in massproduction
- Limitations by:
  - material
  - time
  - cost
What our Industry Requires

- Innovative Applications
- Closed chain from design to manufacturing
- Self Adapting Production lines
- Intelligence in Footwear
- Smart recycling solutions
DESMA Roles in Industry 4.0

- In the market
  - Desma is a global technology leader in a small industry niche
  - a "hidden champion" in the "German Mittelstand"

- In the German IR4.0 Initiative
  - Steering Member in "Plattform Industrie 4.0"
  - Representing SME’s
  - Pushing SME and market requirements and technology developments into the Platform Work-Groups

- For our global Industry
  - Supplier of IR4.0 technologies
  - Multiplier to transfer digitization into equipment and raw material supplier base
  - Integrator of a global interoperational network for the full supply chain in the footwear industry

New Supply Chain Structures – Industry 4.0

- Handlebar as Example for the structure of new business platforms

Latest Actions in Professional and Consumer Market

- 10/2017 Duesseldorf/DE
- 11/2017, Austin/TX

Transfer the Message to Industries

- DIN „Normenwerk“ Exhibition
- DIN explaines Industry 4.0

https://youtu.be/0DaS7zkKcAo
we like to drive industrial innovation in footwear

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