CLOTHING+ SENSORS

COMFORTABLE SENSOR SOLUTIONS
INSPIRING GLOBAL MEGATRENDS

+ **Growing interest in personal wellbeing**
  + Monitoring the effects of sports, exercise and changes in lifestyle
  + Motivation, comparing results with peers
  + Collecting and sharing interesting personal data

+ **Electronics becoming smaller, cheaper and more energy-efficient**
  + Electronics integrate with other products
  + Toys, cars, clothing -> **Clothing+**
Clothing+ Sensors

+ The Clothing+ vision is to implement comfortable sensor systems.
+ Clothing and textile approach gives a natural platform for measuring on the human body.
+ Application areas: sports, wellbeing, rehabilitation, games, occupational health and healthcare.
+ Interdisciplinary approach.
+ Clothing+’s role in the business is to integrate sensors “seamlessly” into textile materials.
STRENGTHS OF TEXTILE INTEGRATED SENSORS

+ Natural to put on and comfortable to wear
+ An invisible and easily accepted way to wear sensors
+ Correct sensor placement is solved with carefully designed clothes or accessories
+ Required cables between the sensors and electronics can be integrated into the textiles as well
+ Sensors are worn unobtrusively, even over a long period of time
TEXTILE HEART RATE SENSING
Comfortable heart rate monitoring

+ **Clothing+** core business is to implement comfortable heart rate sensing solutions

+ Comfortable textile strap is rapidly replacing 30 years old plastic strap technology

+ Textile strap is a clear trend in HRM business

  + **Clothing+** is implementing this trend with key players of industry
The main customers are Polar®, Suunto®, adidas®, Garmin®, Sigma Sport®

Clothing+ sold almost 3,5 million textile HRM straps in 2011
HR SENSING UNDERWEAR BUSINESS

+ **Sport apparel are an interesting products to integrate heart rate sensors**
  + **Products have optimal sizing system and therefore good skin contact for sensing**
  + **Sport underwear (especially the sports bras) has a clear wearing problems with sensor belt**

+ **The dream of heart rate sensing underwear is turning to be a business**
  + **Business environment is more ready than ever for successful integration**
Under Armour E39
PureLime Intelligent Bra

+ Also Purelime launched HR sensing sports bra Integrated textile heart rate sensors in 2011
  + Widely available in 2012
+ Commercially proofed Clothing+ sensors knowhow is successfully transferred to underwear world
+ Learning and iteration to secure successful scale
TEXTILE SENSOR BUSINESS OPPORTUNITIES

Traditional HRM business (wristop and bike computer) is growing and the role of textiles is increasing

Suunto Comfort belt and T1C watch

Mobile devices (MP, PMP, MP3) have Heart rate belt as a sports accessory

Nokia N79 active with Polar textile heart rate belt

Heart rate sensors are integrated into the sports underwear

Adidas heart sensing sports bra

Wearable sensors open a new interaction method to exercise games
Wearable Sensors

The available technology
<table>
<thead>
<tr>
<th>Potentials Signals to Measure</th>
<th>Integration Platforms for Sensors</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ Heart rate</td>
<td>+ Vests</td>
</tr>
<tr>
<td>+ ECG</td>
<td>+ Plasters, bandages, braces</td>
</tr>
<tr>
<td>+ EEG</td>
<td>+ Underwear</td>
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<tr>
<td>+ EMG</td>
<td>+ Socks</td>
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<tr>
<td>+ Bio-impedance/GSR</td>
<td>+ Hats</td>
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<tr>
<td>+ Bending</td>
<td>+ Shoes and insoles</td>
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<td>+ Stretching</td>
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<tr>
<td>+ Temperature</td>
<td>+ Carpets</td>
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<tr>
<td>+ Sounds</td>
<td>+ Straps and bands</td>
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<td>+ Acceleratio</td>
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CLOTHING+ COMPANY
MORE THAN 20 PERSONS IN DEVELOPMENT

- Textile engineering
- Mechanical engineering
- Electrical engineering
- Testing
- Prototyping
- Material sourcing
- Quality control
- Project management

FULLY COMMITTED TEAM TO IMPLEMENT DEMANDING SENSOR SOLUTIONS IN TEXTILES

- Clothing+ lives and is focused on making textile integrated sensors
DEDICATED TEXTILE SENSOR FACTORY

+ **Optimal and versatile manufacturing technologies**
  + Connector assembly, laser cutting, different lamination technologies, ultrasonic welding, dispensing, screen printing, electrical testing, machine vision etc
  + **Philosophy: Automation, not handwork**

+ **Quality control (ISO 9001), social aspects and environmental issues (ISO 14001) handled with high priority**

+ **Stabile mass production**
LOCATION OF CLOTHING+ FACILITIES
CLOTHING+ COMPANY NUMBERS

+ Research project started in 1998, pioneer in combining textiles and electronics for mass production
+ In 2001 spin-off from mother company Reima
+ In 2008 MBO, stand-alone company
+ Net sales 7.5 Meur and profitable in 2011
+ 25 employees in R&D
+ 300+ employees in production
Thanks!