



ICT-258724

PASTA

Integrating Platform for Advanced Smart Textile Applications

**Instrument : Large-scale Integrating Project
Thematic Priority : Information and Communication Technologies (ICT)**

Deliverable D7.13

PASTA Newsletter 4

**Due date of deliverable : 30.9.2013
Actual submission date : 22.11.2013**

Start date of Project : 1.10.2010

Duration : 48 months

**Responsible beneficiary : imec
Contributing beneficiaries : All**

Revision : 2.0

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Project co-funded by the European Commission within the Seventh Framework Programme (2007-2013)		
Dissemination Level		
PU	Public	X
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

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Abbreviations

ISO	International Organization for Standardization
LED	Light emitting diode
RFID	Radio-frequency identification

Document history

Date	Revision	Author	Remarks
18.9.2013	0.1	J. De Baets	Table of contents available
28.10.2013	1.0	J. De Baets	Draft version available for internal review
12.11.2013	1.1	J. De Baets	Revised version after internal review, available for approval by the Project Steering Committee
22.11.2013	2.0	PSC	Formal approval by the Project Steering Committee
		J. De Baets	Formal approval by the Project Coordinator for submission to the European Commission

1. Executive summary

The PASTA Newsletter has the aim to support the dialog between the PASTA Consortium and the development communities, which work on similar topics, respectively potential customers.

We want to inform the target group in the fourth issue about the many achievements realized so far. The developed, beyond state-of-the-art electronic packages are coming to their final stage and in this issue we give the reader a glimpse on the ongoing developments of the final demonstrators. The architecture of the demonstrators has been fixed, the system parts have been selected and the PASTA technology components are available.

The following issues will keep the reader in track about the progress of the PASTA project, new applications, market news, information and activities around our subject from inside and outside our project.

2. Introduction – Aim of the PASTA Newsletter

2.1 Target groups

The following reader groups are targeted :

- Project partners
- European Commission, EC Reviewers, Scientific Officer
- Development community
- Interested public

2.2 Means of publishing

So far the dominant way of publishing is by electronic means (pdf-file). The newsletter is available in the download area of the project web page: www.pasta-project.eu

3. Contents headlines

The contents headlines of the third PASTA Newsletter are :

- **Introduction – Contents of this issue**
- **The Project**
 - Aim of the project
- **Demonstrators**
 - Emergency signage : Invisibly integrated lighting for your interior
 - C-Prosthesis : Better fitting of prostheses by integrated strain monitoring
 - Smart bedlinen : Urine and sweat detection improving patient's comfort
 - Smart car seat heater : Efficient heating by lightweight textile based solution
 - RFID monitoring : Improved textile manufacturing quality control by integrated RFID-tag
- **Upcoming events**
- **Contact**

4. The fourth PASTA Newsletter

A copy of the fourth PASTA Newsletter is provided in Section 6 (Annex).

5. Conclusion

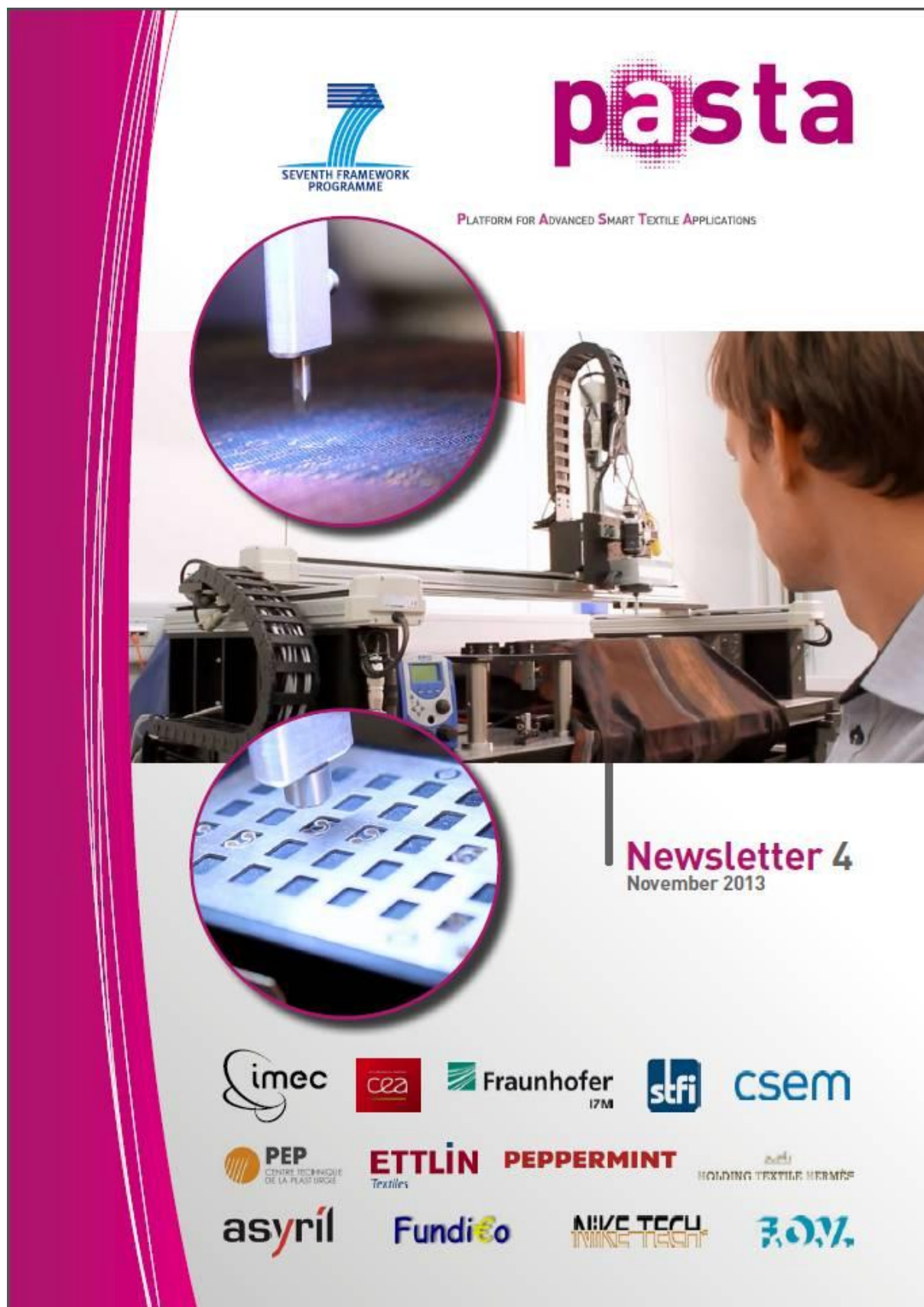
The fourth PASTA newsletter has been created to support the dissemination of the aspects of advanced smart textile applications. This issue concentrated on the many achievements realized so far. The developed, beyond state-of-the-art electronic packages are coming to their final stage and in this issue we give the reader a glimpse on the ongoing developments of the final demonstrators. The architecture of the demonstrators has been fixed, the system parts have been selected and the PASTA technology components are available.

It will be a continuous task to identify further relevant subjects for publication in future planned PASTA newsletters.

6. Annex

6.1 Annex : *PASTA Newsletter 4*

On the next pages a copy of the fourth PASTA Newsletter has been provided.



SEVENTH FRAMEWORK PROGRAMME

pasta

PLATFORM FOR ADVANCED SMART TEXTILE APPLICATIONS

Newsletter 4
November 2013

imec **cea** **Fraunhofer IZM** **stfi** **csem**

PEP **ETTLIN** **PEPPERMINT** **holding textile hermes**
CENTRE TECHNIQUE DE LA PLASTURGIE Textiles

asyril **Fundi€o** **NIVE TECU INKING TECH** **BOV**

INTRODUCTION

Contents of this issue

Welcome to the fourth issue of the PASTA Newsletter! PASTA is an EC funded project within FP7.

It's the PASTA project's ambition to bring both worlds, electronics and textile, closer together to result in a more comfortable, easy manufacturable and reliable combination. Many applications in the consumer, medical or professional markets would warmly welcome such improvements.

The project is heading for its final year, in which all developed technologies will lead to **fantastic demonstrators**. These demonstrators are situated in a broad spectrum of applications, proving the **versatility** of the **PASTA technology**.

In this issue, we give the reader a glimpse on the ongoing developments of these demonstrators. The architectures of the demonstrators have been fixed, the system parts have been selected and the PASTA technology components are on the table. The challenge to merge the worlds of textiles and electronics is ongoing. This, with **manufacturability, reliability** and **cost** taken into account.

Enjoy the reading,



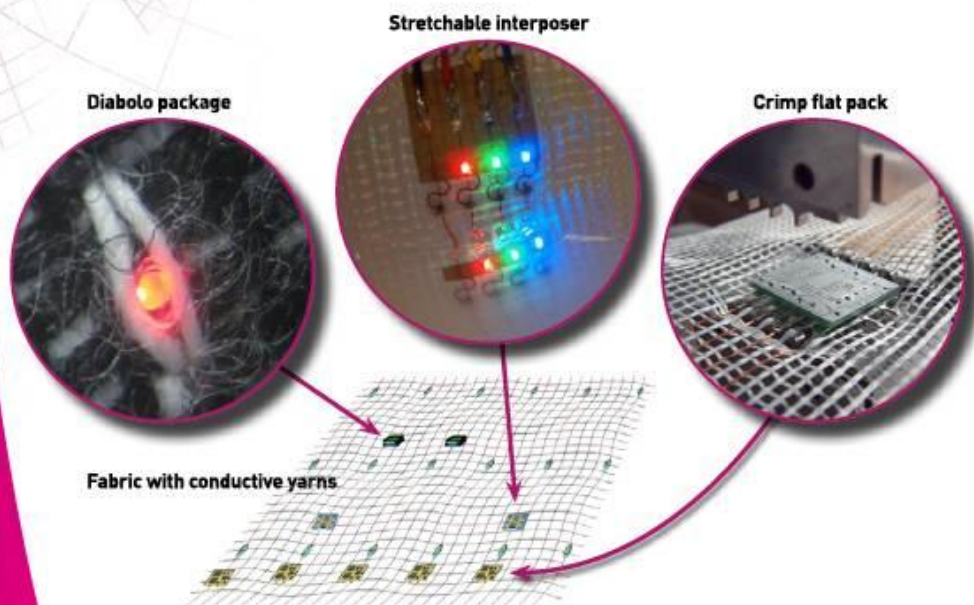
Johan De Baets,
Project Co-ordinator, imec

THE PROJECT

Aim of the project

The PASTA project combines **research on electronic packaging and interconnection technology** with textile research to realize innovative **smart textiles** with **unlimited possibilities**.

Methods have been developed to **integrate electronics in a robust way into textiles**. The ambition of the project is to realize a number of functional demonstrators showing the feasibility of the PASTA technology and proving the **added value** created to the **textile**.



EMERGENCY SIGNAGE

Invisibly integrated lighting for your interior

Emergency signage that will not ruin your art deco or Louis XV interior will soon be real after these last 3 years of intensive and successful development. On the eve of the latest year, all bricks and process steps have been frozen.

The electrical network, steering the colors of the light sources, and conductive yarns, foreseeing the lights of power, have been optimized to ensure a homogeneous luminosity with very limited overheating of the conductive yarns. Moreover, electrical and luminosity simulations have shown that the demonstrator should fulfil the **ISO requirements for normalised signage**; light-mapping will shortly be made to confirm the models.

2 "**PASTA components**" will be used for the demonstrator manufacturing: a stretchable interposer is being designed to **connect the fabric to the power box**. This will ensure a smooth interface and a high reliability of the connection. For the decorative lighting elements, Diabolo LED packages are invisibly integrated in the fabric.

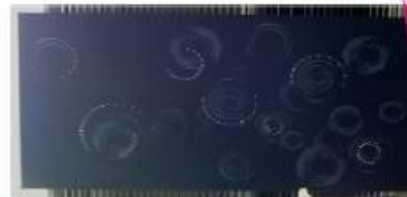
All different components have been separately subjected to end use testing and ageing to select the right materials and assembly. No degradation of the luminosity and electrical behaviour with ageing should occur. This will be confirmed by demonstrator ageing tests next year.

During the project, a machine for **automatically integrating the LEDs** on the yarns and a process for attaching electronic components on fabrics has been developed. LEDs/textile hybridisation for luminous signage has to be performed with **speed and process costs that are compatible with the targeted market**. Moreover, a high yield and reliability is also foreseen for almost **400 LEDs** that are necessary for each signage.

The first complete conductive yarn based electrical networks have been woven according to the manufacturer's specifications.

Conductive yarns are invisible on the frontside and exposed on the backside to facilitate LEDs insertion and connection, which is relevant for an **aesthetic** and durability **point of view**.

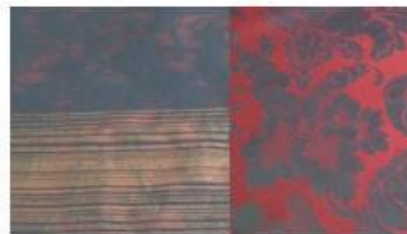
First insertion trials with the automated machine which was described in the previous newsletter have been performed and are very promising. LEDs placement is effective and connections to the conductive yarns will also be fully operational in the near future.



Manually assembled decorative prototype



Stretchable interposer to connect textile electronics with environment



Backside of fabric: conductive yarns serving as power lines Frontside: integrated LEDs and conductive yarns are invisible

INVISIBLE

The integrated light elements are invisibly integrated in the high quality textile, not ruining your interior design.

IMPROVED SAFETY

Exit signs appearing on the walls during an emergency will help people evacuating in a faster way outside public places, hotels, etc.

VERSATILE

This technology can be used for various applications where lights integrated in textile are an added value.

For more information, contact:
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C – PROSTHESIS

Better fitting of prostheses by integrated strain monitoring

In the composite market medical applications have a need for stress measurement in a prosthesis. Already in Germany alone more than 150.000 people with leg prosthesis do exist and the number of amputations ranges between 50.000 and 60.000 per year. To design a new prosthesis it is necessary to know the loading conditions. No sensor exists for that. Prosthesis with incorrect fitting causes consequential injuries like losing the feeling in the leg which leads to more injuries.

In PASTA, a **sensor textile** is being developed, integrated in a high impacted composite part, capable to measure stress and strains under the liability of daily life to **forecast the occurring fatigue** of the component while it is in use. The monitoring textile combines the reinforcing property as layer in the composite structure and also contains the sensors for measuring the upcoming load. This sensor textile will be used in a leg prosthesis for sports. It is a so-called C-prosthesis. The sensor textile will be implemented in the convex face of the C as shown on the picture.



The C-prosthesis

The sensor textile covers two measuring tasks: global stress/strain and local stress/strain measurement. By using special sensor yarns, it is possible to measure the component along the full length concerning surface damage as well as structural fatigue of the composite. For locally occurring forces on the construction part, different types of strain gauges will be used.



Topview carrier fabric with constantan wires

A two-step strategy will be used for realizing the demonstrator. The first step is a proof-of-function of the concept; the second step is building up a prosthesis with the integrated monitoring system. By this strategy the concept can be modified depending on the application.

AVOIDING INJURIES

Integrated sensor textile capable of measuring stress and strains continuously, avoiding incorrect fitting.

FULLY INTEGRATED

The sensors are fully integrated in the composite structures.

VERSATILE

Not only applicable for prostheses, but in any situation where stresses need to be monitored in composites.

The first prototype build-up for the proof-of-function of global strain/stress measurement contains the sensor-textile as a single layer, which is capable of measuring stress and strain and also reinforces the matrix of the composite. The final demonstrator will include **Crimp packages** and **stretchable interposers**.

First Prototype of the sensor concept of monitoring components



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SMART BEDLINEN

Urine and sweat detection improving patient's comfort

The Peppermint Holding is developing a smart bedlinen which will be able to measure moisture e.g. urine and sweat.

This intelligent textile will improve the care work in hospitals, elderly homes and home care. Geriatric nurses and hospital nurses will be informed when bedwetting occurs. Furthermore, bedlinen hygiene can be automatically monitored, improving the patient's comfort.

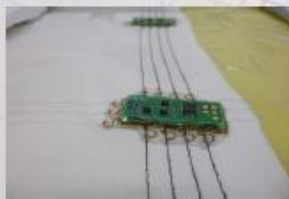
To be able for this detection, Peppermint is weaving sensor yarns into a high quality cotton fabric. Two different sensor yarns are integrated in the fabric: one for moisture detection and the other for pressure measurements. The placement of the integrated sensor yarns is shown in the right picture.

Stretchable interposers are fixed on the crossing points between the sensor yarns (weft) and signal communication yarns (warp).

A central communication unit is connected with the hospital environment. The target is to connect the bedlinen with the normally used equipment in hospitals and elderly homes.

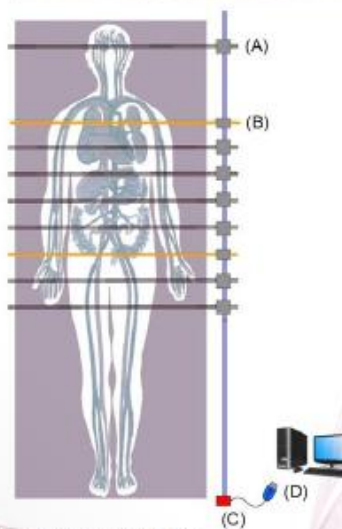
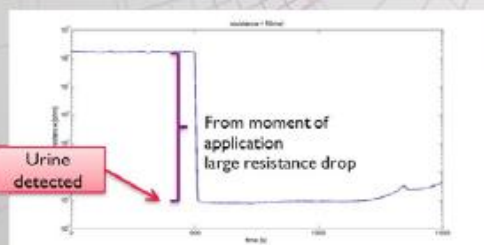
The backside of the fabric is coated to avoid that moisture is running into the mattress. To have the coating on the backside, the textile nature will not be disturbed on the topside where the patient lies.

The bedlinen will have the same lifecycle compared to normal bedsheets in hospitals. The aim is to withstand the washing requirements.



1st version of stretchable interposers performing the sensor readout, placed on fabric. In later versions, thicknesses will be reduced.

Signal captured by the system indicating patient's loss of urine



System design of smart bedlinen

AUTOMATIC URINE DETECTION

The integrated yarns and sensors allow detection of urine, facilitating the work of the nurse and improving the patient's comfort.

HYGIENE CHECK

The system is able to measure the accumulated amount of sweat, giving an objective indication on the hygiene of the bedlinen.

COST-EFFECTIVE

A cost-effective solution increasing quality of health care and reducing effort from nursing personnel.

For more information, contact:
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PEPPERMINT

SMART CARSEAT HEATER

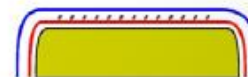
Efficient heating by lightweight, textile based solution

Developing a product for the automotive industry is always a challenge. **Cost** and **reliability** are important design parameters. To further reduce the ecological impact of cars, **reduced power consumption** for hybrid and electrical cars is a must. Another aspect is the weight reduction leading to reduced fuel consumption.

Within the PASTA project, the development of this product has two primary objectives:

- **Reduced power consumption** compared to existing solutions
- **More clever manufacturing technologies** to reduce cost and weight

For the demonstrator developed in PASTA, the fabric's selected materials are polyamide yarns in combination with conductive and feeding yarns, which are based on silver-plated copper. The silver plating is used to prevent patina. The heating fabric is integrated in the carseat in-between the leather covering and the foam.



- foam
- leather covering
- heating fabric with integrated NTC

The supreme properties of the seat heater will be achieved through optimization of the interface between the conductive fabric, integrated sensing components for temperature and pressure, and a power regulating electronic system. The different components are connected through **stretchable interposers**, which also are providing the connection between the heating device and the car environment. Encapsulation of electronics ensures guaranteed functionality in humid environments.

The temperature can be set by the user in a range from OFF up to 50°C, and the power supply is working only under the condition that the pressure sensors are indicating use of the seat. The wide temperature range has been chosen to satisfy the heat needed to be comfortable also in very cold working environments, such as vehicles in deep-freeze warehouses. Power supply within the project has been set to 12V, but the product is adaptable towards up to 48V.

This product's conformability gives a broad range of possibilities, in different environments and businesses where heating properties are desired.

TEXTILE BASED

Heating by means of conductive textiles in combination with integrated textiles

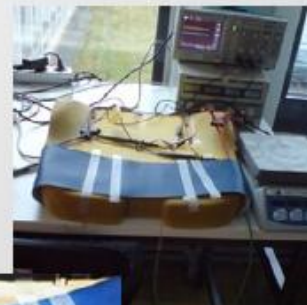
HIGHLY EFFICIENT

Energy consumption reduction compared to existing solutions

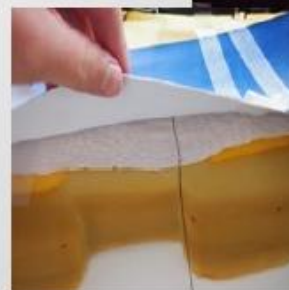
LIGHTWEIGHT

Textile in combination with stretchable electronics

For more information, contact:
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Car seat heater prototype: electrical characterization



Pressure sensing yarn integrated in car seat heater

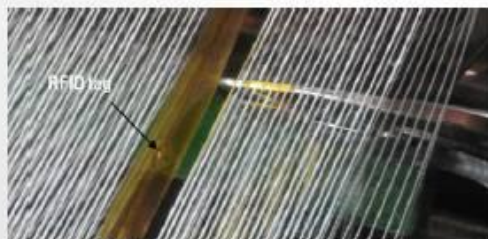
RFID MONITORING

Improved textile manufacturing quality control by integrated RFID-tag

The growing competition in the textile industry leads to innovative ways to further improve the quality control of produced fabrics. Furthermore, the logistical challenges in the supply chain of textiles need clever solutions to reduce these costs.

In PASTA, we want to tackle these challenges by integrating RFID tags in the yarns of textiles, in order

to monitor in a better way the production of fabrics and tag in a unique, invisible way the origin of the fabrics. This is possible by introducing the RFID tag before the start of the weaving process.



Insertion of Diabolo RFID tags during weaving

RFID is a system where passive or active tags can be written to or read from. It is used in a broad area of applications e.g. for identification of persons. In PASTA, **Diabolo packages** have been fabricated with this feature. The Diabolo package contains the RFID chip, the conductive yarns are serving as antenna.

Such a small RFID tag is attached between two layers of sustainable special tape. The tag is programmable with a commercial standard writer (e.g. NordicID). This tape will be woven into the edge of the fabric. The fabric flow throughout the plant decides where readers are needed. The possibility to write to the tag is also given. Logging process conditions are possible. Information has to be implemented into different process monitoring systems. Furthermore, the possibility of automatic store management is guaranteed.

In the PASTA project we are working with the Diabolo RFID tag. The special tape design guarantees a protective cover of the tag. The tag withstand conditions found in the textile process industry. Eg. rolling, scouring, dyeing or heatsetting.

Within the PASTA project, we are investigating the possibility to use already existing process programs. (E.g. Loomdata or Barco)



Detection of RFID tags in woven fabric



RFID before dyeing. Scoured and pre-heatsetted.

BETTER QUALITY CONTROL

Integrated RFID tag allows reading and writing process information allowing traceability and process control.

AUTOMATIC STORE MANAGEMENT

The RFID tag can store fabric information making logistics easier.

For more information, contact:
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UPCOMING EVENTS

Meet the PASTA partners @

- **AACHEN-DRESDEN INTERNATIONAL TEXTILE CONFERENCE**
28-29 November 2013, Aachen (GE)
<http://www.aachen-dresden-itc.de>
- **HEIMTEXTIL**
International trade fair for home and contract textiles
8-11 January 2014, Frankfurt (GE)
<http://heimtextil.messefrankfurt.com>
- **ISPO 2014**
International multi-segment trade show for sports business
26-29 January 2014, Munich (GE)
<http://www.ispo.com/munich>
- **FUTURE TECHNICAL TEXTILE CONFERENCE**
17-21 March 2014, Istanbul (TR)
<http://www.technical-textile.com>
- **EUROSIME 2014**
7-9 April 2014, Ghent (BE)
<http://www.eurosime.org>
- **SMART FABRICS 2014**
Smart Fabrics & Wearable Technology
23-25 April 2014, San Francisco (US)
<http://www.smartfabricsconference.com>
- **6TH EUROPEAN CONFERENCE ON PROTECTIVE CLOTHING**
Safe, Smart, Sustainable...
New pathways for protective clothing
14-16 May 2014, Bruges (BE)
<http://www.centexbel.be>
- **ISWC 2014**
International Symposium on Wearable Computers
13-17 September 2014, Seattle (US)
<http://www.iswc.net>

Check out the PASTA website for more up-to-date information:

www.pasta-project.eu

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PLATFORM FOR ADVANCED SMART TEXTILE APPLICATIONS

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