

## LIFE+ GLUELESS™ PROJECT AS NATURAL AS WE CAN



Co-funded by EU's financial instrument  
supporting environmental, nature  
conservation and climate action projects

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CCaLC Carbon  
Footprinting Tool  
Results validated by the  
University of Manchester

## Hygienix 2016 Conference

October 24<sup>th</sup> – 27<sup>th</sup>, 2016

### RESULTS FROM THE LIFE+ GLUELESS™ PROJECT: AN INITIATIVE FOR ENVIRONMENTAL IMPACT REDUCTION IN AHP PRODUCTION PROCESSES

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# Hygienix 2016 Conference

## Summary

- 1 What is EU's **LIFE** programme
- 2 The **purpose** of Fameccanica Life+ GLUELESS project and the 5 areas identified as part of the project
- 3 The **achievements** of the main project: 5 GLUELESS™ features for the diapers of the future
- 4 Results from the **Life Cycle Assessment** from the University of Manchester
- 5 Additional features on top of the main project and **overview** of a diaper with the new construction features
- 6 Fameccanica Group at a Glance

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2

The purpose of Fameccanica Life+ GLUELESS project and the 5 areas identified as part of the project

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The achievements of the main project: 5 GLUELESS™ features for the diapers of the future

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Results from the Life Cycle Assessment from the University of Manchester

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Additional features on top of the main project and overview of a diaper with the new construction features

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Fameccanica Group at a Glance

## LIFE+ GLUELESS™ PROJECT AS NATURAL AS WE CAN

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# What is EU's LIFE programme?

"LIFE is the **EU's financial instrument supporting** environmental, nature conservation and climate action **projects** throughout the EU. The general objective of LIFE is to contribute to the implementation, updating and development of EU environmental policy and legislation by co-financing pilot or demonstration projects with European added value."



LIFE began in 1992 and to date there have been four complete phases of the programme:

- LIFE I: 1992-1995
- LIFE II: 1996-1999,
- LIFE III: 2000-2006
- **LIFE+: 2007-2013**

During this period, LIFE has co-financed some 3954 projects across the EU, contributing approximately €3.1 billion to the protection of the environment.

EU already started phase LIFE 2014-2020



ENVIRONMENT  
LIFE Programme



# Fameccanica and LIFE+

On July 1st, 2013 **Fameccanica** was granted financial support to project proposal N° LIFE12 ENV/IT/000423 concerning the development of means for cost savings in diaper production processes.

The project **LIFE Glueless "Petrol based Glue and Energy consumption reduction in diapers production processes"**, aims to demonstrate to industry and policy makers that **significant environmental impact reduction** in Absorbent Hygiene Products (AHP), such as diapers, can be realized, with appropriate solutions that will be the subject of this project.

The project will showcase how environmental impact can be reduced, while **cost competitiveness can be held or even increased**.

The project has started on July 1st, 2013 and will continue until Dec. 31st, 2016.



# The Fameccanica Life+ website

Since November 2013, the Fameccanica Life+ website has been published on line.

<http://www.fameccanica.com/en/life-project>

The website has the aim to disclose a selection of key information to the audience and demonstrate the process steps already achieved

The website includes the key achievements and periodical newsletters since the start of the project.



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# The purpose of Fameccanica Life+ GLUELESS project

## Purposes:

- Definition of **5 sub-processes**: technical assessment of thermal welding and ultrasonic technologies as replacement of current glueing processes
- Verification of **the weldability** of raw materials
- Introduction of **innovative concepts** to achieve the result
- Design of the Test Equipment and **validation of the prototypes** in the R&D laboratories
- Manufacture of **samples** for each of the 5 sub-processes

## In addition

- Other opportunities have been also investigated on top of the 5 sub-processes identified and funded on separate internal projects.

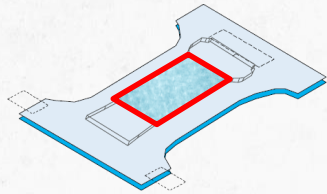
**2 additional sub-processes** have been identified and will be briefly introduced in the second part of this presentation.



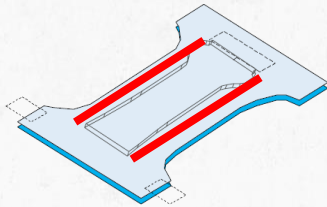


# The 5 areas identified as part of the project

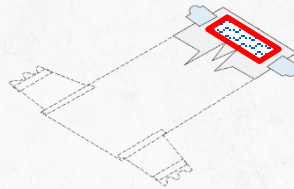
Glueless™ ADL



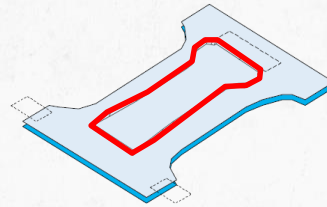
Glueless™  
Intermittent elastics



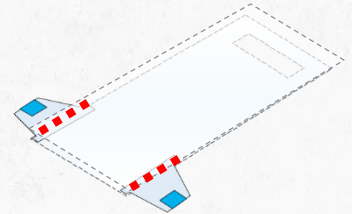
Glueless™ Frontal Tape  
construction



Glueless™ Core



Glueless™ Back Ear  
application



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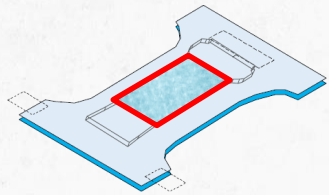
## LIFE+ GLUELESS™ PROJECT AS NATURAL AS WE CAN

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# The 5 areas identified as part of the project

## Glueless™ ADL



Glueless™ ADL  
Intermittent elastics



Glueless™ Frontal Tape  
construction



Glueless™ Core



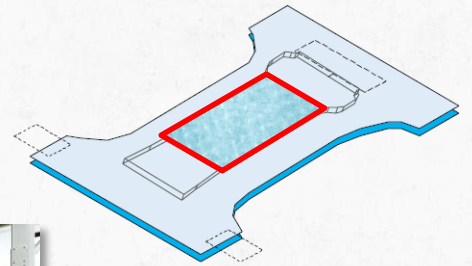
Glueless™ Back Ear  
application





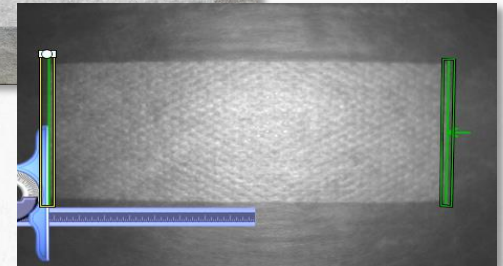
# GLUELESS™ application of ADL

ADL to be welded on NW Topsheet with Ultrasonic System using properly designed pattern



## Key activities:

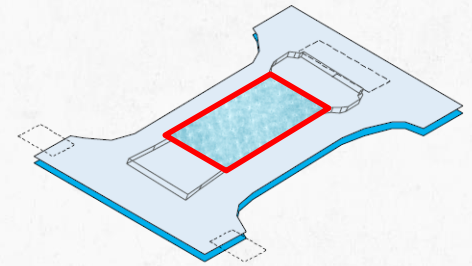
- **Design** of the Test Equipment
- Laboratory validation of the prototype with several different raw **materials** and different **patterns**
- Check **process** stability with Vision System up to 450 m/min or 1000ppm with 100% of flawless products
- Analysis of **weldability** of a selection of raw materials (NW Topsheet e ADL) and test of different type of patterns (different design)
- Analysis of the Fluid Handling **performances**





# GLUELESS™ application of ADL

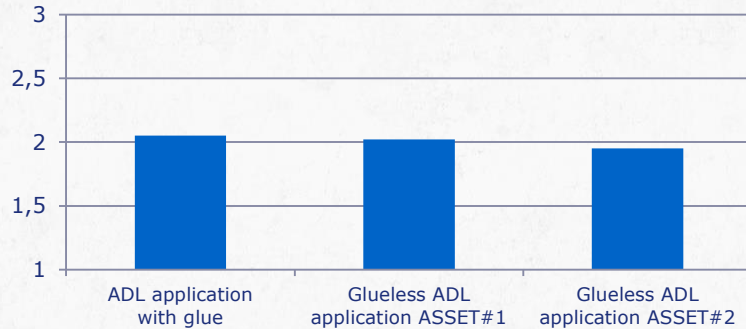
ADL to be welded on NW Topsheet with Ultrasonic System using properly designed pattern



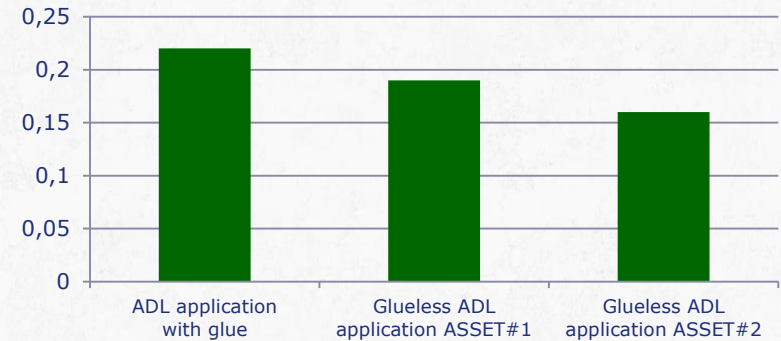
## Key results:

The comparative tests (\*) of product performance vs. traditional technologies show that the GLUELESS™ solution offers **equivalent or even improved results in terms of Acquisition Time and Wetback of the final diaper element assembly.**

Acquisition Time (sec)



Wetback (g)



Same behaviour in acquisition time test

(\*) Test conducted with PP/PE bico fiber ADL

Slightly improved behaviour in wetback test



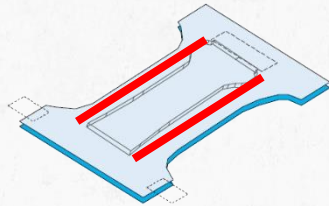


# The 5 areas identified as part of the project

Glueless™ ADL



**Glueless™  
Intermittent elastics**



Glueless™ Frontal Tape construction



Glueless™ Core



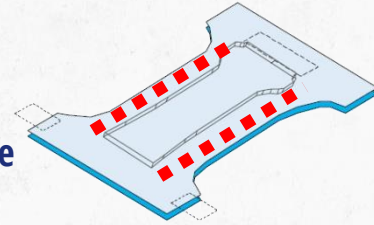
Glueless™ Back Ear application





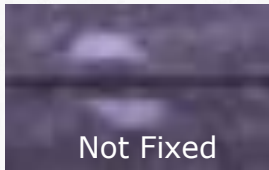
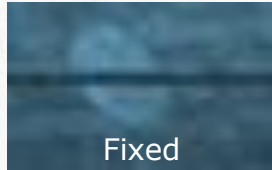
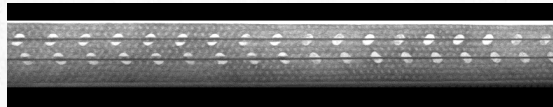
# GLUELESS™ elastic entrapment

Cuffs Elastics mechanically fixed between two layers of NW in intermittent mode



## Key activities:

- Definition of a solution on the basis of a patent owned by Cera Engineering France, to realize the intermittent application in a way to achieve process stability at higher speed than the state-of-the-art
- Optimization of the elastics entrapment process
- Design of the kit and validation of the prototype in the laboratory



(11) EP 3 056 176 A1

### (12) EUROPEAN PATENT APPLICATION

(43) Date of publication: 17.08.2016 Bulletin 2016/33

(21) Application number: 16154085.1

(22) Date of filing: 03.02.2016

(84) Designated Contracting States:  
 AL AT BE BG CH CY CZ DE DK EE ES FI FR GB  
 GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO  
 PL PT RO RS SE SI SK SM TR  
 Designated Extension States:  
 BA ME  
 Designated Validation States:  
 MA MD

(30) Priority: 11.02.2015 IT UB20150478

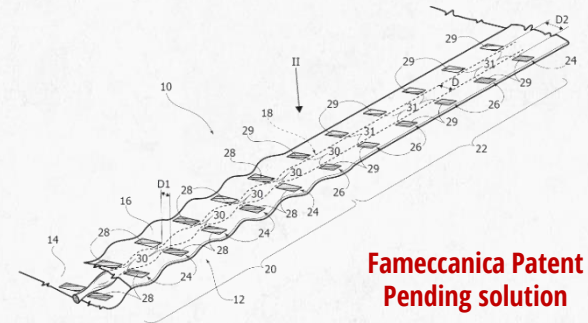
(71) Applicant: Fameccanica.Data S.p.A.  
65129 Pescara (IT)

(51) Int. Cl.:

A61F 13/49 (2006.01) A41D 27/24 (2006.01)  
 A41F 9/02 (2006.01) A61F 13/15 (2006.01)  
 B29C 65/08 (2006.01) B29C 65/18 (2006.01)  
 B29C 65/00 (2006.01) B29L 31/48 (2006.01)

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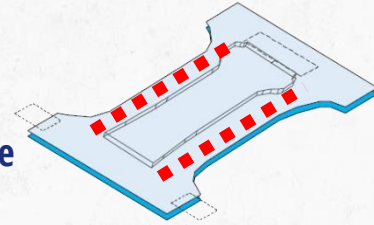
**Fameccanica Patent  
Pending solution**





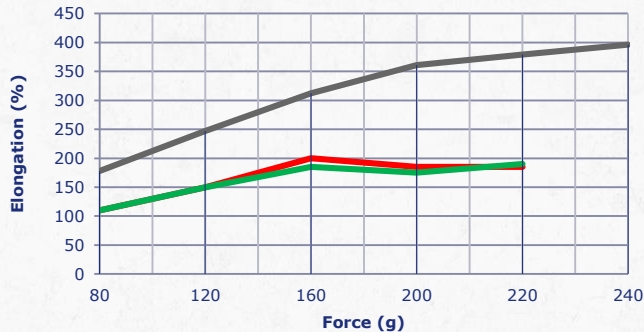
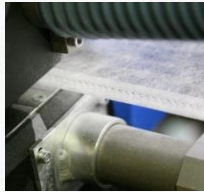
# GLUELESS™ elastic entrapment

Cuffs Elastics mechanically fixed between two layers of NW in intermittent mode



## Key results:

- The comparative tests of product performance vs. traditional technologies show that the GLUELESS™ solution offers **equivalent results in terms of tension-elongation** of the standard application with glue.
- Confirmed strength of the welding
- Process stability up to 450 m/min or 1000ppm



- 800 dtex. Elongation of individual elastic threads NOT bonded with nonwoven (%)
- 800 dtex. Actual elongation with glueless application (%)
- 800 dtex. Actual elongation with in case of application WITH glue (%)



*Details of process and samples with GLUELESS™ elastic application*







# The 5 areas identified as part of the project

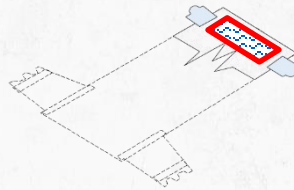
Glueless™ ADL



Glueless™ ADL  
Intermittent elastics



Glueless™ Frontal Tape  
construction



Glueless™ Core



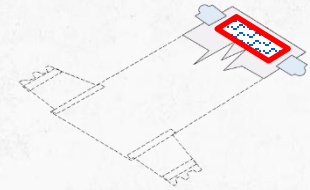
Glueless™ Back Ear  
application





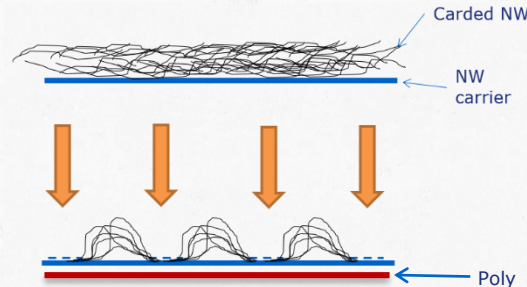
# GLUELESS™ frontal tape application

## In line creation of a backsheet with “loop frontal tape”



### Key activities:

- Definition of a **new solution**, to achieve the result of creating the glueless sealing, without compromising backsheet functionality (impermeability)
- Analysis of the **weldability** of a family of raw materials (nonwoven backsheet and material for frontal tape) and test of different sealing **pattern** designs
- Design of **test** equipment
- **Validation** of the new solution in the laboratory with several different raw materials and 2 different patterns



(19) **United States**  
 (12) **Patent Application Publication** (10) **Pub. No.:** US 2016/0128878 A1  
 BONELLI et al. (43) **Pub. Date:** May 12, 2016

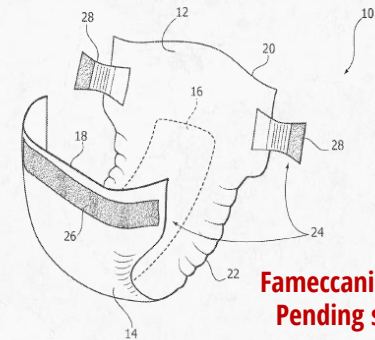
(54) **METHOD FOR PRODUCING A BACKSHEET FOR ABSORBENT SANITARY ARTICLES AND AN ABSORBENT SANITARY ARTICLE INCLUDING THIS BACKSHEET** (52) **U.S. CL. CPC:** *AA1F 18/27* (2013.01); *AA1F 18/54M* (2013.01); *AA1F 18/2572* (2013.01); *AA1F 18/5756* (2013.01); *B29C 65/48* (2013.01)

(71) Applicant: Fameccanica.Data S.p.A., Pescara (IT)  
 (72) Inventors: Guido BONELLI (Pescara (IT), Diego GUALTIERI, Silvana (L'Aquila) (IT)

(21) Appl. No.: 14931,589  
 (22) Filed: Nov. 3, 2015  
 (30) Foreign Application Priority Data  
 Nov. 6, 2014 (IT) ..... TC2014A000918

**Publication Classification**  
 (51) **Int. Cl.**  
*AA1F 18/42* (2006.01)  
*AA1F 18/15* (2006.01)  
*B29C 65/48* (2006.01)  
*AA1F 18/56* (2006.01)

(57) **ABSTRACT**  
 A method for producing a backsheet for absorbent sanitary articles provided with hook-and-loop fasteners, comprising the steps of: advancing a continuous web of fibrous material without support at a first speed, cutting the continuous web of fibrous material in a transverse direction so as to form sections of fibrous material, accelerating the sections of fibrous material at a second speed greater than said first speed, welding said sections of fibrous material spaced apart at constant intervals onto a continuous non-woven support web advancing at said second speed, so as to connect said sections of fibrous material into frontal tapes of loop-material for hook-and-loop fasteners, and fixing a continuous impermeable film to said continuous non-woven support web with said frontal tapes of loop-material, so as to form a continuous backsheet web provided with frontal tapes of loop-material spaced apart at constant intervals.



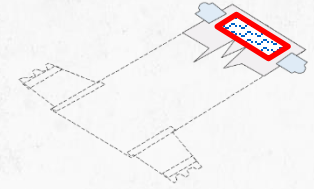
**Fameccanica Patent Pending solution**





# GLUELESS™ frontal tape application

In line creation of a backsheet with “loop frontal tape”

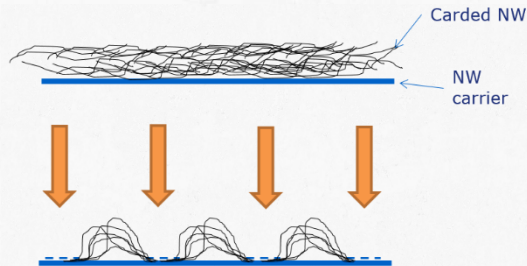


## Detail about the new solution:

The innovation consists of the in-line creation of a complete assembly including:

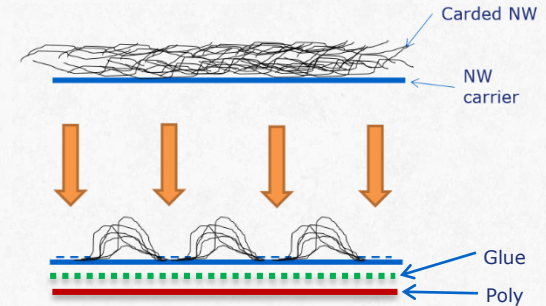
1. a “loop” material acting as frontal tape
2. a nonwoven carrier (nonwoven backsheet)
3. a poly backsheet

Materials are laminated in line in the following order:



**LOOP + NONWOVEN CARRIER are combined together with a mechanical or ultrasonic sealing with a proper pattern**

**Then:**

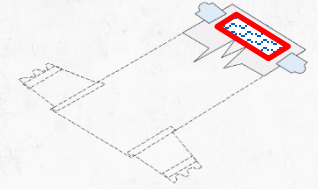


**This is laminated with POLY BACKSHEET using standard gluing technology**



# GLUELESS™ frontal tape application

In line creation of a backsheet with “loop frontal tape”



## Key results:

- Internal validation of the product design concept
- Process stability up to 450 m/min or 1000ppm
- Realization of samples
- Confirmed strength of the welding (peel test)
- Confirmed strength when combined with the fastening tape



Commercial benchmark



Glueless Landing Zone





# The 5 areas identified as part of the project

Glueless™ ADL



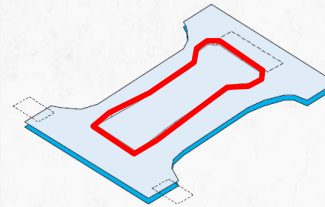
Glueless™ ADL  
Intermittent elastics



Glueless™ Frontal Tape  
construction



Glueless™ Core



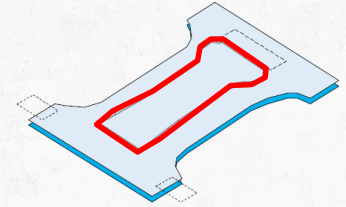
Glueless™ Back Ear  
application





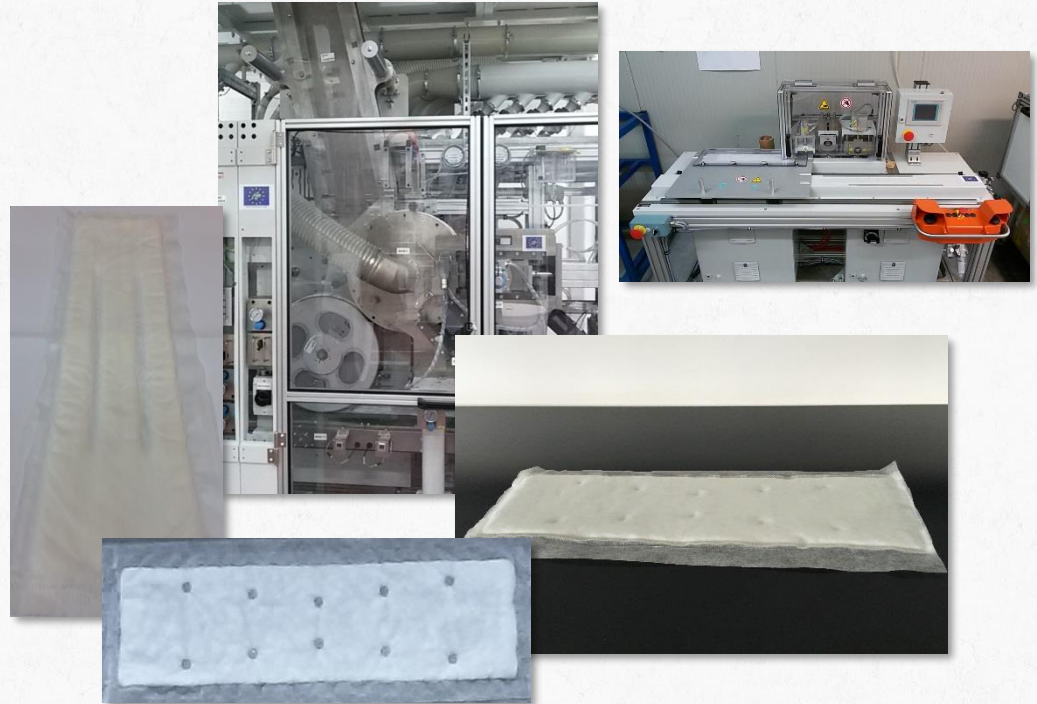
# GLUELESS™ absorbent core

Core welded between two layers with mechanical or ultrasonic system using properly designed pattern



## Key activities:

- Laboratory definition and validation of the **Core design** with several different welding patterns
- Design of the **Test** Equipment
- Laboratory validation of the **prototype** including qualification of the technology at the target speed.
- Analysis of different **sub-processes**: defibration, SAP dosing and entrapment, core closing and welding
- Product **sampling** to achieve the quality and performance tests defined.
- Analysis of Core integrity and Fluid Handling **performances**

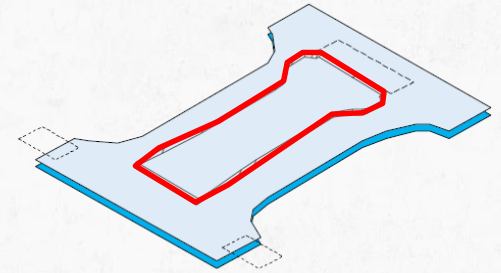




# GLUELESS™ Core forming

Glueless core with a specific welding design

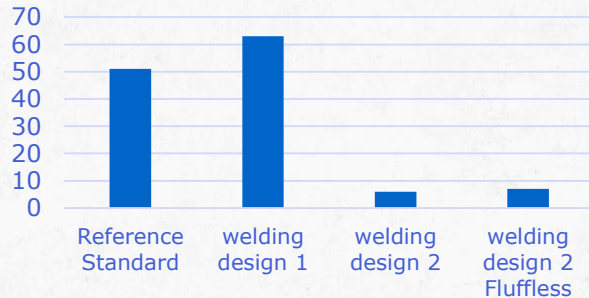
SAP/Fluff ratio 80/20



## Key results:

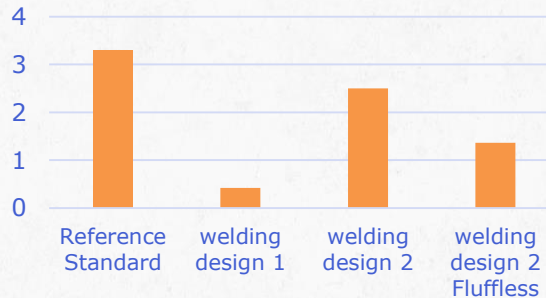
The comparative tests of product performance vs. traditional technologies show that the GLUELESS™ solution offers **equivalent or even improved results in terms of Fluid Acquisition and Core Integrity.**

### Acquisition time (s)



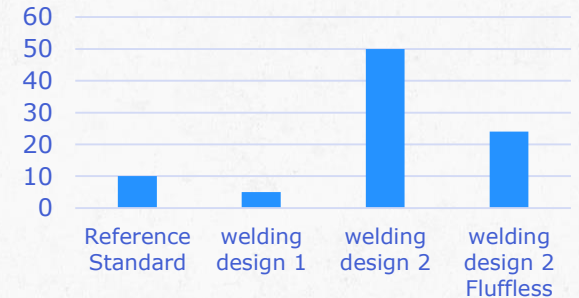
Improved behaviour in acquisition time for welding design 2

### Rewet (g)



Improved behaviour in Rewet for all configurations

### Hardy test (N° drops)



Poor results for welding design 1. Significant improvement for welding design 2.





# The 5 areas identified as part of the project

Glueless™ ADL



Glueless™ ADL  
Intermittent elastics



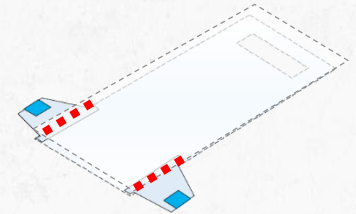
Glueless™ Frontal Tape  
construction



Glueless™ Core



Glueless™ Back Ear  
application

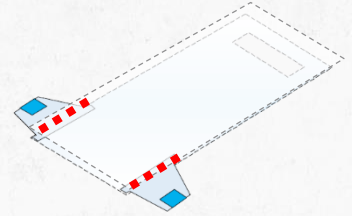






# GLUELESS™ ears application

Application of the ears (back and/or front) without glue reinforcement



## Key activities:

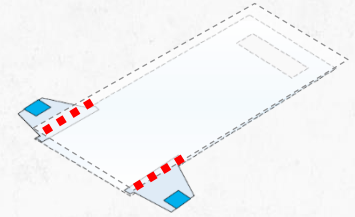
- Definition of the product **structure**
- Study of the glueless fixing process of **back and front ears**
- Realization of **samples** and quality control





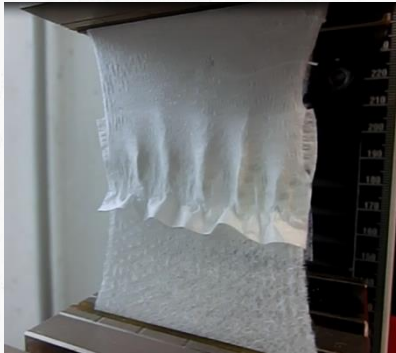
# GLUELESS™ ears application

Ears application (back and/or front) without glue reinforcement



## Key results:

- The comparative tests vs. traditional technologies show that the GLUELESS™ solution offers **equivalent results in terms of strength of side seal** confirming that the welding strength is higher than the breaking point of the ear itself
- Defined process and machine configuration to disclose this version to the market



|                        | With Glue | Glueless  |  |   |  |
|------------------------|-----------|---|--|---|--|
| Side seal strength [N] | Benchmark | Asset 1<br>pattern1=S<br>Pattern2=D<br>Mat=Comm | Asset 2<br>pattern1=S<br>Pattern2=D<br>Mat=FLS | Asset 3<br>pattern1=S<br>Pattern2=T<br>Mat=Comm | Asset 4<br>pattern1=S<br>Pattern2=T<br>Mat=FLS |
| Average                | 28,7      | 28,5  | 28,2   | 28,9  | 28,3   |
| St. dev.               | 1,4       | 1,7   | 2,4  | 2,5   | 2,4  |
| Min                    | 24,1      | 22,9  | 22,0   | 23,5  | 22,0   |
| Max                    | 31,0      | 31,3  | 33,0   | 35,5  | 33,1   |

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**Results from the Life Cycle Assessment from the University of Manchester**

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Fameccanica Group at a Glance

## LIFE+ GLUELESS™ PROJECT AS NATURAL AS WE CAN

Co-funded by EU's financial instrument supporting  
environmental, nature conservation and climate action projects

# Key results from: Glue and energy consumption reduction in baby diapers manufacturing

from a study realized by the University of Manchester

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Determine potential savings in greenhouse gas emissions, primary energy and costs of glueless disposable baby diapers:

- Glue, raw material and electricity savings
- Reduction in greenhouse gas emissions and primary energy demand
- Life cycle cost savings

## Life cycle assessment

- GWP: Global warming potential (kg CO<sub>2</sub> eq.)
- PED: Primary energy demand (MJ)

## System boundary

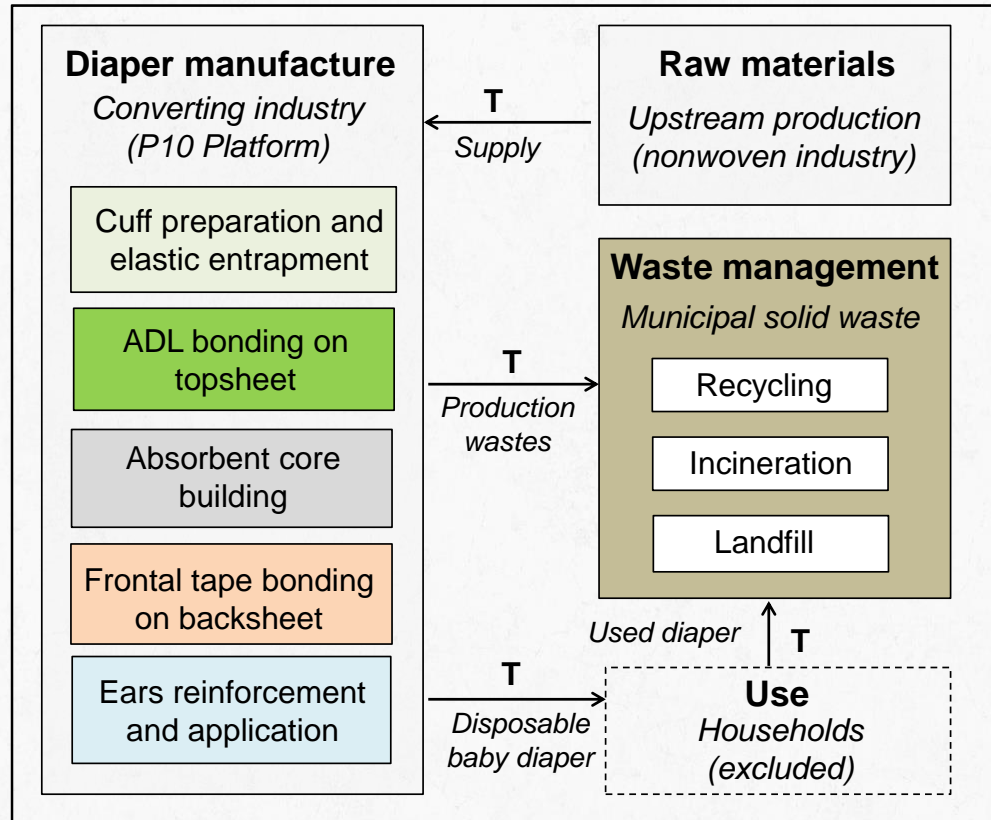
- From cradle to gate

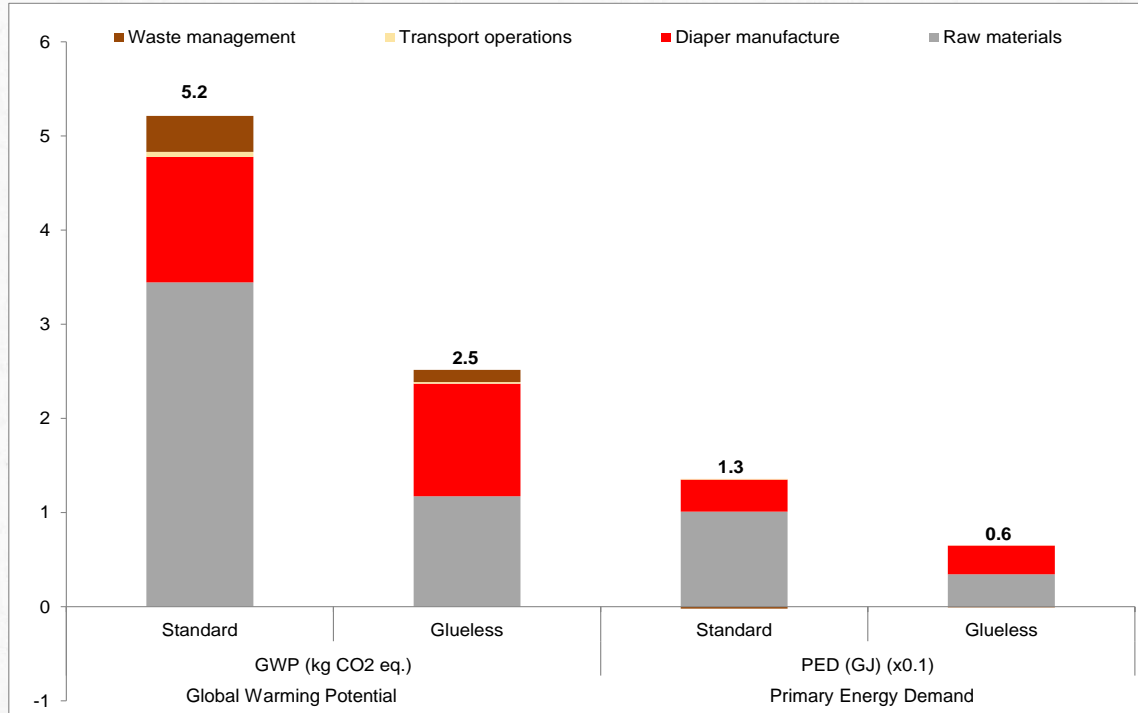
Unit of analysis (functional unit): 1,000 diapers

Comparison with standard disposable diapers

## LCA software and databases

- GaBi , CCaLC and Ecoinvent





A reduction of 66% (0,62 kg/1000 diapers) in the glue requirements for the manufacture of glueless diapers entails a reduction of 52% in the GWP and PED of standard glue bonding.

This corresponds to 2,7 kg of CO<sub>2</sub> eq. and 69,3 MJ of primary energy savings per 1000 diapers.



- Raw materials are the key life cycle hotspot for disposable diapers
- Product light-weighting is important for minimising environmental impacts and costs
- Even small improvements in the resource and energy efficiency can lead to significant environmental savings at the EU level
- Fameccanica Glueless™ solution for the manufacture of diapers has a great potential for achieving the resource, energy and climate change sustainability goals defined by the EU 2020 strategy

# Hygienix 2016 Conference

## Summary

- 1 What is EU's LIFE programme
- 2 The purpose of Fameccanica Life+ GLUELESS project and the 5 areas identified as part of the project
- 3 The achievements of the main project: 5 GLUELESS™ features for the diapers of the future
- 4 Results from the Life Cycle Assessment from the University of Manchester
- 5 Additional features on top of the main project and overview of a diaper with the new construction features**
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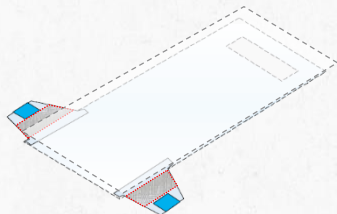


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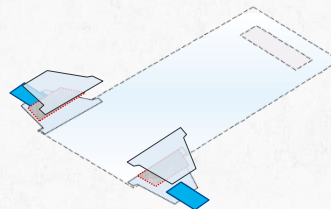
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# ADDITIONAL FEATURES ON TOP OF THE MAIN PROJECT

**Glueless™ Back Ear  
lamination (FLS)**

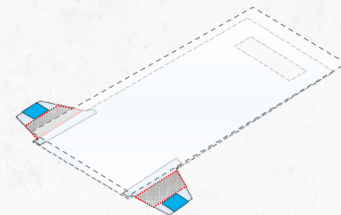


**Glueless™ Back Ear with  
tape as sandwich**



# ADDITIONAL FEATURES on top of the main project

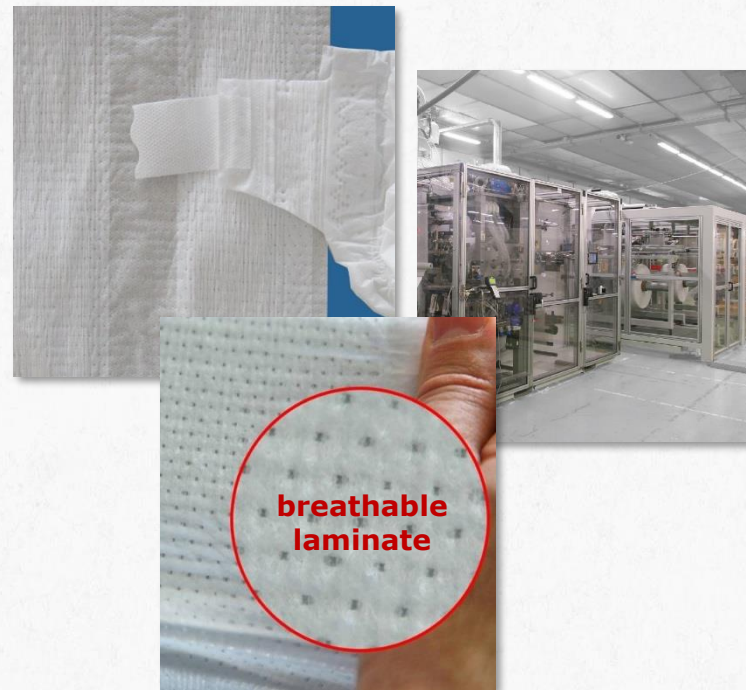
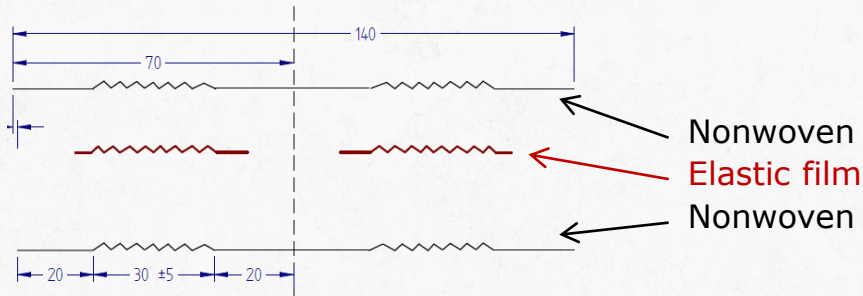
## Glueless™ Back Ear lamination (FLS)



In addition to the 5 main features, Fameccanica presented in December 2013, its

### GLUELESS™ lamination concept for back ears for baby diapers

This GLUELESS™ construction is now a commercially available solution with Fameccanica laminating **machine model FLS**.



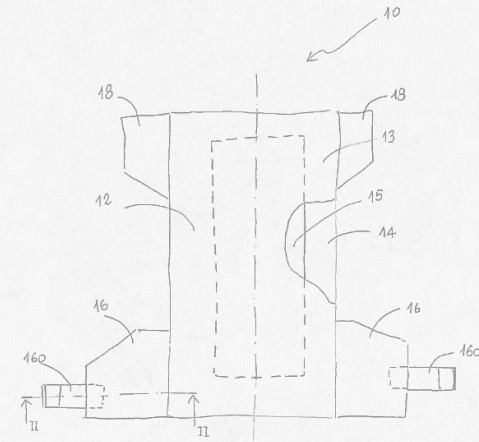
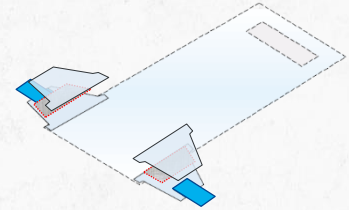
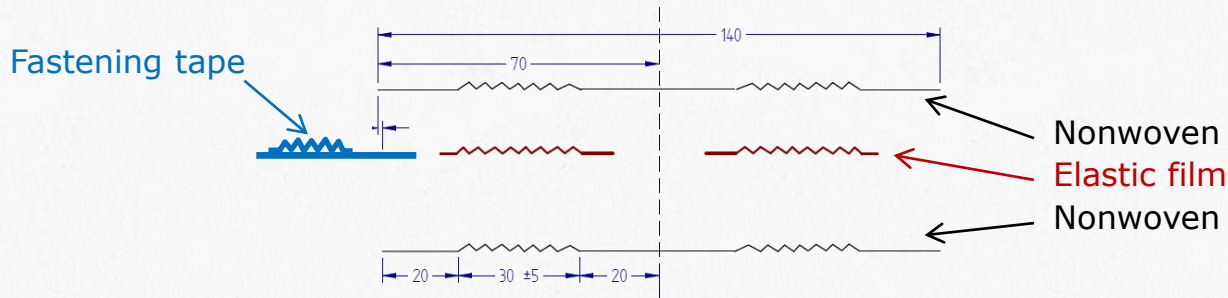
# ADDITIONAL FEATURES on top of the main project

## Glueless™ Back Ear with tape as sandwich (tape inside FLS)

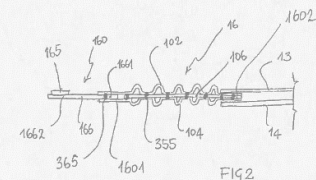
Fameccanica has recently extended the concept of Glueless Back Ear lamination with the new

### **GLUELESS™ lamination concept for back ears with tape as sandwich**

This GLUELESS™ construction can be integrated in Fameccanica FLS or can be made in-line integrating the FLS on the manufacturing machines.



**Fameccanica Patent Pending solution**



# THE FIRST PROTOTYPE OF FAMECCANICA GLUELESS™ DIAPER



**LIFE+ GLUELESS PROJECT**  
AS NATURAL AS WE CAN  
**WHAT IS EU'S LIFE PROGRAMME?**

"LIFE is the EU's financial instrument supporting environmental, nature conservation and climate action projects throughout the EU.  
The general objective of LIFE is to contribute to the implementation, updating and development of EU environmental policy and legislation by co-financing pilot or demonstration projects with European added value."

**MANCHESTER 1824** **CatC Carbon Footprinting Tool**  
Results will be validated with University of Manchester

The Fameccanica project LIFE GLUELESS™ "Petrol based Glue and Energy consumption reduction in diapers production processes", aims to demonstrate to industry and policy makers that **significant environmental impact reduction** in Absorbent Hygiene Products (AHP), such as diapers, can be realized, with appropriate solutions that will be the subject of this project. *The project will showcase how environmental impact can be reduced, while cost competitiveness can be held or even increased.*

**GLUELESS™ lamination of back ears for baby diapers**  
Commercially available solution with Fameccanica lamination machine model FLS for a Unique technology for in-line processing of breathable laminates with ultrasonically bonded bonding spots. (Patented solution)

**The Frontal Tape Glueless Lab Test has started**  
**Validation activities**  
Fameccanica has started the test activities aimed at validating the technology to manufacture the new Fameccanica GLUELESS™ Frontal Tape product concept, consisting in an innovative composite structure comprising the Backsheet and the Frontal Tape with glueless welding techniques.  
Tests done up to date allowed Fameccanica to confirm that all the raw materials identified for the test have a good bonding activity, that the welding technology allows to reach the product tactile perception required and that the

**Mr. Diego Gualtieri, Glueless R&D Project Manager**



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# OUR EVERYDAY MISSION: NON STOP INNOVATION.

• WE EMPLOY  
**STATE-OF-THE-ART TECHNOLOGY**  
TO ACHIEVE THE HIGHEST  
MANUFACTURING STANDARDS

• **THE SUPERIOR QUALITY**  
OF FAMECCANICA  
IS IN EVERY COMPONENT  
OF OUR PRODUCTS

• WE ARE RESPONSIVE  
TO MARKET DEMAND  
AND FULLY  
**DEDICATED TO OUR JOB**

• **TECHNOLOGY INSIDE**  
THAT'S WHY WE DELIVER  
BENCHMARK **SOLUTIONS**  
TO OUR MARKET

## FAMECCANICA GROUP AT A GLANCE

1

**FOUNDED IN 1975**, Fameccanica is recognized as a benchmark manufacturer of machinery for disposable hygiene absorbent products

2

**MORE THAN 1100 MANUFACTURING** lines delivered since 1975

3

**CONSTANT FOCUS ON INNOVATION:** technology, manufacturing processes and finished product design

4

**SERVING TODAY OVER 75 MULTINATIONAL**, Regional and Local Companies

5

**GLOBAL PRESENCE** with 4 plants located in **ITALY, CHINA, BRASIL** and **U.S.A.**

6

Over **850** employees worldwide





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CCaLC Carbon  
Footprinting Tool  
Results validated by the  
University of Manchester

## THANK YOU

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