

# A bonding solution

Technical Director **Francesco D'Aponte**, Marketing Manager **Alessandro D'Andrea** and Mechanical Design Team Leader **Diego Gualtieri** discuss their efforts to revolutionise diaper manufacturing

## Can you introduce the focus of your team's research into sustainable absorbent hygiene products (AHPs)?

The Petrol Based Glue And Energy Consumption Reduction In Diapers Production Processes (GLUELESS) project wishes to demonstrate to industry and policy makers that significant environmental impact reduction in AHPs such as diapers can be realised by drastically reducing the amount of glue used in the production process. At Fameccanica.Data SpA, we have shown that it is possible to use thermo-welding and ultrasound in five different subprocesses and product layers, reaching the same bonding performance as glue. The project will demonstrate the feasibility of upscaling these technologies to industrial volumes and speed, while maintaining critical product performance.

## How do you aim to convince AHP producers to adopt a cost-effective, environmentally friendly alternative?

AHP producers and end users display less acceptance of new solutions if they are combined with higher costs or reduced performance. Obviously they tend to request the opposite. The project will showcase how environmental impact can be reduced, while cost competitiveness can be maintained or even increased.

The aim of the GLUELESS project will therefore be twofold: first, convincing AHP producers to adopt this cost-effective, environmentally friendly alternative bonding solution by demonstrating that it meets current performance criteria; and second, underpinning with an industrial showcase (including dissemination to multiple industrial sectors) the public environmental policy objectives of decoupling environmental impact

from economic growth and implementing the number one priority in the waste hierarchy, which is waste avoidance.

## Can you explain how you intend to demonstrate the efficiency of your product against standard items available on the market?

We will run a full-scale diaper production process at Fameccanica, combining results in a single product to showcase product and process performance, and environmental and cost benefits (decoupling) to a wider group of AHP producers, policy makers and citizens. A global diaper producer will assess product performance.

## How far are you into the project timeline?

GLUELESS has the aim of developing a number of product features, intended as separate applications that may be

## Sticking with it

At **Fameccanica.Data SpA**, Italy, LIFE GLUELESS is working to upscale innovative bonding solutions for incorporation into the industrial manufacturing of absorbant hygiene products, with the aim of bringing about significant environmental and economic benefits

**THE USE OF** glue in the manufacture of absorbent hygiene products (AHPs) is costly, energy-intensive and environmentally unsound. Furthermore, the disposal of AHPs is the cause of 4 per cent of incinerated solid waste and 2 per cent of all waste sent to landfill worldwide, contributing to air, water and soil pollution. Disposable diapers are a prime example of a widely used AHP in which the reduction of its reliance on petrochemical-based glues would generate significant environmental and economic benefits.

### GOING GLUELESS

Fameccanica.Data SpA is the technical centre behind the development and design of Fameccanica's innovative machinery for the production of sanitary products. Within this organisation, researchers are currently partway through the Petrol Based Glue And Energy Consumption Reduction In Diapers Production Processes (GLUELESS) project, funded by EU LIFE+. By developing novel thermo-welding and ultrasonic bonding processes, the team believes that the diaper manufacturing

industry's reliance on non-renewable glue could be reduced significantly. This would not only generate green advantages, but also render the entire production process more energy-efficient and cost-effective.

The development of glueless bonding technologies is a hot topic in the AHP sector, and a goal towards which many companies are aiming. Fameccanica.Data SpA is committed to making these glueless bonding technologies happen through the GLUELESS project, by developing appropriate processes, product structures and enhanced technologies.

### STREAMLINING SUBPROCESSES

GLUELESS began in July 2013 and is scheduled to run until the end of 2016. Within just six months of the project start, the team achieved their first major breakthrough: the qualification of its new lamination concept for the back ears of baby diapers. The resulting construction has completely eliminated the need for glue, and is already

patented and commercially available as part of the Fameccanica FLS machine model for diaper manufacture.

Over the course of last year, the Fameccanica.Data SpA researchers turned their attention to the qualification of a novel glueless application of the acquisition distribution layer (ADL) onto the diaper topsheet. Initial lab tests and product performance assessments produced positive results when applying the novel technology within diaper manufacture machines that are currently commercially available, and this application has now been finalised.

Additionally, efforts were made to qualify glueless technology's suitability in producing diaper elastic strands. Overall, it was found that the glueless solution was not only appropriate but, when compared to conventional glue application, offered equivalent results in terms of tension elongation of the final diaper element assembly and improved ageing behaviour. Industrialisation efforts are now in progress.

combined by the producers at a later stage when deciding their final product specifications. We have already finalised GLUELESS lamination of back ears for baby diapers and GLUELESS acquisition-distribution layer application, and we are currently finalising the industrialisation of GLUELESS elastic strands application. Other activities for new features are ongoing and will be disclosed at a later date.

### What is the FLS laminating system, and what are the benefits of using it?

FLS is a standalone machine for the lamination of material for the elastic side panels of baby diapers. Laminated web is rewound in reels ready to be used on baby diaper converting machines. Lamination with ultrasonic bonding employs a unique technology for the in-line processing of breathable, elastic, laminated material with ultrasonically bonded transpiring spots (patented by Fameccanica). The latest improvement includes the complete elimination of glue in this laminate.

There is a clear advantage in terms of cost reduction: the estimated saving for each baby diaper machine using the Fameccanica laminate is in the range of €150,000-250,000 per year compared to common pre-made

materials available on the market today. As one FLS laminating system can serve up to eight baby diaper machines, savings can reach €2 million per year.

### Why is collaboration so important for this project?

We believe that our company does not have the necessary strength to carry out a project like this without partners. While Fameccanica is responsible for development, a key diaper producer will validate product performance, and the University of Manchester in the UK is carrying out an independent lifecycle assessment analysis in the value chain, giving a broad overall view of the subject, and ultimately increasing the probability of success.

### Where will you be focusing your attention in the future?

Attention will be focused on the timely conclusion of each step of the project plan. Our hope is that, in parallel, a number of customers accept the challenge in advance by taking advantage of the GLUELESS back ears, GLUELESS acquisition-distribution layer and GLUELESS elastic strands, as well as the new features that we are working on now and will introduce in the next 18 months.

## THE ENVIRONMENTAL IMPACT OF DISPOSABLE DIAPERS

Every year, disposable diaper production within the EU:

-  Uses **30,000 tonnes** of glue
-  Consumes **1,269 Twh** of energy
-  Generates **200,000 tonnes** of CO<sub>2</sub>



At the end of last year, GLUELESS researchers also began life cycle assessment (LCA) activities. These are being conducted at the University of Manchester in the UK. The environmental impact of Fameccanica.Data SpA's novel technologies will be validated using CCaLC – a carbon footprinting tool capable of estimating life cycle greenhouse gas emissions that takes into account entire supply chains.



Caption to be added

### A GREENER FUTURE

In light of its already considerable progress, the GLUELESS researchers are confident that this project will produce a wide variety of technical, environmental and economic outputs. By the time the project has reached its conclusion, the scientists involved will have produced novel glueless bonding solutions for a total of five diaper manufacturing subprocesses. In addition to this, they will have created a

demonstration diaper utilising all of these novel subprocesses that, in addition to offering equivalent performance to current glue-based products, will require approximately 65 per cent less glue to manufacture. This reduction should equate to a 10 per cent total energy saving, and could result in financial savings of up to €500,000 per year for an average manufacturing facility. With figures like that, it seems likely that diaper manufacturers will be keen to adopt these new technologies.

## INTELLIGENCE

# LIFE GLUELESS

## PETROL BASED GLUE AND ENERGY CONSUMPTION REDUCTION IN DIAPERS PRODUCTION PROCESSES

### OBJECTIVES

- To convince absorbent hygiene product producers to adopt a cost-effective (and environmentally friendly) alternative bonding solution by demonstrating that it meets performance criteria
- To underpin via an industrial demonstration project (including dissemination to multiple industry sectors) public environmental policy objectives of decoupling environmental impact from economic growth, and implementing the number one priority in the waste hierarchy: waste avoidance

### PARTNERS

**Fater SpA**, Italy

**University of Manchester**, UK

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