

- **Reference:** Calaf Forn, M., Puig Ventosa, I., 2012. "A Catalan residence for elderly people tests reusable nappies". Recueil des Interventions. 1ères Rencontres européennes de la prévention des déchets (Collection of interventions. 1st European Meeting for Waste Prevention). ADEME (Agence de l'Environnement et de la Maitrise de l'Energie). Paris.

## **A CATALAN RESIDENCE FOR ELDERLY PEOPLE TESTS REUSABLE NAPPIES**

Maria Calaf Forn (ENT Environment and Management)  
Dr. Ignasi Puig Ventosa (ENT Environment and Management)

### **1. INTRODUCTION**

Disposable nappies for incontinence are a growing fraction of municipal waste, due to the progressive aging of the population in our society. Currently, disposable nappies cannot be recycled, so their destinations are disposal or incineration. Besides the environmental impacts caused by these treatments, it must be added the high consumption of resources and energy that involves its manufacture.

In geriatric centres, waste arising from the use of disposable nappies is a very important part of total waste generation. It is estimated that approximately 90% of residents have some type of incontinence and an every incontinent person generates an average of 3.5 kg of nappies per day. In Catalonia, this represents almost twice the average of municipal waste generation, around 1.64 kg / person / day.

As an alternative to disposable nappies for incontinence, reusable nappies could be used. Reusable nappies are made of absorbent cloth, and are washed after each use. They can approximately be used between 150 and 300 times before becoming waste. Therefore, the use of reusable nappies in geriatrics could lead to a significant reduction of waste generated in these institutions.

For this purpose, the Metropolitan Area of Barcelona<sup>1</sup>, launched in 2007 the first pilot introduction of reusable nappies in nursing homes in Catalonia. The pilot had the financial support of the Waste Agency of Catalonia (Agència de Residus de Catalunya) and the collaboration of ICASS (Institut Català d'Assistència i Serveis Socials) and ACRA (Associació Catalana de Recursos Assistencials). It began in April 2008 and continued in operation until 31 March 2009.

The preparation and implementation of the pilot was divided into three phases: an initial preparatory phase, in which the feasibility and options for the implementation of reusable nappies in nursing homes was studied (November 2006-March 2007), a second phase in which the pilot test started and reusable nappies were introduced in Pare Batllori residence for three months (April-July 2008) and a third stage of consolidation of the pilot, in which implementation of reusable nappies initiated in the previous phase was continued so as to obtain a greater amount of data for evaluating the project (July 2008-March 2009).

### **2. ENVIRONMENTAL IMPACTS RELATED WITH DISPOSABLE NAPPIES**

The problem of disposable nappies (for both children and adults) lies in its composition. Except for compostable nappies (which are only sold in a marginal proportion), almost all disposable nappies are made at least with three layers of different materials: a first layer of polypropylene which prevents the return of moisture, a second layer of cellulose in flakes or fluff, and a waterproof outer layer of polyethylene. In addition, most nappies also include superabsorbents gel polymer (SAP), stickers and rubber bands in the opening leg.

This composition, together with the organic content, makes recycling of used nappies technically and economically not feasible.

Therefore the destination of these nappies are landfills and / or incinerators, which involve environmental problems such as emission of greenhouse gases and pollutants, possible leaching to groundwater, etc.

In addition, the consumption of natural resources (cellulose, water, oil, etc.) must be taken into account, along with the emissions generated by the manufacturing process of disposable nappies.

---

<sup>1</sup> This institution changed its name recently. During the project it was called Metropolitan Entity of the Environment (Entitat Metropolitana del Medi Ambient).

- **Reference:** Calaf Forn, M., Puig Ventosa, I., 2012. "A Catalan residence for elderly people tests reusable nappies". Recueil des Interventions. 1ères Rencontres européennes de la prévention des déchets (Collection of interventions. 1st European Meeting for Waste Prevention). ADEME (Agence de l'Environnement et de la Maitrise de l'Energie). Paris.

### 3. REUSABLE NAPPIES FOR INCONTINENCE

There are different types of reusable nappies to suit the needs of each person, similar to what is common for disposable nappies. In general, they can be classified according to the type of incontinence:

- For light or urgency incontinence, options are the following:



- *Washable underwear:* briefs and panties which incorporate an absorbent layer on the bottom (a towel or similar material) for occasional and slight urine losses. Models are different for men and women, although some unisex models can be found. One advantage is that have the appearance of normal underwear, which tends to be better accepted. They are usually the most comfortable and discrete option for independent people with very light incontinence.
- *Underwear with pocket:* these are panties and briefs with a pocket at the bottom where an absorbent pad is located, which can be reusable or disposable. They have the advantage that only the interior pad needs to be changed after each use; whereas the underwear can be changed with a lower frequency. The total absorbency depends on the material and thickness and can vary from 200 to 800 ml.
- *Waterproof underwear + washable pad:* there is usually no difference between products for men and women. They are two independent pieces, which facilitates cleaning and changing. The underwear has an impermeable part inside and can be covered by another material outside. The absorbency, as in the previous case, can vary greatly depending on the type of pad used. This system can be used for a little more severe incontinence, since waterproof underwear prevents leaks, and pad can be adjusted to different needs.

- For severe incontinence, available options are:

- *Waterproof underwear + washable nappy:* as in the previous case, these are two independent pieces, but in this case the nappy covers a bigger area and is more absorbent, so that leaks are avoided in cases of moderate / severe incontinence. Nappies can also vary greatly depending on the shape, material, type of closure, thickness, etc. They can be combined with a booster pad to increase absorbency.
- *All-in-one nappies:* it is a cloth nappy with a waterproof outside layer, similar to disposable nappies. They can also be manufactured with different materials and different types of closure. The main problem is that the waterproof layer is more vulnerable to intense conditions of washing, needed by the inside absorbent layer. As they cannot be separated, they have an average life shorter than the above options. Its main advantage is that they are less difficult to put than two pieces nappies, since they are more similar to traditional disposable nappies. For severe cases of incontinence they can be combined with a booster pad.

For the pilot introduction of reusable nappies at geriatric Pare Batllori of Barcelona (see section 4) two models of all-in-one nappies were used, along with two models of booster pads, two types of pads and an impermeable underwear:

Table 1: Models of nappies used in the test in the Pare Batllori Residence of Barcelona.

	<p>All-in-one nappy. They were chosen with Velcro closure and elastic leg and waist bands.</p>
	<p>Booster pad. A model with a butterfly shape (pictured) and another one with a rectangular shape were chosen. They were adapted to be inserted into the all-in-one nappies and provide extra absorbency in cases of severe incontinence or at night.</p>

- **Reference:** Calaf Forn, M., Puig Ventosa, I., 2012. "A Catalan residence for elderly people tests reusable nappies". Recueil des Interventions. 1ères Rencontres européennes de la prévention des déchets (Collection of interventions. 1st European Meeting for Waste Prevention). ADEME (Agence de l'Environnement et de la Maitrise de l'Energie). Paris.



	Pad. Two models were chosen. One had an impermeable lower layer, which could be worn with the regular underwear. The other one, which was 100% cotton, had to be worn with impermeable underwear to prevent leaks. They were used in cases of light incontinence.
	Waterproof underwear. It has elastic leg and waist bands and serves for both men and women. It has to be combined with the cotton pad to prevent leaks.

Table 2: Comparison between the features of reusable and disposable nappies.

Reusable nappies	Disposable nappies
Manufactured with natural fabrics	Manufactured with synthetic materials
Perspirable: good for skin conditions	In some cases increase of irritations and allergies.
Larger	Smaller
Softer	Rough texture
Must be washed after its use	Must be purchased and disposed of periodically
Environmental impacts associated with washing	Environmental impacts associated with manufacturing and landfilling/incineration

#### 4. CHARACTERISTICS OF REUSABLE NAPPIES IMPLEMENTATION IN THE GERIATRIC RESIDENCE "PARE BATLLORI" OF BARCELONA

The first pilot introduction of reusable nappies for elderly people in Catalonia was developed in the geriatric residence Pare Batllori. This public residence has 90 places and is managed by Foundation "Vella Terra". The main features of implementation are:

1. Resident participants in the pilot: for sanitary reasons the pilot only included people with urinary incontinence, being excluded people with fecal or double incontinence. During the experience some persons with cognitive impairment were also excluded because they repeatedly threw the reusable nappies away, in the same bin of disposable ones. However, participation was voluntary, and some people who started participating, requested to move back to disposable nappies after a trial period. Also there were some casualties for decease. The average participation in the first three months was 18 people, of a total of 28 with urinary incontinence.
2. Washing and drying system: nappies were washed in the laundry of the residence taking around four hours per day, and it was completely separated from any other clothes being washed in the residence. Due to the different composition of nappies and pads, they were separated into two types and washed at different temperatures. Two washing machines of 23 kg each were used for the all-in-one nappies, the booster pads and the cotton pads, and a 6 kg domestic washing machine for waterproof underwear. In the first case a prewash of 10 minutes at 35°C was made and a wash of 25 minutes at 65°C; in the second case, waterproof underwear were washed with the synthetic clothing program at 30°C. In both cases, environmentally friendly and non aggressive detergents and bleaching were used (ecological detergent consisting of vegetable soap with active agents of palm oil and coconut and percarbonat calcium base bleaching). Finally, nappies were dried in the residence industrial dryers at a temperature of 65°C, and distributed later to the wardrobes of each floor.
3. Distribution of nappies: for the correct distribution of the appropriate type and size for each participant, the collaboration of the geriatric staff was required. Once defined the needs of each user, and after a few days of test, nappies were marked with the name of its owner. Although there were exceptions due to specific needs of some people, in general, the following number of nappies were assigned per resident:
  - For people with severe incontinence: 10 all-in-one nappies and 4 booster pads.
  - For people with light incontinence: 2 impermeable underwear and 7 pads

- **Reference:** Calaf Forn, M., Puig Ventosa, I., 2012. "A Catalan residence for elderly people tests reusable nappies". Recueil des Interventions. 1ères Rencontres européennes de la prévention des déchets (Collection of interventions. 1st European Meeting for Waste Prevention). ADEME (Agence de l'Environnement et de la Maitrise de l'Energie). Paris.

- For people with incontinence only at night: 4 all-in-one nappies and 4 booster pads.

In addition, they were provided a number of extra units to replace those that would deteriorate or in case of contingencies.

4. **Staff involved:** the introduction of reusable nappies at geriatric residences required the involvement of nursing assistants, of the staff management, and of the staff of the laundry:

- Nursing assistants were those responsible for changing the nappies, and therefore their collaboration was essential. The number of daily changes of reusable nappies is the same as for disposable nappies. Once reusable nappies were changed, they had to be deposited in special containers which were later taken to the laundry. Nursing assistants also had to ensure that each resident had the right nappies for their needs, and had to notify to their superiors of any incident.
- The management of the residence was responsible for coordinating the process and collecting information provided by nursing assistants and residents. Along with the coordinator of the project from the Metropolitan Area of Barcelona, they were both responsible for the decisions as regards any important aspect of the project.
- Staff of the laundry carried out the washing and drying of nappies and distributed them to the plants. The Metropolitan Area of Barcelona covered personnel costs associated with nappies washing.

To monitor the introduction of reusable nappies and to address any problems there was the support of a specialized company, which also designed the executive project (ENT Environment and Management).

5. **Implementation costs:** the cost of full implementation of reusable nappies in this pilot project was assumed by the Metropolitan Area of Barcelona, with the support from the Waste Agency of Catalonia (Agència de Residus de Catalunya). Among the main expenses are found the purchase of reusable nappies, the laundry personnel cost, the consultancy costs, and the water and energy from washing machines and dryers. In addition, under the project, actions started to achieve that reusable nappies could be financed by the Spanish public health system, as already happens with disposable nappies.

Table 3: Total costs of the introduction of reusable nappies in the geriatric residence Pare Batllori.

Concept	Total cost (VAT included)
Purchase of nappies	16.677,20 €
Purchase of cleaning products	886,78 €
Water, energy and laundry staff costs <sup>1</sup>	22.834,46 €
Consultancy and monitoring costs	39.605,32 €
Other expenses	635,12 €
<b>TOTAL</b>	<b>80.638,88 €</b>

<sup>1</sup> The staff costs means 88% of this concept.

6. **Maintenance costs:** the total costs per resident and day of the use of reusable nappies in the long term would be 5.65 €. The majority (62%) arise from the laundry staff. The cost of nappies that were lost also represented a significant percentage of the total (21%). This is expected to be reduced in the long term (by 10%). In contrast, the costs of purchasing nappies, represented only 7.3%. The unit costs would decrease significantly if the laundry tasks were assumed by the staff of the residence, instead of additional personnel, or if the loss of nappies would come to a stop. Regarding the costs of using different types of nappies, the purchasing costs per person per day of all-in-one nappies and booster pads are far higher than those for waterproof underwear and for pads.

- **Reference:** Calaf Forn, M., Puig Ventosa, I., 2012. "A Catalan residence for elderly people tests reusable nappies". Recueil des Interventions. 1ères Rencontres européennes de la prévention des déchets (Collection of interventions. 1st European Meeting for Waste Prevention). ADEME (Agence de l'Environnement et de la Maitrise de l'Energie). Paris.

Regarding the long term costs of using reusable nappies (including a 10% replacement of losses)<sup>2</sup>, these would still be 26% more expensive than disposable nappies<sup>3</sup>.

## 5. RESULTS ACHIEVED DURING THE FIRST MONTHS OF THE EXPERIENCE

The results of the pilot test at Pare Batllori Residence can be summarized in the following points:

- The use of reusable nappies is viable for independent people with urinary incontinence, while problems are encountered when applying them to dependent people or people with fecal incontinence.
- Choosing the right model is substantial for the success of the project. The project identified and tested different materials that meet certain quality requirements.
- The introduction of reusable nappies involves a substantial reduction of waste (1.10 kg/day and resident<sup>4</sup>) at the residence. Water consumption and associated energy is of 39 liters and 3.72 kWh, respectively, per day and per resident.
- There was a good acceptance of reusable nappies both among residents and among the staff of the residence, especially for absorbents for light incontinence. According to surveys, 40% of the users were "very satisfied" and 50% "reasonably satisfied" with reusable nappies.
- The introduction of reusable nappies, once completed an initial period of adaptation, does not mean a load of extra work for staff of the residence, except in the case of the laundry staff. Changing routines and distribution of reusable nappies are integrated into the work of employees.
- The experience ended for lack of funding.

## 6. POSSIBILITIES OF INTRODUCING REUSABLE NAPPIES IN OTHER RESIDENCES

For the introduction of reusable nappies in geriatrics the following considerations must be taken into account:

- Due to sanitary problems resulting from reusable nappies stained with feces, it must be assured that participants suffer from urinary incontinence only.
- It is not recommended to introduce reusable nappies in residences with people with cognitive impairment (Alzheimer's disease, senile dementia, etc.) for the difficulty that residents may have to differentiate reusable nappies from disposable ones.
- The introduction of reusable nappies requires a significant initial effort by the staff of the residence due to the need to identify the type of incontinence of each resident and choose sizes and nappies needed for each one. The workload decreases significantly after the first few weeks.
- The involvement of the staff of the residence, as well as the residents themselves, and their families is important.
- As mentioned, reusable nappies –unlike disposable ones– are not currently funded by the Spanish public health system, which makes it very expensive for geriatric residences to undertake similar experiences, until the financial treatment received by the Spanish public health system turns to be fairer.

10<sup>th</sup> May 2012

---

<sup>2</sup> This does not include any consultancy costs. It neither considers savings in collection and treatment costs of disposable nappies, but these are estimated to be negligible.

<sup>3</sup> With an average cost of 3.64 € per resident and per day for the case of disposable nappies.

<sup>4</sup> This is lower than the data of 3.5 kg of waste generated per resident and day, since, in that case are included both urinary and fecal incontinence.