



Madras collection trial 2022

New potentials for high recycling of danish mattresses

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MADRAS COLLECTION TRIAL 2022: New potentials for high recycling of danish mattresses

The quality of the collected mattresses indicates potential for future recycling opportunities in Denmark

KEYWORDS: Increased recycling, mattress, PUR foam, degradation technology

SUMMARY

The waste fraction of mattresses holds a recycling potential that has not yet been fully realized in Denmark. Tests conducted in the Netherlands demonstrate the feasibility of shredding mattresses, although box spring mattresses presented particular challenges. Scaling solutions for improved mattress recycling appears promising, especially considering the potential market for recycled foam.

BACKGROUND

To investigate Danish opportunities for mattress collection systems and treatment technology, a pilot test of collected mattresses from Denmark was conducted by the Dutch company RetourMatras. The results were so promising that the project partner, Bramming Plast Industri (BPI), conducted additional tests on the PUR foam. Based on the overall positive results, BPI developed a new product solely based on post-consumer bonded PUR foam.

TESTS AT BPI

The Danish company BPI A/S conducted further recycling tests on mechanically sorted PUR foam from mattresses. The experiments yielded such positive results that BPI has now developed a new product based on post-consumer PUR foam. Currently, input for this fraction is imported from Holland, while BPI awaits a similar actor in Denmark that would enable the purchase of Danish post-consumer mattress foam of good quality.

BPI assesses its capacity to potentially process all the post-consumer PUR foam that may come from the Danish market in the future, and sees the market opportunities as favorable:

"We are experiencing great interest in post-consumer-based bonded foam and are convinced that customers will increasingly prefer sustainable solutions. Therefore, we appeal for the establishment of a Danish infrastructure for collecting and separating mattresses as soon as possible, which will enable us to base our product on Danish mattresses rather than Dutch ones."

– Kasper Kamp Jensen, Director of Development, BPI A/S



Photo: Bale of PUR foam from Danish mattresses received at BPI – Source: BPI 2022



Photo: Foam samples for mechanical testing at BPI - Source: BPI 2022



Photo 1: Foam granules in BPI's mold, Photo 2: Bonded foam being pressed, Photo 3: Mattress foam from Denmark (Marius Pedersen), Photo 4: Mattress foam from Holland

HIGH RECYCLING IS POSSIBLE

A subset of the collected mattresses was sent to Holland to test shredding and processing methods and examine the recycling potential in Danish mattresses. The results were promising: *“When comparing Danish and Dutch mattresses, we can identify many similarities. By treating the mattresses according to the RetourMatras method, Denmark can achieve the same recycling rate as in Holland, approximately 80%. This means that Danish municipalities can save up to 70 kg of CO2 emissions per mattress, if the collected mattresses are kept dry and separated from other waste.”*

– Chico van Hemert, CEO RetourMatras

In Copenhagen Municipality, over a 6-week trial period, 4.1 tons of mattresses were collected from the Sydhavn Recycling Center, and over a 10-week period, 8.5 tons of mattresses were collected directly from multi-story buildings with covered bulky waste rooms. The collection trial included both box mattresses and soft mattresses without wooden frames. A subset was transported for processing tests at the company RetourMatras. RetourMatras could not sort and process the box mattresses, which are relatively unknown in Holland, but it was possible with the soft mattresses. Provided the mattresses are dry and separately collected, the recycling rate for this fraction is expected to be up to 80% (metal parts approx. 22%, PUR foam approx. 41%, and textiles approx. 14%).

Scaling

If the results from the trial are scaled to the entire Copenhagen Municipality, over 500 tons of soft mattresses alone can be collected for recycling each year. However, these figures are associated with some uncertainty. Scaling the model nationwide thus holds great potential, especially since the experiences from the trial also indicate that citizens are willing to travel further with their mattresses if they know they will be recycled. However, approximately 80% of mattress waste in Copenhagen comes through bulky waste collection, which is likely also the case in other Danish cities. This further contributes to a positive business case in a scaling model for mattress collection.

Key results from BPIs tests

BPI received approximately 2,400 kg of post-consumer mattress foam from RetourMatras. All foam was protected from moisture and dirt during transport. To examine the quality between the foam BPI normally works with (post-industrial foam), the company conducted a thorough comparison of post-industrial and post-consumer foam.

The investigation showed the following:

- Post-industrial foam complied with both CertiPUR US and Europe as well as REACH & RoHS.
- Post-consumer foam complied with CertiPUR US and Europe except:
 - NL foam showed a too high phthalate value.
 - DK foam had too high levels of heavy metals.
 - Both had too much organically based tin (EuroPUR only).

The elevated values are expected to stem from the ingredients used in the past.

Both NL and DK post-consumer foam complied with REACH and RoHS, including REACH Annex XVII (products for children). Long-term tests, however, must be conducted to document the lasting effect if the foam is to be included in products for particularly vulnerable individuals (e.g., children's products).

The mechanical properties of bonded foam based on post-consumer mattresses were on the same level with or better than post-industrial bonded foam. No results raised any concerns regarding ordinary use.

Authors

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References

<https://circularcph.cphsolutionslab.dk/cc/partnerships/partnership-for-circular-mattresses>

Partners in the project

Vejle Kommune, Odsherred Kommune, Københavns Kommune, ARC, ARGO, Vestforbrænding, Danfoam/Tempur-Sealy, Bramming Plast Industri, Region H.



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