Introduction
The purpose of this report is to examine the effects on mattress performance when a layer of ‘Kaymesh’ material is bonded to the top surface of the mattress. Performance for the purpose of this report is defined and measured as follows:

1) Pressure distributive properties
Tests are performed with the mattress on a 4-section profiling bed in standard position according to EPUAP draft guidelines, with the backrest inclined to 45°, the gatch section elevated to 20°, and made up with a loose sheet. The phantom is lowered onto the mattress in standard 45° rigid attitude, and then the hip and knee joints are released.

The phantom is left to dwell for 10 minutes on the mattress, to allow for initial stabilisation of the mattress.

Multiple measurements are made, to obtain confidence intervals for the peak pressures in the pelvic and heel regions. Low peak interface pressure is deemed to be the most valid measure of pressure reducing properties according to current evidence at the time of publication.2


Report Outputs:

• Peak Interface pressure Pelvic area (95% confidence limits) (mmHg)

• Peak Interface pressure Heels (95% confidence limits) (mmHg)

• Pressure map (10mmHg Isobars)
2) Heat and water vapour transfer properties

The ability of a mattress to dissipate body heat and moisture makes an important contribution to comfort. Excessively moist conditions at the skin/mattress interface are also known to macerate the skin, exacerbating the risk of mechanical damage to the skin.

Heat and Water Vapour Transfer Measurement Apparatus

A controlled environment testing facility with a thermal-guarded sweating hot-plate\(^3\) permits accurate measurements to be made of both heat transfer rates and water-vapour transfer rates through the product.

The hot-plate is maintained at constant temperature and humidity at the interface to the mattress, and losses of heat and water vapour into the mattress are electronically monitored simultaneously.

Tests are conducted using the whole mattress construction, complete with cover. It has been shown that surface microclimate is determined by the transfer properties of the entire system, and cannot be inferred from data relating to individual components of the system, such as the cover.

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\(^3\) Nicholson GP et al. A method for determining the heat and water vapour permeability of patient support systems

Report outputs:

- Heat Transfer rate (Wm$^{-2}$K$^{-1}$)
- Water Vapour Transfer rate (gm$^{-2}$day$^{-1}$)
3) Fatigue Longevity

Mattresses are known to have a finite life-span. Their pressure-distributive properties degrade substantially over a period of years. Significant changes in these properties, if left undetected, may lead to increased risk of pressure ulcers.

A representative sample of mattresses would have to be monitored in service for several years, by which time the sample would no longer be representative of the mattresses on the market. In the interests of currency, the preferred approach is to subject mattresses to an accelerated, artificial fatigue cycle.

Products undergo 100,000 repetitive indentations using a cylindrical indentor of 80mm diameter. Force-indentation tests using a Quince 2 mattress audit device (having a matching 80mm cylindrical indentor) quantify changes in mattress properties relative to the starting point. A high percentage indicates a large change in indentation properties after fatigue.

This measure cannot be directly extrapolated to give an estimate of the service life of the mattress, since the fatigue conditions are artificial, and not accurately representative of the fatigue of a mattress in use. It does however allow indicative comparisons to be made between mattresses.

Report Outputs

- %Change in Quince2 bottoming force after 100,000 indentations

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4 Bain DS Ferguson-Pell MW Davies PJ In-service mattress testing of hospital mattresses using the Quince mattress tester. J. Tissue Viability 11,4 October, 161-165,
## EVALUATION

Kaymed with ‘Kaymesh’

### Pressure Map

![Pressure Map Image]

### Technical Data

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Interface Pressure (pelvis)</td>
<td>61</td>
<td>+/-4 mmHg</td>
</tr>
<tr>
<td>Peak Interface pressure (heels)</td>
<td>66</td>
<td>+/-11 mmHg</td>
</tr>
<tr>
<td>Heat transfer rate</td>
<td>29.5</td>
<td>+/-0.1 Wm⁻²</td>
</tr>
<tr>
<td>Vapour transfer rate</td>
<td>749</td>
<td>+/-8 gm⁻²day⁻¹</td>
</tr>
<tr>
<td>Longevity (% reduction Quince after 10⁵ cycles)</td>
<td>7</td>
<td>%</td>
</tr>
<tr>
<td>Fire retardancy</td>
<td>BS 6807:1996 Source0, 1 &amp; 5</td>
<td></td>
</tr>
</tbody>
</table>

### Supplier

Kaymed  
Bluebell Industrial Estate  
Naas Road  
Dublin 12  
Ireland
EVALUATION  Kaymed without ‘Kaymesh’

Pressure Map

Technical Data

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Interface Pressure (pelvis)</td>
<td>60 +/-4 mmHg</td>
</tr>
<tr>
<td>Peak Interface pressure (heels)</td>
<td>68 +/-11 mmHg</td>
</tr>
<tr>
<td>Heat transfer rate</td>
<td>24.5 +/-0.1 W/m²</td>
</tr>
<tr>
<td>Vapour transfer rate</td>
<td>530 +/-8 gm² day⁻¹</td>
</tr>
<tr>
<td>Longevity (% reduction Quince after 10⁶ cycles)</td>
<td>7 %</td>
</tr>
<tr>
<td>Fire retardancy</td>
<td>BS 6807:1996 Source0, 1 &amp; 5</td>
</tr>
</tbody>
</table>

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Results and Discussion

It can be seen that the mattress comprising a layer of Kaymesh bonded to the surface shows significantly improved heat transfer and water vapour transfer characteristics when compared with other visco-elastic polymer mattresses tested in accordance with the same guidelines. The mattress displayed good pressure distribution properties though no significant difference was recorded when compared to other visco-elastic mattresses supplied previously by Kaymed for evaluation.

The mattress displayed impressive fatigue longevity performance. The Quince 2 device, in addition to performing indentor tests, also generates specific points of shear force. Shear force is generated when the angles at the circumference of the two cylindrical heads are indented (this is distinct from the more traditional roll on-roll off cylinder commonly used to perform fatigue longevity tests). The pressure generated would be roughly similar to that caused by the ischial tuberosities; or in response to a specific question from Kaymed, to the shear forces generated as patients adjust their position using their hands.

Therefore, an important benefit of the application of Kaymesh to the surface would be the elimination of cracking or fissures sometimes observed on the surface of 'visco' materials in general.