Variable Pressure Foaming and Surface Modification Technology™ in Polyurethane Systems Show a Clear Reduction of Pressure in an *IN VIVO* Test Model.

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Introduction

Pressure ulcers occur on any body part and are caused by a combination of factors, with unrelieved pressure as an important one: pressure relief, both passive (support surfaces) and active (regular repositioning of the patient) is essential for prevention and treatment of pressure ulcers.

A new type of mattress has been designed to significantly change and increase pressure distribution. The manufacturing (variable pressure foaming, VPF) and post-manufacturing (surface modification, SMT™), has led to a viscoelastic polyurethane foam technology which produces an open-cell foam with 8 times higher air flow than traditional viscoelastic technology. In these mattresses, VPF is combined with SMT™ which assures high levels of pressure distribution from known high risk anatomical areas (i.e. head, sacrum, heel) to low-risk areas such as the thigh and calf. The technology produces no detrimental emissions during manufacturing and uses materials derived from renewable natural elements.

Using these techniques, mattresses for subjects with regular weights (Bodyzone® 700) and for bariatric subjects (Bodyzone® 1000) have been designed.

Test methods

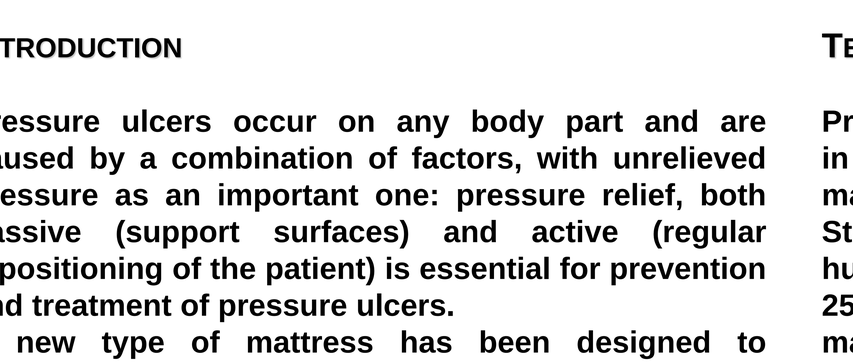
Pressures on VPF/SMT™ mattresses were compared in an *in vivo* model with pressure in standard mattresses, using total body pressure mapping. Standard and bariatric mattresses were tested with human subjects (female, 5'3", 120 lbs; male, 6'3", 250 lbs) in supine position. An XSensor pressure mapping system (XSENSOR Technology Corp. Calgary, Canada) was used to map each person on each mattress for 3 minutes at a mapping rate of 600 frames per minute (Figure I).

The average pressure, peak pressure and pressure area for all frames were added and divided by the total number of frames. The average pressure, peak pressure, and area were averaged between the two test subjects. Specific pressures for the head, sacrum, and heels were also reported.

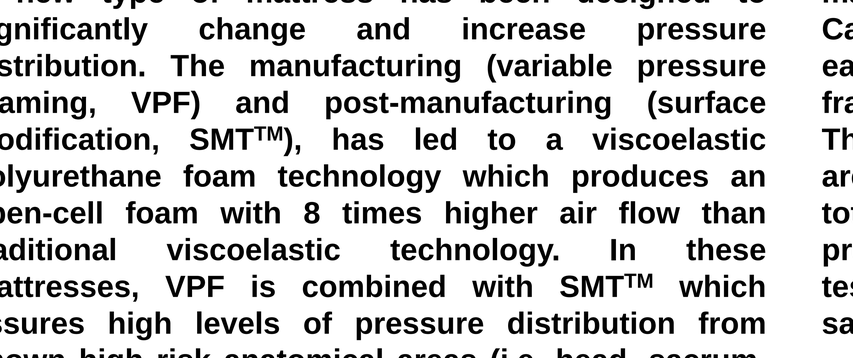
Figure I

- Female subject
- Height = 5' 3"
- Weight = 120 lbs.

Pressure Measurements in mm Hg/inch²

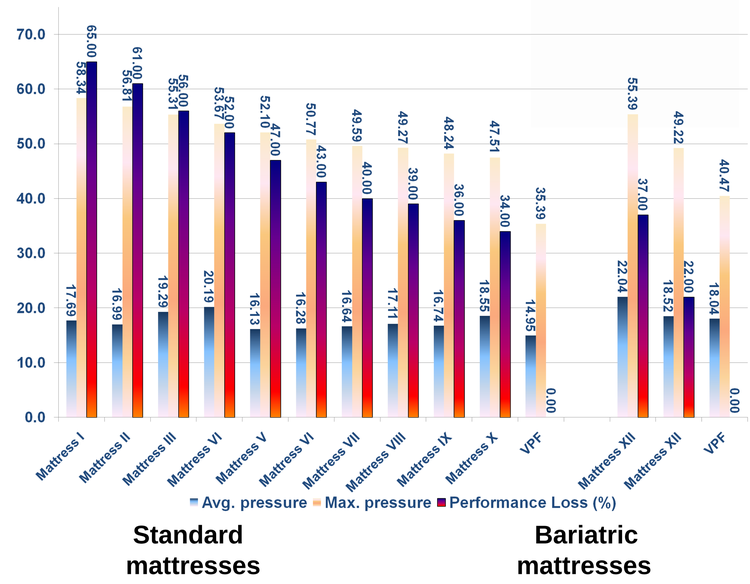


- Average pressure = 14.3
- Maximum pressure = 29.9
- Average Area = 664
- Head pressure = 27.6
- Sacrum pressure = 29.9
- Heel pressure = 21.7



- Average pressure = 17.9
- Maximum pressure = 54.0
- Average Area = 407
- Head pressure = 50.9
- Sacrum pressure = 42.4
- Heel pressure = 54.0

Figure II



Results

Eleven standard mattresses, including the Bodyzone® 700, and three bariatric mattresses, including the Bodyzone® 1000, were tested. Results were calculated and expressed as a percentage of the best performing mattress. On average, the pressure for standard mattresses was 17.32 mm Hg/inch² (min: 14.95, max: 20.19), and for bariatric mattresses the average pressure was 19.53 mm Hg/inch² (min: 18.04, max: 22.04). The average maximum pressure was 50.74 mm Hg/inch² (min: 18.04, max: 22.04). The average maximum pressure was 50.74 mm Hg/inch² (min: 35.39, max: 58.34) for standard mattresses and 48.36 mm Hg/inch² (min: 40.47, max: 55.39) for bariatric mattresses) (Figure II).

On average, the standard mattresses performed 47.0% less well than the best performing mattress, Bodyzone® 700® (range: 34.0-65.0%). For the bariatric mattresses this was 29.5% (range: 22.0-37.0%) versus Bodyzone® 1000, the best performing mattress in this group (Table I).

Conclusion

Pressure mapping tests of standard and bariatric mattresses clearly show the advantages of the VPF/SMT™ mattress, with substantially lower values for average and maximum pressure versus standard mattresses.

In the clinical situation this should translate to significant advantages for the prevention and treatment of pressure ulcers, by reducing the main threat to patients, pressure.

Environment-friendly manufacturing methods and the use of renewable sources add to the overall value of the VPF technology.

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