

Performance of the New Model Fluid Diamond Floor Aspirator

Arthrex Orthopedic Research and Development

Introduction

Floor suction devices are commonly used to maintain dry conditions on floors in hospitals, especially in operating rooms, where liquids would inevitably be spilled onto floor surfaces in and around work areas. The objective of this study was to investigate the performance of the Fluid Diamond floor aspirator with respect to other commonly used aspirators in the market through three specific aims:

- Speed Test: to measure the volume removed over time under wet conditions
- Noise Level Test: to measure the average noise level produced by the device during operation
- Resistance to Movement Test: to measure the difficulty associated with relocating the device from one wet area to another area

Materials and Methods

Speed Test: A confined space of approximately 2 ft² was flooded. Aspirators were placed in the flooded space and connected to a drive medical pump rated for maximum vacuum pressure (560 mmHg). Aspirators were operated for 10 seconds before the pump was turned off (Figure 1). Repeated measurements (3 trials) were taken for each aspirator.

Noise Level Test: Aspirators were isolated from the pump and the sound it produced. Aspirators were operated while one gal of liquid was introduced to the confined floor area in which it was stationary. A decibel meter was positioned 24 in from the center of the device to record noise level (Figure 2). Repeated measurements (3 trials) were taken for each aspirator.

Resistance to Movement Test: The floor surface was covered with a visible film of liquid. Aspirators were positioned in a specific location while the pump was set at maximum negative pressure (300 mmHg) and turned on. A force meter was tethered by a nonelastic line to the center of each aspirator. The force meter was pulled along a fixed rail path from a stationary position until it began to move (Figure 3). Repeated measurements (3 trials) were taken for each aspirator.

Figure 1. Setup for Speed Test

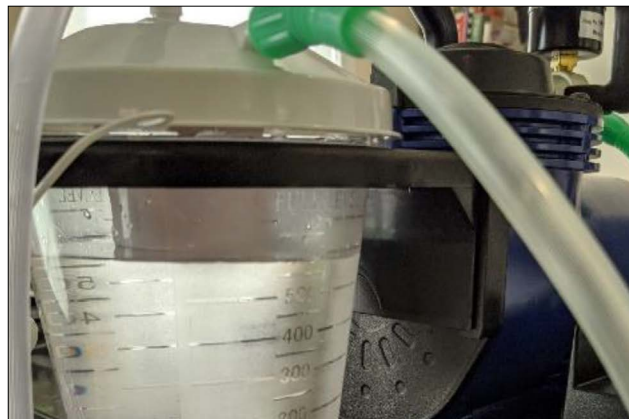


Figure 2. Setup for Noise Level Test



Figure 3. Setup for Resistance to Movement Test



Results

Figures 4, 5, and 6 below show performance data for all aspirators.

Figure 4. Shows speed performance for all aspirators

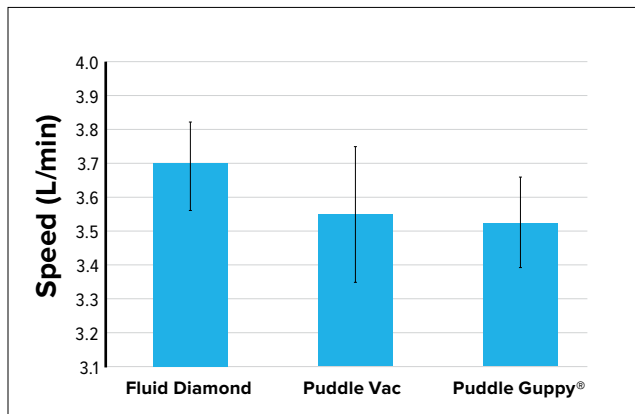


Figure 5. Shows noise performance for all aspirators

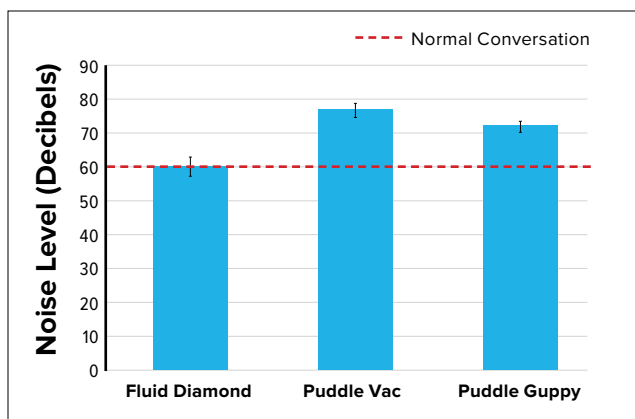
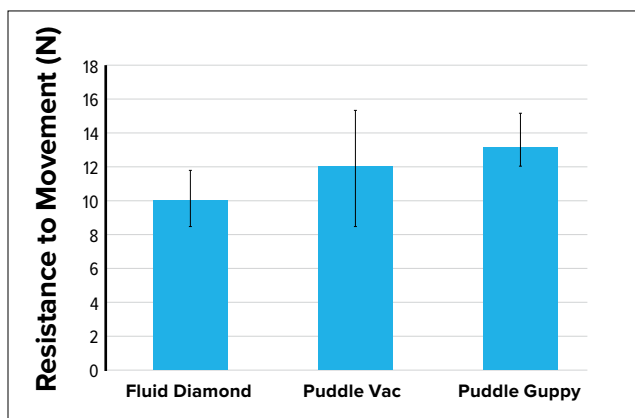
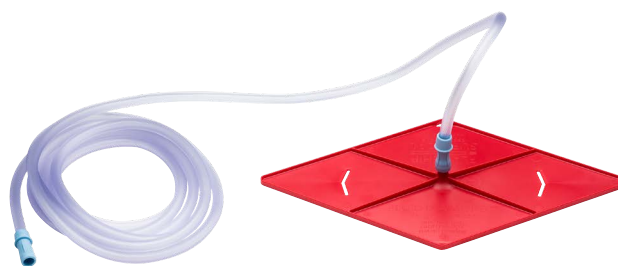


Figure 5. Shows resistance to movement performance for all aspirators



Conclusion

The Fluid Diamond exhibited better speed performance as compared to other aspirators as it removed the maximum amount of fluid per minute in the given time (Figure 4). The Fluid Diamond is comparatively quieter during operation as it had the lowest noise level recorded (Figure 5). The mean noise level for the Fluid Diamond was same as the noise produced during normal conversation (60 dB). Other aspirators, however, produced intense noise, ie, >70 dB. Considering that loudness is not directly proportional to sound intensity and that the intensity of the sound grows very fast, one may feel annoyed an intensity corresponding to 70 dB, according to Center for Diseases Control and Prevention (CDC)¹. In addition, the Fluid Diamond is comparatively lighter as it required less force to move (Figure 6). In conclusion, the Fluid Diamond aspirator outperformed as compared to other aspirators in the market.



References

- Centers for Disease Control and Prevention. Loud noise can cause hearing loss. What noises cause hearing loss? Accessed November 4, 2020. www.cdc.gov/nceh/hearing_loss/what_noises_cause_hearing_loss.html.