



Optimal Strategies to Relieve Tissue Congestion

Emily Andrews, Anthony Schuler, Tyler Vovos, Chelsea Wanta, Stephen Welch

Client: Doug Reinemann, Ph.D Advisor: John Webster, Ph.D

Department of Biomedical Engineering University of Wisconsin-Madison



Problem Statement

Current milking machines rely on a strong vacuum force to extract milk from the sinus udder. As a side effect, blood and interstitial fluids collect in the teat causing tissue congestion and chronic edema. Tissue congestion is uncomfortable and can also lead to canal constriction, causing reduced milking speed, bacterial infection, and hyperkeratinization. The newly designed milking machine attachment must extract milk at a comparable rate while simultaneously providing compression of the teat to better reduce tissue congestion.

Design Constraints

1. Quantitatively reduces congestion symptoms
2. Maintains high milking rate for economic efficiency
3. Addition to existing milking machine for simple integration
4. Intuitive and convenient for implementation by dairy farmer

Final Design

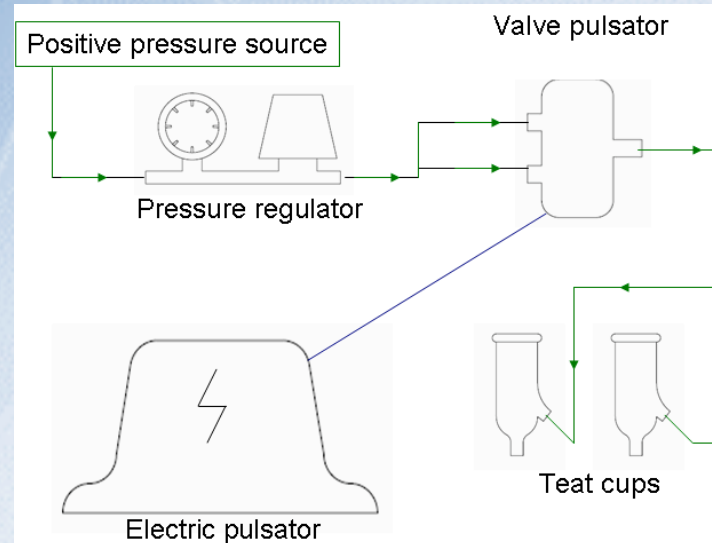


Figure 1. Prototype

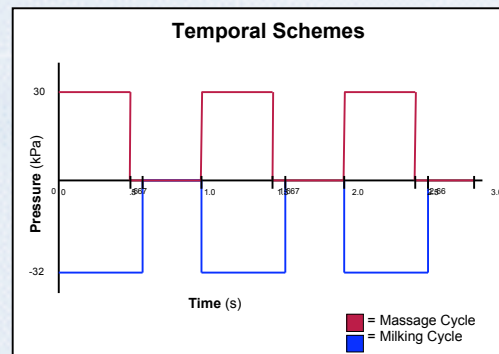


Figure 2. Temporal Schemes

Testing



Figure 3. Ultrasound Results

The front and rear right teats received a 90 second post-milking positive pressure massage. The left teats served as a control. Ultrasound images of all four teats were taken pre-milking, post-milking, and post-massage. Measurements of teat canal muscle wall thickness were used to quantify congestion relief.

Future Work

- Optimize temporal and pressure schemes
- Finalize attachment mechanism
- Integrate massage component into existing milking machine



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