



Technical Report

**Bellows Pump vs. Centrifugal Pump
Recirculation Bath Heat Generation
TR154-1**

Author

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*2015 September 30 – Correction: Levitronix BPS600 pump operated
at 7,000 rpm. Original report erroneously specified 4,000 rpm.*

1. Scope

To determine the amount of heat that various pumps add to a recirculation bath we will perform the following tests. We will test out a White Knight PXASD060 pump by having it continually recirculate an insulated bath. The bath temperature will be checked every hour and compared to the ambient air temperature to see how much heat the pump adds to the bath.

We will simultaneously run a centrifugal pump Levitronix BPS600 in an identical system under the same environmental conditions. The bath will be checked every hour and compared to the ambient air temperature to see how much heat the pump adds to the bath.

The results from the two pumps will then be compared.

2. Executive Summary

The pneumatic bellows pump (PXASD060) did not add temperature to the fluid bath. The bath temperature followed that of the test lab room temperature.

The centrifugal pump (BPS600) increased the bath temperature significantly. In 8 hours the centrifugal pump bath raised over 30 degrees C and about 30 degrees greater than the room temperature. This calculates out to a rise in temperature of more than 3 degrees C per hour over the first hours of testing.

It is recommended that if you want to maintain the bath temperature at a given temperature that a pneumatic bellows type pumps such as the PXASD060 be utilized to recirculate the bath. If it is a concern that the bath temperature should not be raised it would be best not to use a centrifugal pump, as it will significantly raise the temperature of the bath.

3. Methodology

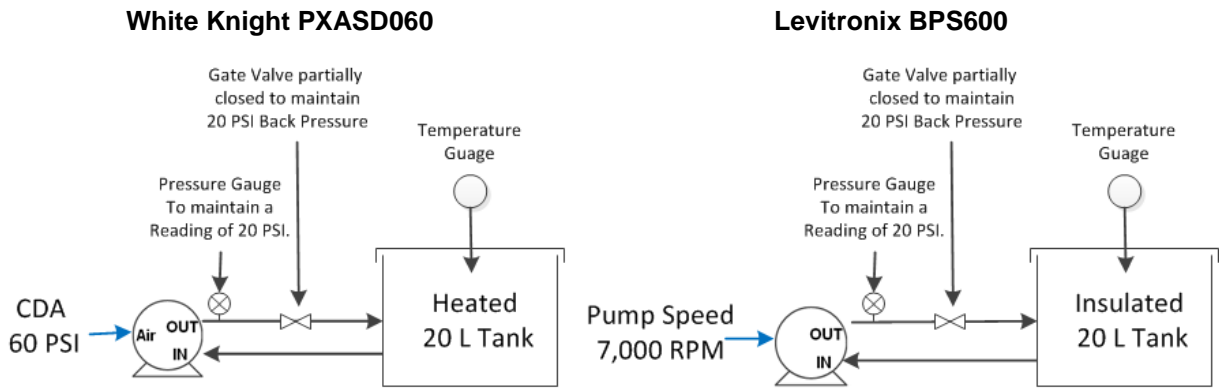
Recirculation Heat Generation Test

Two identical recirculation systems will be constructed. One will be equipped with the White Knight PXASD060 and the other with a Levitronix BPS600.

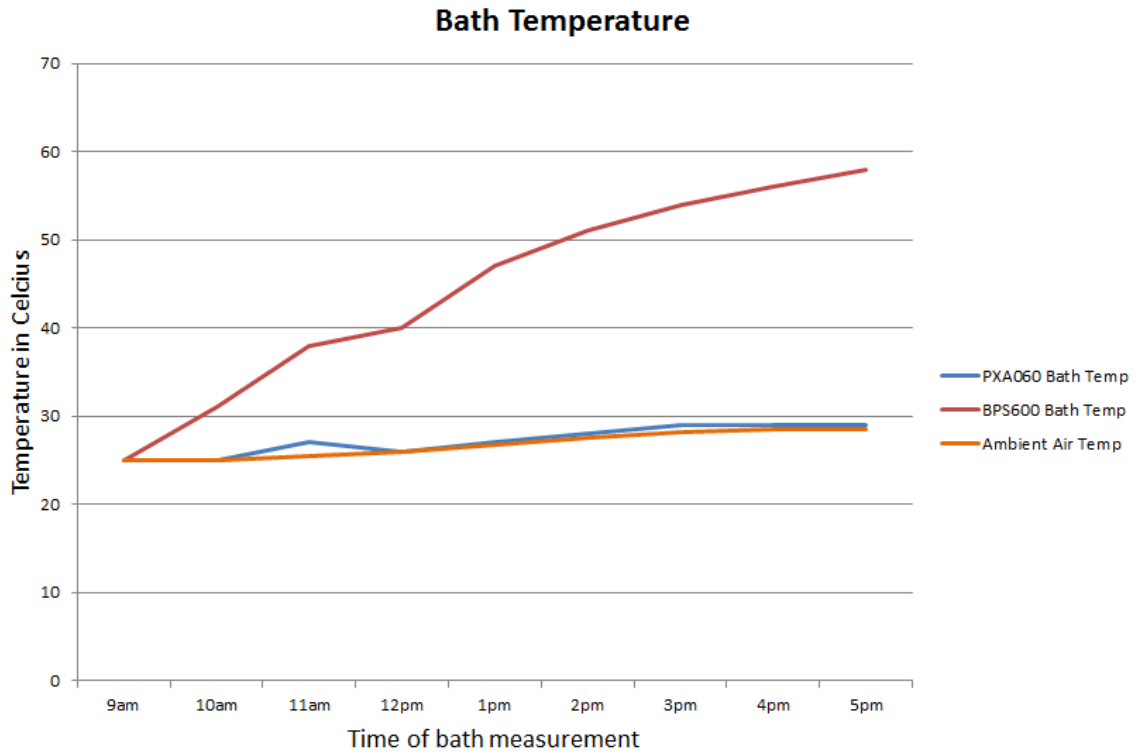
Testing to include:

- a. Each pump will pump through the same length of $\frac{3}{4}$ " PFA tubing (about 2 feet from tank to inlet and the same on outlet).
- b. Each pump will recirculate the fluid (DI water) in its own insulated 20 Liter tank.
- c. The discharge lines to include a gate valve which will be partially closed to maintain a head pressure of 20 PSI on both pumps.
- d. Fluid temperature and test lab temperature will be monitored every hour.

Ambient Dry Run Test Stand Set-up



Results/Findings



4. Conclusion

The pneumatic bellows pump (PXASD060) did not add temperature to the fluid bath. The bath temperature followed that of the test lab room temperature. Although the tank was insulated it appears that the air supply air temperature running the pump causes the fluid temperature to match the air supply temperature. As such as the air temperature increases the bath temperature will increase. Conversely it appears that as the room temperature drops the fluid temperature will also drop.

The centrifugal pump (BPS600) increased the bath temperature significantly. In 8 hours the centrifugal pump bath raised over 30 degrees C and about 30 degrees

greater than the room temperature. This calculates out to a rise in temperature of more than 3 degrees C per hour over the first hours of testing.

5 Recommendations

It is recommended that if you want to maintain the bath temperature at a given temperature that a pneumatic bellows type pumps such as the PXASD060 be utilized to recirculate the bath. If it is a concern that the bath temperature should not be raised it would be best not to use a centrifugal pump, as it will significantly raise the temperature of the bath.

6 Observations/Notes

At the end of the 8 hour test the outside temperature of the PXASD060 pumps was 29 degrees C (0.5 degrees warmer than the room temperature). At the end of the 8 hour test the outside temperature of the BPS600 was 58 degrees C (29.5 degrees greater than the room temperature).