

Houston Zoo CASE STUDY

Houston Zoo Achieves 40% Energy Savings
with Flux Drive Adjustable Speed Drive



"The installation of the Flux Drive here at the Houston Zoo has resulted in a much quieter work area and we can now adjust the speed of the motor with ease.

The Flux Drive has cut the power use for that pump in half. Installed across the board, this could result in a significant savings to an institution both in dollars and energy use as we all try to be more aware of our impact on the earth's resources.

We also believe that the wear and tear on our pumps will be significantly reduced as we no longer have to throttle back the flow of water leaving the pump. We will definitely be tracking those savings as time goes on."

*Beth Schaefer
Curator of Natural Encounters
and Sea Lions, Houston Zoo*

FLUX DRIVE RESULTS AT HOUSTON ZOO:

- 40% Energy Savings
- Elimination of Pump Cavitation
- Greatly Reduced Noise and Vibration
- Lower Motor Operating Temperatures
- Lower Pump Bearing Temperatures
- Reduced Wear and Tear on Pumps



Flux Drive Helps the Houston Zoo Save Energy

The Houston Zoo is the seventh largest in the United States and home to over 6,000 animals of more than 900 species. Soaring energy prices and a concern for environmental sustainability has led this world-class facility to seek energy saving solutions wherever possible. The Zoo's Sea Lion Exhibit water filtration system was recently fitted with a Flux Drive® Adjustable Speed Drive (ASD) as part of this ongoing effort.

The filtration system consisted of two 15hp AC motor and pump applications running in parallel to circulate salt water through sand filters. The motors were run at full power and speed (1760 rpm) while pressure and flow rates were controlled manually with hand-operated discharge valves.

A Flux Drive 08-60 Adjustable Speed Drive was installed to one of the motor and pump applications to allow for a side-by-side comparison of the energy savings and overall improvements to the system.

Challenge

The Sea Lion Exhibit filtration room is the lowest point at the 55-acre Houston Zoo and has flooded by as much as 12ft of water in the past. Any energy savings device installed at this location would have to withstand possible submersion during large storms.

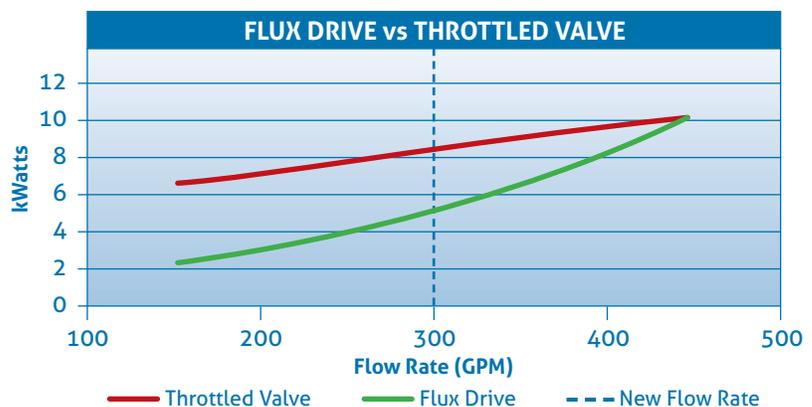
Solution

Flux Drive Adjustable Speed Drives utilize permanent magnets rather than electrical current to adjust speed. A Flux Drive system can withstand submersion as well as extreme temperatures, salt water, salt air, and high humidity—an ideal solution for the Houston Zoo.

Flux Drive Energy Savings

Power measurements were checked after installation using a Fluke 345 power quality meter and found to have been reduced from 8.96 kW using the throttling valve to just 5.5 kW using the Flux Drive ASD; resulting in approximately a 40% energy savings. There was no measurable change in the Total Harmonic Distortion (THD) of 1%.

In addition to the power savings, pump cavitation was completely eliminated on the Flux Drive application, thereby significantly reducing noise levels. Pump bearing temperatures were also reduced from 143 to 104 degrees F.



Houston Zoo Case Study Technical Discussion

The Sea Lion Exhibit filtration application had two 15 hp, 1760 rpm, US Motors running Flow Serve GRP 4x3x10 salt water pumps coupled with Dodge 7E flex couplings. Pressure and flow rates were controlled manually using a hand-operated discharge valve to balance the pump flow.

- *Initial vibration levels on the motor and pump as found were low but the motor bearings had high ultrasonic levels (55 dB) due to the bearings needing grease. The facility staff stated that the pump is rebuilt often, and in fact, just had new bearings and seals installed in the previous month.*
- *The as found misalignment was 8.3 mils vertically and 5.6 mils horizontally. The alignment tolerances for this close-coupled installation are noted to be 3 mils at 1800 rpm.*
- *Cavitation and noise levels on the pump were noticeably high due to the discharge valve being partially closed.*
- *Energy levels were measured on the motor at operating pressure. Operating wattage was 8.68 kW, 29.8 amps and 1% Total Harmonic Distortion (THD) with the valve throttled.*
- *The output pump pressure was maintained at 22 psi by a hand-operated throttle valve. The pump bearings had elevated temperatures (143 degrees F).*

A Flux Drive, Model 08-60 Adjustable Speed Drive (ASD) was installed between the motor and pump of one of the filter applications. The original shaft to shaft distance, with the Dodge coupling installed, was 4 inches. The motor had to be moved back another 6 inches to accommodate the Flux Drive ASD. Four new holes were drilled and tapped into the base plate and helicoil inserts were threaded and epoxied into the holes to anchor the motor. Flux Drive supplied a new WEG 15 hp 1770 RPM C-face motor to complete the installation.

A Joyce hand-operated actuator was installed on the Flux Drive ASD to control the discharge pressure of the pump and the resulting water flow through the sand filter.

The total time needed to install the Flux Drive ASD was approximately 2.5 hours.

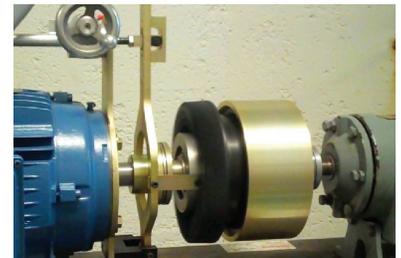
Alignment of the Flux Drive was done using the supplied .050" shim air gap spacers to verify adequate air gap between the induction rotor and magnet assembly. A visual inspection of the flex hub showed the alignment to be acceptable.

The actual alignment was checked using a laser and found to be 12.7 mils vertically and -11.8 mils horizontally. Allowable misalignment for the Flux Drive ASD or Coupling is noted to be less than 20 mils for this speed and the 08-60 model.

System Testing

The system was started and the pump discharge valve fully opened with the Flux Drive ASD running the pump at minimal speed / flow. The required pressure set point of 22 psi was achieved by engaging the Flux Drive ASD using the hand actuator to increase the pump speed to 1428 RPM. As a result of this new operating point, cavitation on the pump was eliminated. Vibration and noise levels fell significantly.

The pump bearing temperature was also reduced from 143 to 104 degrees F. Vibration levels were re-checked and recorded on the motor and pump with the results being very low at less than 0.04 in/sec horizontally, 0.02 in/sec in the vertical and axial directions on the motor and less than 0.06 in/sec horizontally, 0.01 in/sec vertically and 0.03 in/sec axially on the pump.



Flux Drive 08-60 Adjustable Speed Drive at the Houston Zoo Sea Lion Exhibit

Flux Drive Inc. designs and manufactures permanent magnet adjustable speed drives and couplings that increase the life and performance of rotating equipment. The company's patented technology greatly lowers power requirements and extends the life of motor driven systems by allowing motors to run at constant speed while the Flux Drive provides soft starting and adjustable speed. Flux Drive products have been proven to reduce system maintenance costs and offer substantial energy savings.



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