

Vancouver Aquarium CASE STUDY

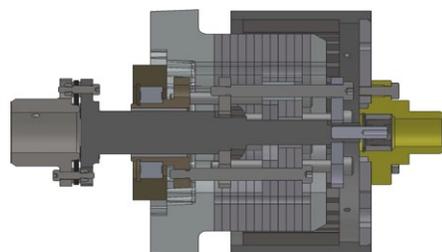
Vancouver Aquarium installs Flux Drive Adjustable Speed Drives. Saves 1 Megawatt per year and receives 70% reimbursement from BC Hydro.



The Vancouver Aquarium is the largest in Canada and the fifth largest in North America. The facility features over 150 aquatic displays which together hold more than 2.5 million gallons of water.



A Flux Drive® Adjustable Speed Drive installed at the Vancouver Aquarium Wild Coast Exhibit



Flux Drive® Adjustable Speed Drive



Problem

The water filtration system at the Vancouver Aquarium was designed with throttling discharge valves to control flow rates. These hand-operated valves restrict the flow of water as it leaves a pump to match a designated flow rate as required for proper filtration. Filtration systems using throttling valves have several drawbacks:

- Valve induced cavitation results in vibration and noise
- Pump bearings run at an elevated temperatures
- Pump motor runs at close to full power thereby wasting substantial energy

The inefficiency of throttling the pump discharge results in much higher energy costs due to the motor running at close to full power rather than at its best efficiency point by slowing down the pump to its corresponding flow rate.

Solution

Flux Drive® Adjustable Speed Drives were installed on 12 filtration systems at the Vancouver Aquarium. These patented drives control the flow of water by slowing down the speed of the pump rather than impeding the flow of water after it has left the pump with a throttling valve.

The results of the Flux Drive installations at the Vancouver Aquarium were quite dramatic:

- **Total energy savings exceed 1 Mwatt / year**
- Reduced or complete elimination of pump cavitation
- Greatly reduced noise and vibration
- Lower motor and pump operating temperatures
- Reduced wear and tear and maintenance costs for motors and pumps

Electric Utility Reimbursement

BC Hydro approved the Vancouver Aquarium project at up to a 70% energy grant reimbursement for the total project cost. Energy savings met the BC Hydro energy saving goal, based on Flux Drive meeting the energy savings estimate of 1 Mwatt / year.

Prior to and after installation, each pump system was tested for actual flow and corresponding energy savings with measured flow rates and power meter readings verified during actual tank level 'draw down' testing that confirmed exact flow rates vs. energy savings.

Final energy savings were witnessed by BC Hydro. Metering was installed months prior to the Flux Drive installs and data collected several months after the final installations.

The entire project cost \$120k before the BC Hydro reimbursement. Even with the low energy rates in Vancouver (about 3.7 cents / kwh) the project would pay for itself in about 3 years. Taking into account the BC Hydro 70% reimbursement, and the entire project payback was reduced to approximately one year.

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Operating Environment

The Vancouver Aquarium currently uses diatomaceous earth as a secondary filtering medium. This fine organic powder permeates the filtration pump rooms. This leads to an extremely wet and dirty environment when coupled with the often damp conditions in Vancouver. As such, the filtration pump rooms require regular pressure washing of all machinery and surfaces. Flux Drive Adjustable Speed Drives can easily withstand these fresh water wash downs (not possible with electronic variable frequency drives).

Installation Challenges

The Flux Drive Adjustable Speed Drive (ASD) installations at the Vancouver Aquarium included both in-line and belt-driven applications from 10 to 60 hp. The in-line installations required the motor to be moved back 12 inches to make room for the Flux Drive ASD device to be mounted in-between the motor and pump. Motor foundation extensions were welded onto the existing foundations to allow the motor to be re-mounted where necessary.

Belt-driven Flux Drive Sheave ASD units were used on 4 pumps due to pump skid length constraints. Base plates were installed under the exiting motors to allow the motors to be moved horizontally (to the side) or raised vertically as needed. In each case a pulley sheave was added to the pump shaft to re-configure for a belt driven application.

Pump Issues

The use of throttling valves caused many of the pumps to have severely worn impellers due to constant cavitation and the resulting erosion. As a result, many of the pumps had to be rebuilt prior to installing the Flux Drive ASDs. Making the project a bit more complicated, the pumps running at this facility are no longer manufactured and supported, so custom impellers had to be fabricated. Since the new Flux Drive ASDs reduce flow rates without throttling, no longer will cavitation damage occur and these pumps will have a much longer life.

Control Options

The entire installation at the Vancouver Aquarium was a retrofit upgrade replacing hand-operated throttling valves. Flux Drive provided Rotork® automatic linear actuators (4-20 ma control signal) fitted with a hand wheel, for manual backup actuation (a customer requirement).

The commissioning of the system was performed with manual, hand wheel setup prior to the automatic control system being installed. This allowed the Aquarium staff to save energy by running the pumps at variable speeds even while the control system was still being installed. Automatic control was added to each Flux Drive ASD approximately 2 months after the original installation.



Flux Drive® ASD in-line installation with motor foundation extension.



Flux Drive® Sheave ASD belt-driven installation with raised motor foundation.



Flux Drive® Sheave ASD belt-driven installation with side mounted motor.



Flux Drive® ASD with Rotork® automatic actuator and hand wheel backup

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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