Water pump condition monitoring.

By:

Diego Rueda

Introduction

Organizations and companies that have widespread assets rely heavily on their fleets to operate and support their field processes. This requires organized efforts from these industries to respond to events in their systems. In the case of Utilities Kingston, a significant number of assets are operating across the city, requiring the routine movement of personnel.

The project aims to create a centralized monitoring system that allows the health monitoring of pumps located in Kingston, Ontario. This system plays a crucial role in maintaining services in the area. We will start our project at a clean water pumping station, which operates with two main pumps and one backup pump (Figure 1).

Figure 1: Pump station view of the motor and pump

The project will start by monitoring one of the pumps. The selected water pump is powered by a WEG motor, operating at 1750 RPM. This motor was replaced approximately six years ago. To ensure optimal functionality, the pump undergoes preventive maintenance and is oiled every six months. This report outlines the status of the equipment, presents our findings, and recommends the next steps to ensure continued reliability and performance.

Figure 2: AURORA pump view

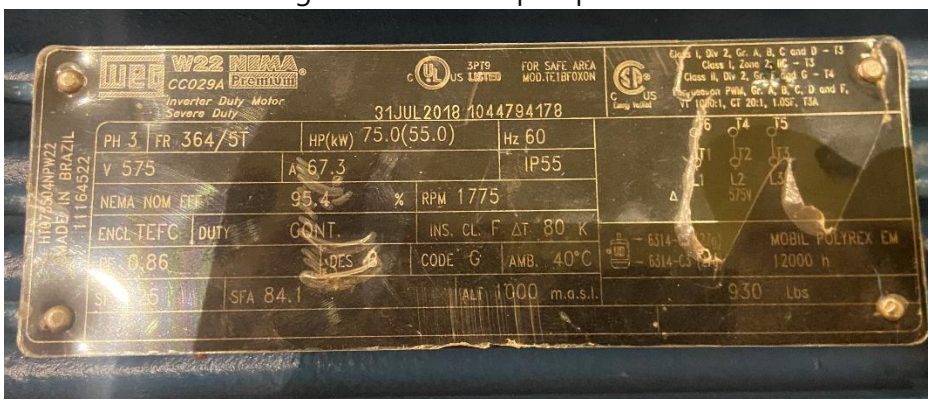

Figure 3: WEG Motor Specifications

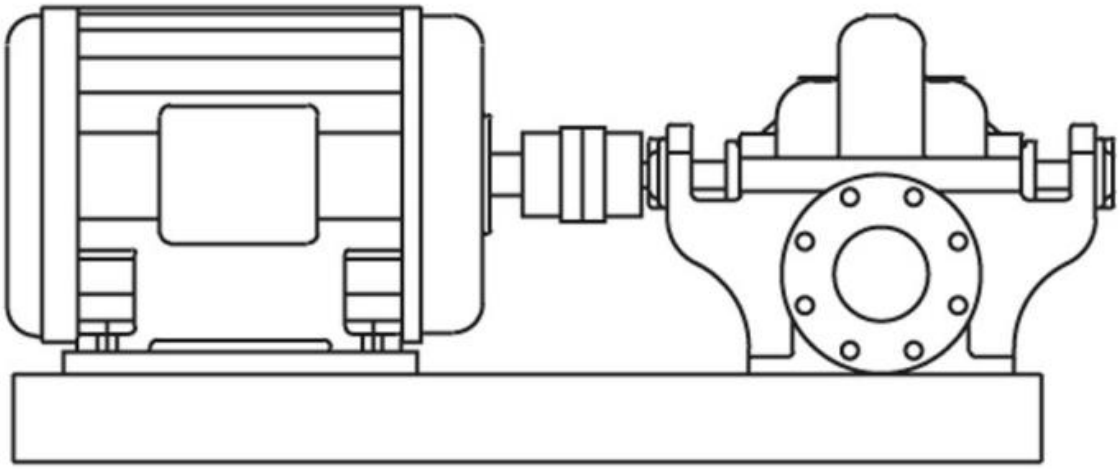

Figure 4: Motor Pump Schematic Installation

Equipment description

"The Progress Avenue Reservoir, located at 730 Progress Avenue(Figure 5), is an in-ground reservoir with a capacity of 6,600 m^3. Two electric pumps and one diesel pump are available to pump water from the reservoir into the distribution system. The reservoir provides drinking water storage for the pressure zone."

The pumps are designed to operate continuously, 24 hours a day. These pumps alternate in their leading roles every day, ensuring even wear and extended operational life. In the event of a system pressure drop, the lag pump is programmed to activate automatically, thereby maintaining consistent water pressure in the area.

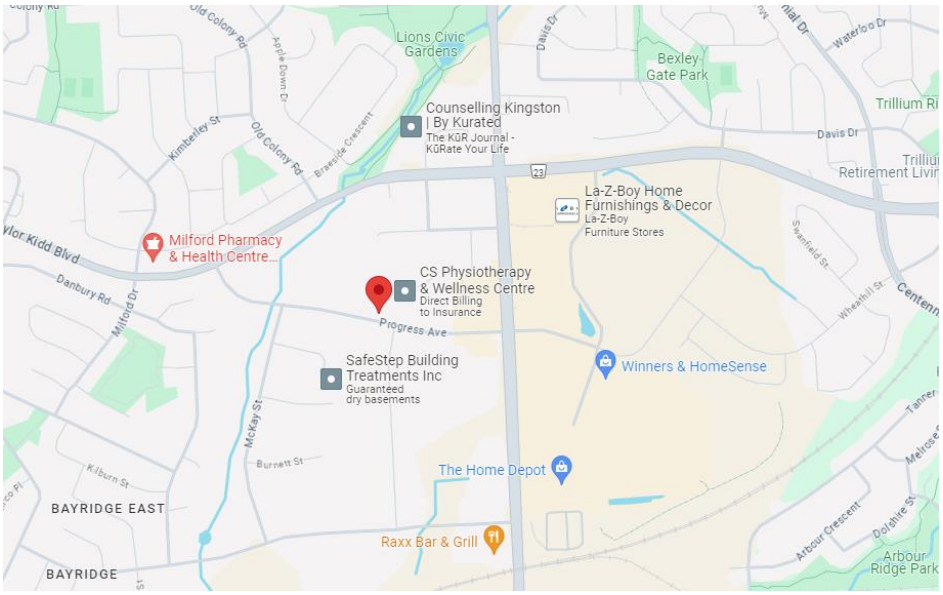

Figure 5: Pumping station location

Key components include:

- Pump 1 and Pump 2: Alternating every 24 hours to ensure even usage.
- WEG Motor: Operating at 1750 RPM, replaced six years ago.
- Control System: Monitors pressure and automatically switches to the lag pump if needed.

Findings

Upon review of the water pump system, the following observations were made:

- **Motor Performance:** The WEG motor shows no signs of wear or overheating, indicating good health and proper maintenance.
- **Preventive Maintenance:** The bi-annual preventive maintenance and oiling schedule is being adhered to, which is crucial for the longevity and performance of the pumps.

- **System Redundancy:** The alternating lead/lag configuration is functioning as intended, providing a robust system with built-in redundancy to handle pressure drops and allow motors to wear evenly.
- **Mounting:** both motor and pump are mounted in a cement plate that ensure its stability, however the pumps mounting looks more deteriorated with some water running down.
- **Coupling:** The coupling between the motor and the pump looks good and there is no sign of extreme wear.

Figure 6: Pump installation

Figure 7: Motor installation

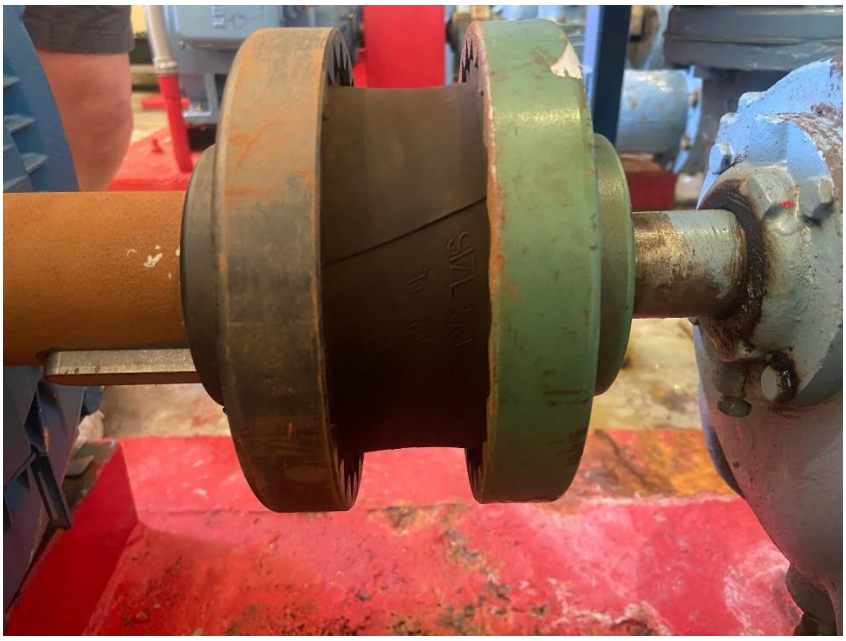

Figure 4: Motor Pump coupling

Next Steps

Vibration model Steps

Key Steps in Vibration Analysis:

- **Baseline Measurement:** Establish baseline vibration levels for the pump system under normal operating conditions.
- **Regular Monitoring:** Use vibration sensors to measure vibration levels continuously.
- **Data Analysis:** Analyze the collected data to detect patterns or anomalies indicating potential issues.
- **Diagnosis:** Identify the root cause of the abnormal vibrations.
- **Maintenance Action:** Schedule and perform maintenance to address the identified issues.
- **Improve measurements:** Create an improvement process over the monitoring capabilities, increasing the value it delivers.

Project Installation

To ensure the continued health and performance of the water pump system, the following steps are recommended:

1. **Hardware Setup:** Install sensors on the equipment or in the environment to be monitored.
2. **Software Development:** Develop or customize software to collect and process data from the sensors.

3. **Data Transmission:** Ensure data is reliably transmitted from sensors to the central system.
4. **Monitor and Evaluate:** Closely monitor the system's performance and collect feedback from users and stakeholders.
5. **Iterate and Improve:** Make necessary adjustments based on the pilot test results.

By following these steps, we can ensure the monitoring phase of the water pump system continues to operate efficiently and reliably, bringing the insights to teams within utilities Kingston and support their goal of providing uninterrupted water supply to the Kingston area.

This report highlights the status and health of the water pump system and outlines actionable steps to maintain its operational integrity. By adhering to these recommendations, we can mitigate risks and enhance the longevity of the system while reducing expenses for the city.