



Pilot Project Results Report

Project Name: Electrifying Small Equipment - RPS 2

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Background

In 2022 a pilot project was conducted to test battery powered equipment with crews from Parks Maintenance and Roads and Parking Services (RPS). Due to the Derecho in the spring and the subsequent cleanup efforts the pilot was delayed, and ongoing supply issues related to covid and the war in Ukraine limited the Roads portion of the pilot to testing only leaf blowers in the ByWard market from September 13th to November 21st, 2022. The pilot project intended to test road cut saws, leaf blowers and line trimmers.

One of the main recommendations of the 2022 Pilot was to continue testing the equipment from the early spring to the end of the fall to capture data from all growing seasons. The additional testing time will allow for a more in-depth analysis of the equipment performance and hopefully the ability to measure any impacts to service delays using this equipment may cause.

The 2023 RPS Pilot gave the opportunity to test other equipment besides leaf blowers to better understand what commercial level battery powered small equipment is available and to properly assess the technology to ensure that it meets RPS' operational needs.

Brand specific details have been removed for confidentiality reasons.

Pilot Overview

Based on the RPS gas-powered small equipment inventory and the battery powered equipment currently available on the market the project team decided to test road saws, breaker (jack hammer), handheld leaf blowers, line trimmers and attachments for split shaft power units including a hedge trimmer (for wild parsnip) and power brooms. A conclusive assessment required testing multiple brands which were selected based on availability and City staff recommendation that these brands were expected to be successful based on experience with these types of equipment. All equipment from Brand 5 tested was provided by the manufacturer via a local retailer for a free 2 month trial period.

To gather feedback from various sources the equipment was made available to crews operating out of several City facilities that were able to support the battery charging requirements. Crews from Industrial, Cyrville, Maple Grove, Moodie and Woodward yards participated at various times throughout the 2023 pilot.

Table 1: Equipment tested in 2023 RPS Pilot

Equipment	Quantity	Brands
Blower	4	1,3,5,6
Breaker	1	3
Line Trimmer	3	1,5,6
Road Saw	3	2,3,5
Split Shaft-Power broom/line trimmer	1	3
Split Shaft-Hedge trimmer Attachment	1	5

Evaluation Overview and Objectives

1. The Pilot intended to determine if the available commercial battery powered equipment on the market is a suitable replacement (able to meet maintenance quality standards) for the gas-powered equipment currently being used in PWD.
2. The Pilot intended to determine if phasing out activities (purchasing equipment, installing charging banks etc.) can begin immediately.

Methodology

Crews were provided a digital survey to capture their feedback related to power of the equipment, battery runtime and general useability (ergonomic rating of weight, balance, vibration, and comfort) for each type of equipment and noted the conditions they were used in while crews completed their work to the current maintenance quality standards. The project team also collected feedback from crew leaders and met with crews on several occasions to observe and record equipment performance data.

In conjunction with the 2023 Parks Maintenance pilot, the line trimmers were used by project team staff in two comparative tests designed to determine if using battery powered equipment will cause delays in service delivery.

Key Findings

Road Saws

Brand 3 is the only battery saw with a cart currently available. Cut time per battery (6Ah) range between 4-6 minutes for a distance of 17-20' at 5" depth.

New prototype battery had a cut time per battery approximately 14 minutes for a distance of 25-35' at 5" depth. The saw would stall at 5" depth cut but worked better when cutting ½ depth of 2.5" and then went over the cut a second time to achieve 5" depth. This battery provides increased run time but less torque. It is not on the market yet.

Brand 5 saw running 2, 40v 8ah batteries for a cut time between 6-10 minutes for a distance of 20-25' at 5" depth.

Brand 2 saw with 4Ah battery cut for approximately 4 minutes for a distance of 12' at 5" depth then battery had thermal shutdown. After letting it cool, cut 28" then thermal shutdown again. A second attempt with fresh battery produced a cut time of 1:40 min then thermal shut down again on the battery. After it cooled down cut for 4:38 min then battery and saw showed thermal shutdown. Saw was inspected with Husqvarna sales rep and no defects were detected; this issue was not uncommon to the rep. The saw was returned for refund due to Thermal Shut Down issues.

Road Saws Overall

Benefits: No gas cans in vehicle is nice and no need to pull start machine. The saw may work better for cutting a pipe or interlock where its not used for more than a few minutes at one time.

Issues: Staff report using 1 to 4 batteries for each manhole repair depending on which saw was used. On the average day, a crew will do five manholes, sometimes more or less. It could take 5-12 or more batteries for one crew to get through a day's work depending on saw type. Battery price range between \$500-800. Saws are no quieter than gas powered saws. Some staff are unwilling to use saws without a cart as they would be bent over for a prolonged period when cutting which means a risk of back injury.

Recommendation:

Battery powered saws cut well in asphalt but struggle more in concrete. Currently, battery life is too short to be of practical use for the needs of roads crews regardless of what they are cutting. Better to wait for improvements in battery technology and carts to be widely available before transitioning to battery powered road saws.

Breaker

Brand 3 Breaker

Benefits: No air compressor required. Frees up room on trailer, makes for quick and easy transportation and set up.

Issues: Breaker is temperamental and can be awkward to get started. It stops if you put too much weight on it, requires correct balance to start. Once running it works fine for cut outs on asphalt only. The tool struggled to breakout concrete due to lack of power. This makes work slow on sidewalks. If the chisel gets stuck it won't work itself out like a standard pneumatic breaker which has much more power. To remove the chisel once stuck, staff had to take it off and chip it out with another breaker or chisel.

Recommendation:

Crews can continue to use this piece of equipment for small jobs on asphalt only as it is better than hauling a compressor around for a pneumatic breaker. Crews prefer to use a backhoe instead of breaker whenever they can, this limits its uses. Additional attachments such as tamper plates may provide more utility. It is not recommended for full transition at this time. We should continue to monitor the market for improvements in battery technology before purchasing more units.

Handheld Blowers

All Brands used in the pilot provided similar results.

Benefits: Crews used blowers for small clean ups after cutting out manholes, noted they are convenient for intermittent use. No gas tank in truck is a nice bonus. No need to pull cord to start makes it simpler and less demanding to use.

Issues: Battery Life is main issue across all brands. 1 battery lasts from 20-40 min of continuous use which is not suitable for large cleanups. Brand1 Battery blower is the only blower tested with lower noise levels, other models have similar or higher dB than gas blowers.

Recommendation:

Battery life for blowers limits their use as discovered with the overnight crew in the 2022 Pilot, however, the convenience of no pull start and no gas tanks make them a nice fit for crews who only do small clean ups as part of their daily tasks.

Battery blowers could be good for patrol trucks, bus pads and manhole crews to clean up after their cuts.

Wide scale transition is not recommended at this time but crews that fit the recommended uses could be equipped with a battery blower if there is a demand to make the switch and their yard can support the charging demand. Brand selection should be made based on other battery equipment being purchased so batteries and chargers can be used for multiple types of equipment to minimize costs.

Split Shaft Attachments

Brand 5 multi tool with hedge trimmer attachment was well received for trimming small branches, hedges and shrubs when needed.

Benefits: No exhaust in your face when using overhead.

Excellent fit for roadside Wild Parsnip cleanup, very effective at cutting thick weeds and quick to set up for use. The extension provides some distance between user and the noxious weeds.

Issues: None noted.

Recommendation:

Staff prefer these to traditional gas-powered trimmers as they perform very well, have no noted issues and aren't used often so battery life is not a concern. Recommended for staff who handle wild parsnip cleanup. Full transition can occur if facilities have charging capacity as RPS only has 3 hedge trimmers in the inventory, this is not a frequently used piece of equipment.

Line Trimmers

Not used by crews in 2023 pilot, most roadside trimming has been contracted out and staffing issues prevented use for mid-summer vegetation cleanup.

Line Trimmers were tested by project team along with Parks pilot trimmers as noted in the project methodology.

Results (see appendix 3) show most brands of line trimmers perform well compared to gas powered units when trimming thick, dense grass and weeds with only slightly more time required to perform the same task.

Parks 2023 Pilot was able to gather detailed data for line trimmers. If RPS crews continue to have no consistent use for the equipment purchased, it should be shared with Parks crews in 2024.

Recommendation:

Although a transition to battery powered Line Trimmers could occur, it is not recommended at this time as RPS crews do not use this piece of equipment enough to justify the switch. If the use of this equipment changes and charging capacity is adequate, we could explore transitioning based off the results of the Parks pilots.

Limitations of Results

- 1- Two Power broom attachments for the Brand 3 multi tool were purchased but not used during spring cleanup due to timing issues. Brand 3 multi tool with line trimmer attachments tested poorly in terms of battery life so Power broom will not likely perform better.

Recommendation: Give to crews in spring of 2024 to use in spring cleanup and gather feedback before considering transition. Power brooms not used regularly so impact of transition will be limited.

- 2- Line Trimmers not used by roadside crews in 2023 pilot, so performance in that specific situation remains unknown. Recommend testing in these conditions before considering any transition.
- 3- Equipment lifecycle is unknown since durability and serviceability of the equipment remains unknown due to limited time in use.
- 4- Since each facility is unique, an in-depth study by electrical professionals in consultation with operational staff and Facility Operations Services would be required. This consultation would determine the necessary changes to accommodate the charging demand at each specific facility.

Recommendation

No wide scale transitioning of any equipment tested at this time to allow battery technology to improve, and other stakeholder research to be completed. Recreation, Culture and Facilities Services (RCFS) is conducting an in-depth review of the electrical capacity at City Facilities and Fleet's Green Fleet Strategy will impact the needs of any electrical infrastructure upgrades required to support charging. Results expected in 2024.

We should continue to use the equipment we have purchased as much as possible between Roads and Parks staff as part of an ongoing pilot to track durability/maintenance requirements and battery life over the next 3-5 years to help determine the lifecycle of this equipment.

Staff should continue to monitor the market for changes in technology or new lines of equipment. Any new equipment testing should be done via free trial if possible.

A brief yearly report on equipment performance and durability as well as opportunities for testing new equipment types and market research to be prepared each year. Project team will meet in January/February each year to review the report and to see if there are any new opportunities or desires to test more equipment or explore transitioning.