MUNICIPAL DEMO CASE STUDY

FUEL SAVINGS AND GHG REDUCTIONS

ACHIEVED THROUGH UTILIZATION OF AN ELECTRIC REFUSE COLLECTION BODY WHEN COMPARED TO A HYDRAULIC BODY

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RevAMP®

The future of refuse collection is now

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BACKGROUND

Solid waste refuse collection bodies are traditionally powered by hydraulic systems that use a Power Take Off (PTO) to divert power from the chassis' driveline as the body's energy source. Energy-robbing PTOs consume energy from the chassis to power the body mechanisms (commonly referred to as parasitic load), which requires additional fuel to provide this output.

The Heil RevAMP eASL is a refuse collection body that utilizes a self-contained independent battery to power an electric lift arm and auger-driven compaction system. This independent energy source eliminates the need for a PTO, eliminating power draw from the truck chassis and dramatically reducing the overall fuel consumption of the vehicle.

This case study demonstrates what is possible in the real world and highlights comparable performance on additional key metrics such as sustainability, productivity, and payload.

MAJOR FINDINGS

- **38%** Reduction In Fuel Consumption (versus city-reported incumbent average usage)
- **10.5** Ton Average Payload
- **140** Containers Serviced Per Hour
- **36+** Metric Tons/Yr. Reduction in GHG Emissions (versus city-reported incumbent average usage)

This case study highlights certain real-world observations seen during the course of certain demonstration units. The data provided herein is a combination of both Heil-observed and customer-reported data points. This information is provided solely for informational purposes and does not necessarily mean your results will match those contained herein—your mileage may vary. This case study does not give rise to any promise, guarantee, or warranty. The intent of this case study is to demonstrate real-world observations only. Results should be expected to vary based on various factors (chassis, route type, conditions, drive style, lift weights, etc.). This is representative of a particular use case and instance and does not necessarily represent broader results or characteristics.

OVERVIEW

This study was conducted by performing a typical residential Municipal Solid Waste (MSW) refuse collection route at a large Texas municipality in March of 2024. In addition, RevAMP demonstrations on recycling routes have yielded similar results, as reported by both haulers and Material Recovery Facilities (MRFs) alike.

The refuse collection vehicle (RCV) used in this study was the Heil RevAMP eASL body mounted on a Mack LR diesel chassis. Data from the route was collected through the 3rd Eye Connected Collections telemetry package, and this data was compared to the performance of a similarly configured RCV with a hydraulic body, which normally operates the route, as reported by the customer.

The route performed by the RevAMP on this day was a typical residential collection of two loads, with a total combined payload of 21 tons of residential solid waste. The RCV traveled a total of 68 miles over the course of the day while collecting 926 standard residential waste containers (see Fig. 1).

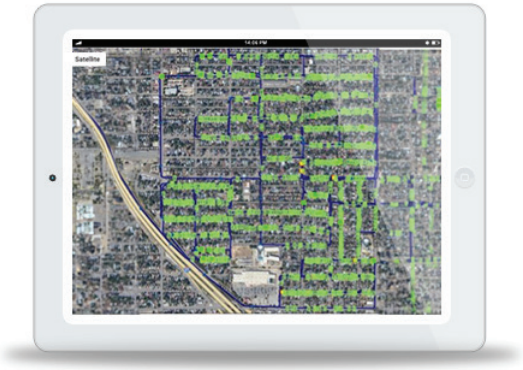
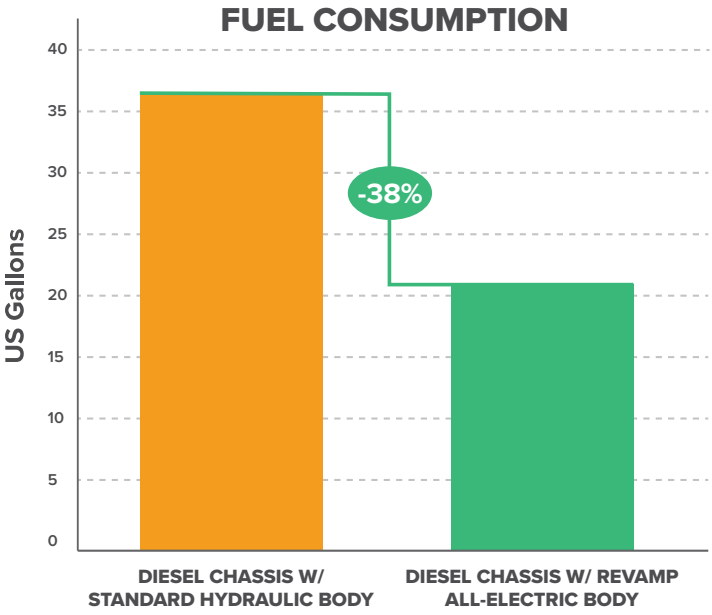


Fig. 1



The total volume of diesel fuel consumed during the case study was 22.32 gallons. When compared against the city's typical RCV with a hydraulic body (with the city's reported average fuel consumption), the test vehicle with electric RevAMP body showed a net **fuel savings of over 13 gallons per day**, demonstrating a **38% reduction in daily fuel consumption**.

Even when considering the cost of electricity (reported by the city as $0.12 per kWh) required for charging the electric-powered body, the potential diesel fuel savings of the RevAMP could add up to **over $14,000 per truck/ per year**, when compared to the city-reported average annual fuel usage.

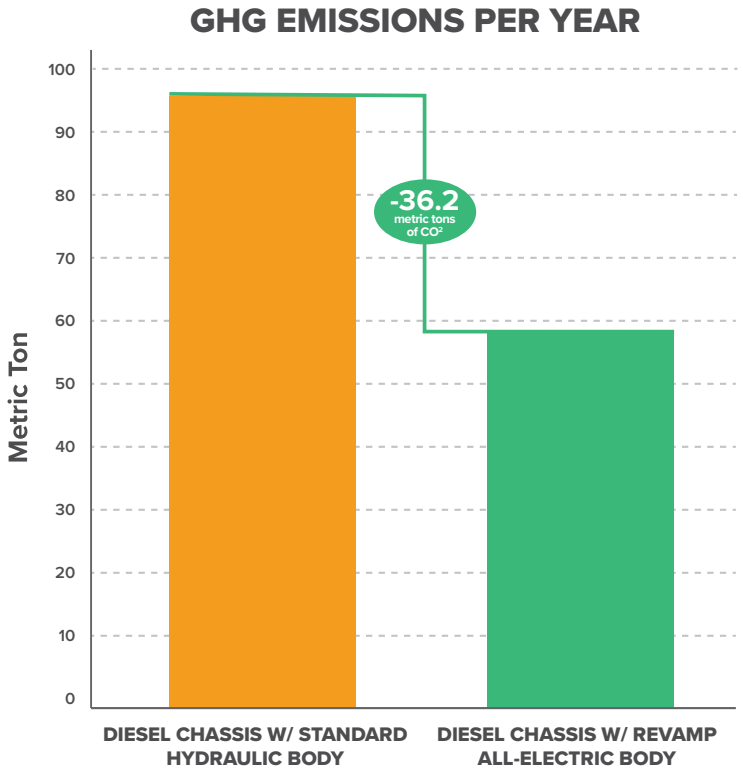
In addition to the monetary savings, this reduction in fuel consumption, translates directly into significantly reduced Greenhouse Gas (GHG) emissions (please see details under Sustainability Impacts).

SUMMARY OF KEY OBSERVED METRICS

	Containers Collected (96-gallon wheeled carts)	Payload (Tons)	Fuel (Diesel/Gallon)	Battery Consumption (SOC%)
First Load	428	9.80	10.0	26%
Second Load	498	11.20	12.3	21%
Total For Day	926	21.0	22.3	47%

SUSTAINABILITY IMPACTS

The transportation sector is a significant contributor to greenhouse gas (GHG) emissions, particularly the Class 8 trucks typically used in refuse collection. According to the EPA[1], each gallon of diesel fuel consumed emits 10,180 grams of CO_2. Utilizing the data yielded by comparing city-reported average fuel consumption versus those observed with the Heil RevAMP unit, and based on the difference in city-reported average fuel consumption on the incumbent RCV and Heil's observed fuel consumption on the RevAMP unit, it was demonstrated that the RevAMP eASL could be capable of **reducing CO2 emissions by 36.2 metric tons per year per vehicle**.



The RevAMP eASL provides this immediate sustainability benefit, helping RCV operators significantly reduce their carbon footprint through reduced fuel consumption.

Additionally, the RevAMP eASL utilizes powerful, electric-driven arm and auger compaction, which requires no hydraulic oil while operating on route. The elimination of hydraulic oil, a major source of fluid leaks and spills, reduces the likelihood of introducing yet another environmental pollutant hazard common in the waste industry.

Case study shows that the RevAMP could **save over 36 metric tons/year of GHG** based on this city-reported average fuel consumption versus that observed with the Heil RevAMP unit when compared to a hydraulic body.

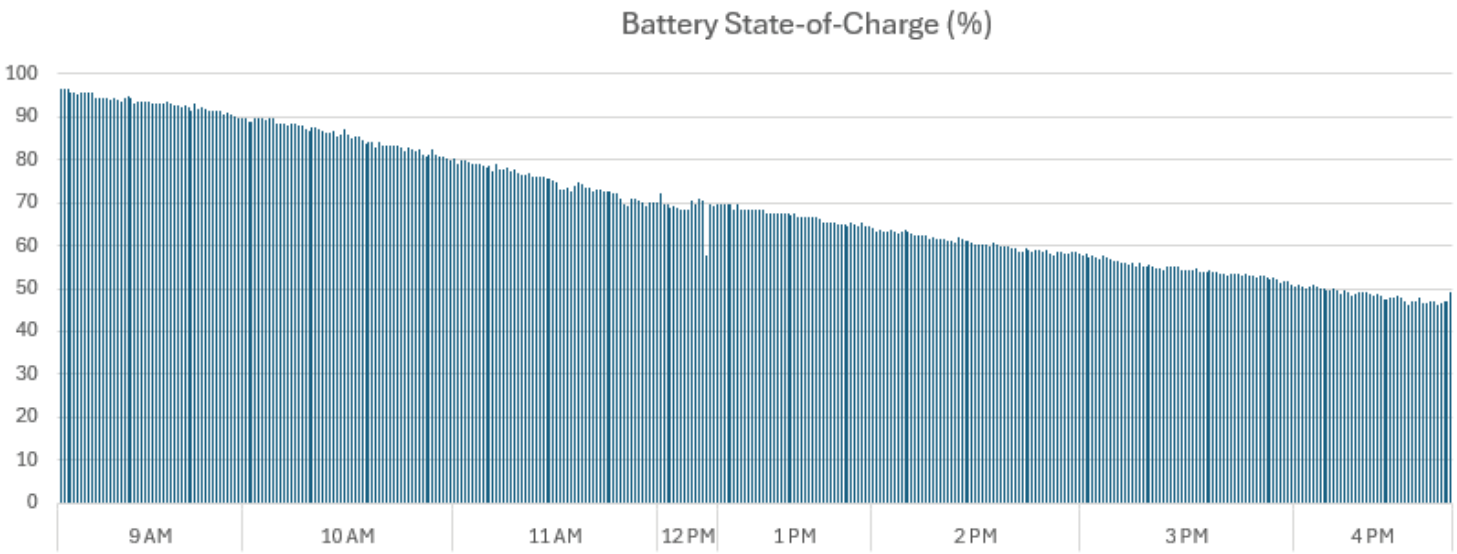
THE EQUIVALENT OF PLANTING 1,663 TREES![2]

BATTERY PERFORMANCE

Many potential EV refuse truck buyers may be hesitant to deploy electric vehicles into their fleet due to concerns about battery capacity, vehicle range, and the ability of the vehicle to perform at comparable levels to their existing equipment.

In this case study, it was successfully demonstrated that the RevAMP 46 kWh body battery has more than sufficient capacity for a full day's refuse collection route, with plenty of additional capacity if needed. The chart below illustrates the battery state-of-charge over the course of the day. As shown, the RevAMP collected nearly 1,000 containers and 21 tons of payload, using only about half of the body's battery capacity!

The RevAMP is capable of servicing about 1,200 stops during a full 8-10 hour day, all on a single overnight charge. It is important to note that the RevAMP electric body utilizes a simple Level 2 charger with a standard 240V plug, similar to that used for an electric car, welder, or other common shop equipment, enabling integration into a fleet without the need for significant infrastructure modifications.



SUMMARY OF REVAMP BATTERY CAPABILITIES

1200
HOMES PER DAY ON SINGLE OVERNIGHT CHARGE

240v
UTILIZES LEVEL 2 CHARGER WITH STANDARD 240V PLUG

<8hrs
TO RECHARGE A FULLY DEPLETED BATTERY

OTHER PERFORMANCE BENEFITS

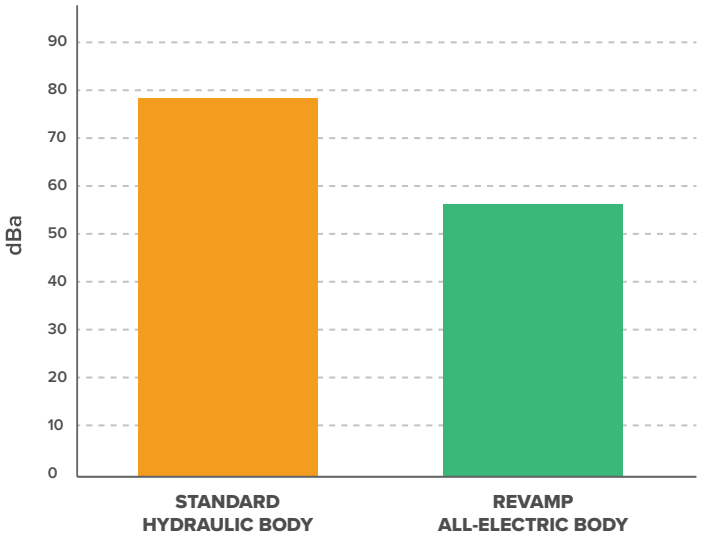
Although the focus of this case study was primarily related to savings in fuel costs and GHG emissions, it is worth noting that the RevAMP possesses numerous additional benefits that were recognized by the testing municipality. These benefits can significantly impact productivity, driver satisfaction, as well as sustainability. The following are a few of these.

REDUCED NOISE AND CAB SHAKE

The electric side load body also provides multiple important benefits to the vehicle operator. As RCV drivers typically spend 8-10 hours per day operating their vehicle, providing maximum safety and comfort is critical to ensure operator well-being and satisfaction.

The smooth and quiet operation of the RevAMP electric side loader significantly reduces vehicle noise and the jarring cab shake that drivers experience constantly throughout the day. These reductions provide an improved experience for operators, enhancing driver wellness and overall satisfaction. Additionally, reduced cab noise while on route could reduce complaints from residential communities, particularly when operating early-morning routes.

CAB NOISE LEVEL



NO HYDRAULICS ON ROUTE

As mentioned in the Sustainability section of this study, the RevAMP eASL body utilizes an electric arm and auger compaction, driven by electric motors, which completely eliminates the use of hydraulics while on route. Although this might seem like a minor benefit at first glance, the impact of eliminating hydraulics from a refuse collection vehicle can be significant, reducing costs, improving uptime, and enhancing sustainability.

The benefits of no body hydraulics on-route include:

- Eliminate the cost of fines and cleanup for environmentally-damaging hydraulic leaks/spills
- Eliminate the cost of hydraulic oil, filters, and parts
- Eliminate the cost of hydraulic system repair/maintenance
- Increased uptime by eliminating hydraulic failures, a common cause of downtime
- Increased safety benefits by avoiding vehicle fires caused by ruptured hydraulic lines

NON-OFFSET ARM WITH NO KICK-OUT

An additional benefit of the RevAMP, recognized by the participants in this case study, was the non-offset arm of the eASL, which operates with no “kick-out.” Compared to the offset arm of the hydraulic body in the case study, the RevAMP’s integrated in-line arm can pick up residential containers in close proximity to the body, allowing for faster pickups and the ability to operate in tight areas such as narrow roads and alleyways.

CONCLUSIONS

The data from this route case study provides key real-world insights into the fuel savings and sustainability benefits of the RevAMP eASL body when paired with a diesel chassis. Although the sustainability benefits and fuel-cost savings documented in this case study using a diesel chassis are extremely significant, these benefits increase exponentially when the RevAMP is mounted on an EV chassis (the RevAMP can be mounted on a diesel, CNG, or EV chassis). For refuse fleet operations unable to convert to full electric, the RevAMP eASL hybrid solution provides an immediate positive impact to help achieve sustainability goals and lower fuel costs.

While fuel savings and sustainability initiatives are highly important, a truly viable solution cannot come at the cost of decreased vehicle performance. This study illustrates that the innovative Heil RevAMP eASL can improve sustainability and productivity, and lower costs, without sacrificing performance.

IMPROVE SUSTAINABILITY

UP TO 38% FUEL SAVINGS ON DIESEL CHASSIS

NO HYDRAULICS ON ROUTE

NON-OFFSET ARM WITH NO KICK-OUT

SIMPLE CHARGE WITH 240v OUTLET

REDUCED NOISE/ CAB-SHAKE

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REFERENCES

[1] https://www.epa.gov/greenvehicles/greenhouse-gas-emissions-typical-passenger-vehicle
[2] USDA/Arbor Day Foundation: https://www.usda.gov/media/blog/2015/03/17/power-one-tree-very-air-we-breathe

CASE STUDY SPONSOR INFORMATION

This case study was conducted by The Heil Co.

About Heil
Heil is one of the world's premier manufacturers of ultra-durable, high-productivity, custom-configured garbage trucks and Connected Collections technology that help customers achieve the lowest Total Cost of Collection (TCC).

The Heil line of refuse collection bodies includes a wide variety of Front Loaders, Automated Front Loaders, Side Loaders, and Rear Loaders. Heil bodies are known throughout the waste industry for their legendary productivity, long life, ease of maintenance, and operator safety. We are proud to be a leader in customer service and provide world-class training and after-the-sale support. **For more information on the RevAMP or The Heil Co., visit www.Heil.com.**

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