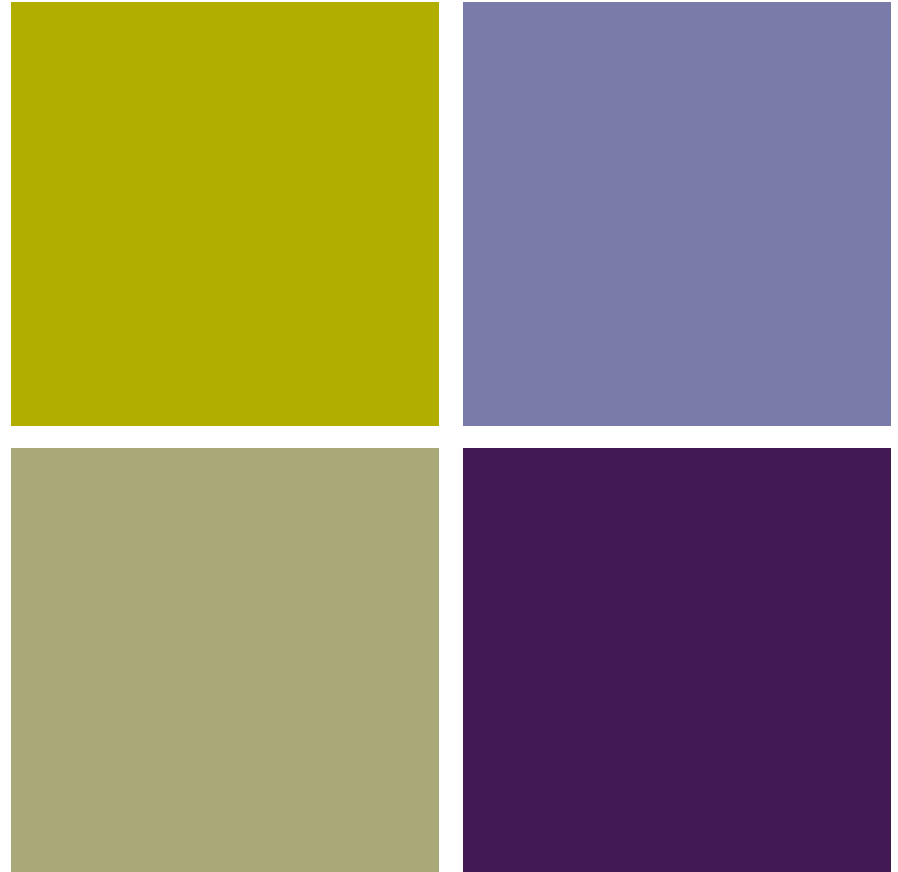




Hybrid Trucks for Municipal Waste



Optimization of Detroit's Refuse Collection

Bringing Hybrid Technology to Detroit's Fleet

+ Current Refuse Collection



- In 2009 the City of Detroit serviced almost 300,000 households, collecting more than 280,000 tons of waste.
- Refuse collection truck fuel economy is about 6mpg, with intermittent stopping very common on residential routes.

+ Clean Energy Coalition Partnership

- Clean Energy Coalition, a nonprofit, nonpartisan organization is partnering with the City of Detroit to help secure grant funding for the modified refuse trucks
- Through American Recovery and Reinvestment Act grant appropriation Clean Energy Coalition was able to work with Detroit towards implementation of this infrastructure.



+ Hybrid Technology

- Through partnering with Bosch technology, the City of Detroit is able to outfit 8 new vehicles to have hybrid assist systems, optimizing fuel economy on select municipal routes.
- The incremental cost of \$40,000 for the hybrid retrofit has a 4-6* year payback period, dependent on the cost of fuel.

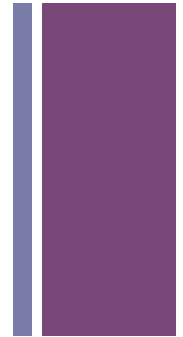


Picture from City of New York, Rexroth Hybrid Assist Truck Retrofit

* Payback period varies

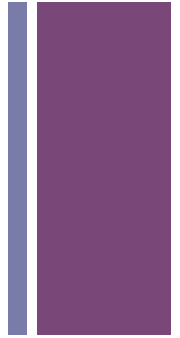
+ Hybrid Technology

- The hybrid technology allows the refuse truck to optimize fuel efficiency through :
 - Regenerative braking
 - As the driver brakes, the kinetic energy is stores
 - Reusing the stored energy to assist the vehicle
 - When the driver begins to accelerate again, this energy is then used to propel the vehicle



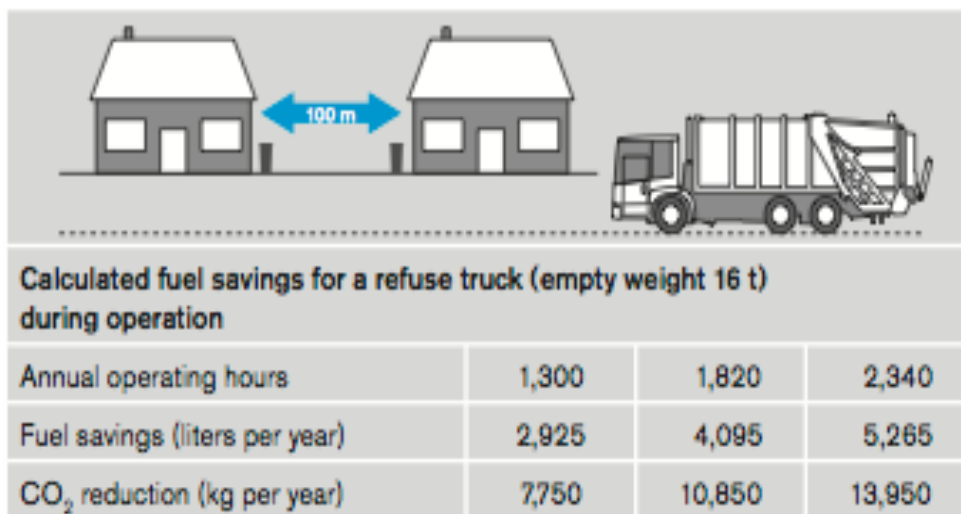
+ Environmental Benefits

- Hybrids provide communal environmental benefits, offering cleaner air, and less harmful emissions.



+ Cost Savings

- In tandem with environmental benefits, hybrid systems offer significant fuel cost savings over the life of the vehicle.
 - Fuel savings of up to 25%
 - Can save up to 2.25 liters (.59 gallons) per hour of operation
 - Reduced maintenance costs
 - Regenerative braking reduces wear on brakes



Graphic from Bosch™ rexroth online content