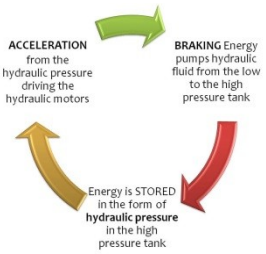
Electric Hybrids versus Hydraulic Hybrids

Hybrid systems recover braking energy, store it, and use it again during the next acceleration event. There are two types of hybrid systems sold today for vehicles—electric hybrids and hydraulic hybrids. Electric hybrids use electric generators to capture the braking energy, batteries to store the energy, and electric motors to place the power back on the prop shaft during acceleration. Hydraulic hybrids use hydraulic pumps to capture the braking energy, hydraulic accumulators (high-pressure tanks) to store the energy, and hydraulic motors to place the power back on the prop shaft during acceleration. Hybrid systems generally are installed on new vehicles as an option at the time of purchase (Lightning Hybrids has an option to install a hydraulic hybrid on used vehicles as well). Although Electric Hybrids have proven useful for small cars, they have had dismal success in larger vehicles. Batteries simply do not have the power density to effectively and reliably support vehicles over 5 tons, and as the mass of the vehicle gets larger (i.e. 7-25 tons as seen on large shuttle buses, transit buses, and large delivery trucks), the motors, generators, and power controllers have also proven to be unreliable and inefficient. To make matters works, batteries remain very expensive on a price/power basis—which has led to a consistent revelation that electric hybrid buses have not achieved the return on investment they initially promised. The transit bus hybrids (the only heavy duty vehicle with over 3 years' experience with electric hybrids) have averaged over $125,000 per bus, and replacement batteries have run over $85,000 per bus. In addition, replacement motors/generators have cost customers over $65,000 each. The biggest reason though that transit bus operators have been unhappy with their series hybrid buses has been poor reliability. When any component of the electrical system fails, the bus must be towed home. Here are two articles articulating these points:



http://www.cbc.ca/news/canada/ottawa/city-could-pay-to-turn-hybrid-buses-into-diesel-buses-1.1154110

http://www.ibtimes.com/new-york-city-scrapping-nearly-fourth-its-hybrid-bus-engines-100-diesel-bus-engines-1329977

There is an obvious answer though for heavy duty vehicles—Hydraulic Hybrids.

The US EPA has published extensive information on Hydraulic Hybrids—an excerpt can be seen here:
http://www.epa.gov/otaq/technology/research/research-hhvs.htm

Hydraulic Hybrids are 10 times more power dense than electric hybrids and cost less than half the price. This extraordinary power density means that Hydraulic hybrids successfully recover a much higher percentage of the braking energy (70% versus 20%) and provide 5X more torque during acceleration, resulting in a far better fuel efficiency improvement.

Lightning Hybrids Hydraulic Hybrid system is a parallel system with full system redundancy, which means that if the hybrid system fails, the vehicle still drives home. In addition, the Lightning Hybrids system can be installed on trucks and buses that are already on the road, as well as new trucks and buses.

The Lightning Hybrids Hydraulic Hybrid system is different from anything else offered today:

1) Costs less than half of the cost of any other hybrid systems offered in Asia today.
2) Can be retrofitted to buses and trucks already on the road.
3) Provides twice the fuel efficiency improvement as electric hybrids.
4) Parallel system is NOT a tow-home system. If the system fails, the vehicle drives normally.
5) Is easily maintained by a typical maintenance team in Asia—no high voltage components, no fire danger, familiar technology (there are many other hydraulic components in heavy duty fleets today).
6) Dramatically better braking—brake retarders are no longer needed because the Lightning Hybrids system provides the full braking torque necessary to fully stop the vehicle (the standard factory brakes are not changed and are fully available for panic stops or in the event that the hydraulic system fails).

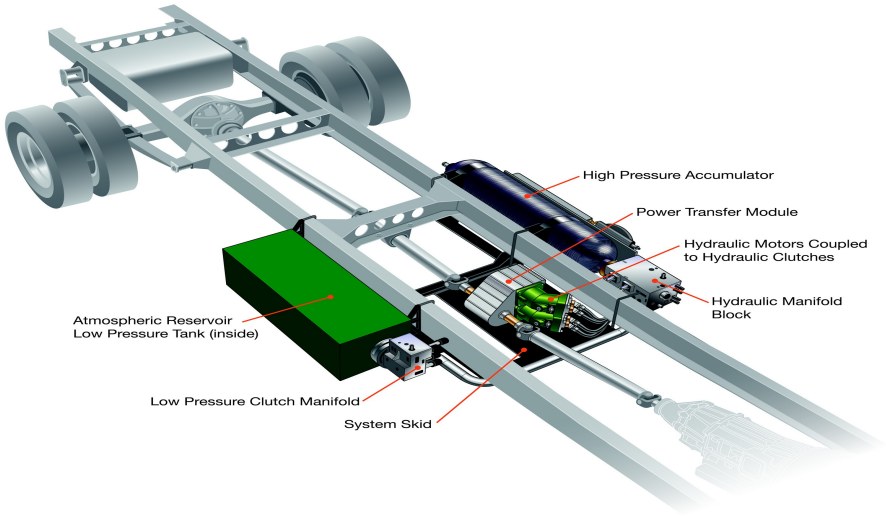


Figure 1: Lightning Hybrids Hydraulic Hybrid system for buses