



# **Making Electrification Work: How to Successfully Deploy HDEVs**

## *A Yard Truck Case Study*

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# *HDEVs are Deployed & Accelerating*

- Terminal trucks
  - AKA hostlers, spotters, yard trucks, yard dogs, shunt trucks, etc.
  - Class 8, GCWR 81,000 lbs, up to 25 MPH
  - Used in container sites: rail, manufacturing, distribution, etc.
  - Operate mostly in-yard, 24x7 Managed by hours (not miles)
- *Electric* terminal trucks
  - No diesel engine, transmission, tailpipe/emission control, or PTO
  - All brushless induction motors (BIM)
- Acceptance
  - Truck of choice: cooler, smoother, quieter, cleaner
  - Deployed from CA to NY across weather and duty cycles since 2015
  - Brand leader advocacy: testimonial, press releases, site host, more.

**Commercially deployed and doing the job every day for years**

# *Operating across the country and environments*

**Rail Intermodal** – Leader re-ordered 9 trucks for intermodal yards in Chicago and New York.

## **Seaport Operations**

- Carson, CA - 1<sup>st</sup> commercially-deployed, electric Class 8s supporting port of LA, Long Beach.
- Oakland, CA - truck services firm deploys 1st in Port of Oakland, CA.

**Parcel** – multiple, global brand leader deployed

## **Warehouse, Distribution, LTL, 3PL**

- World's #1 contract logistics firm is all electric on its yard trucks at several sites.
- 1st McD's distributor deployed in Rochester NY. Diesel gone, one electric running the site.
- Largest LTL break-bulk site in the U.S. operating 4 trucks as primary use in CA's Inland Empire

## **Manufacturing**

- Passenger car manufacturer, consumer brand leader, deploys to Texas
- upstate NY construction materials firm powers via solar generated onsite.

## **Waste Management**

- 1<sup>st</sup> municipal / county fleet in U.S. with 100% electric Class 8 trucks in fleet operations.
- “Making the Case for Electric Waste Transfer Vehicles” in Waste Advantage Magazine.

## **Spotting (aka yard management) Services**

- Indiana-based firm with 8 eight trucks in spotting operations at customer facilities
- Illinois-based firm serving leading manufacturer of consumer packaged goods in MI and CA

**And a lot more...**

# *Built to the site duty cycle*

Delivered with everything to begin operations: trucks, charging, telematics, training, manuals, operator settings, warranty, tech support, and more.

## Major configuration choices include:

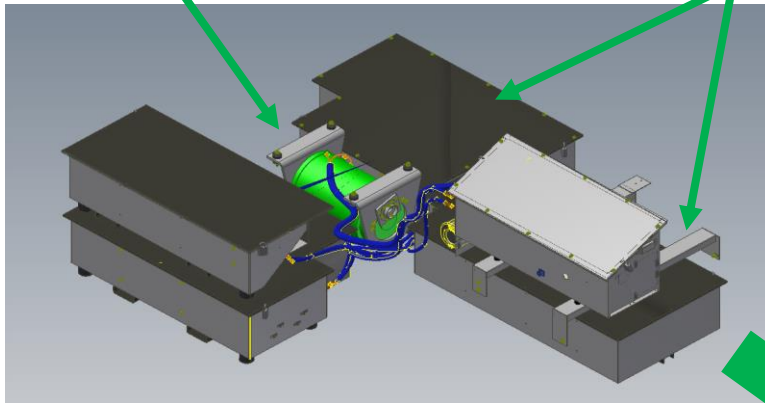
- Truck:
  - New
  - Remanufactured (aka repowered, converted)
- Battery:
  - Standard 80 kWh
  - Extended 160 kWh
- Charging:
  - Standard 10-20 kW
  - Fast 80 kW
- DOT:
  - Off-road
  - On-road (DOT compliant)



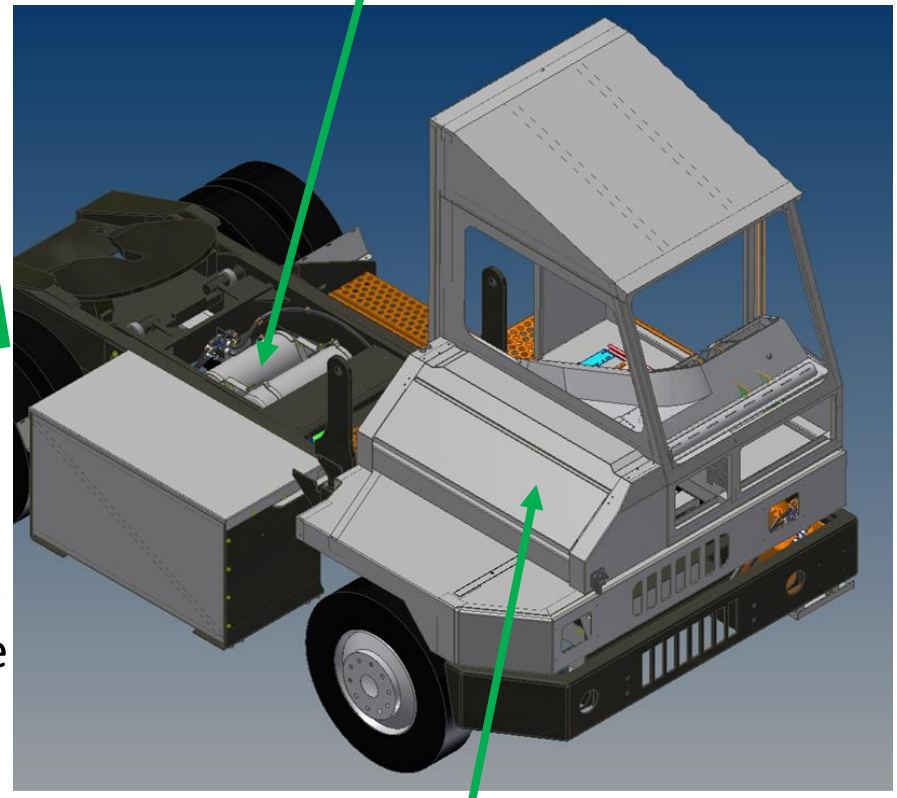
# With Much Less to Maintain and Repair

Traction Motor (BIM)

Battery Boxes



Hydraulics & Pneumatics (BIMs)



Vehicle Control Box (BMS, Controllers)

Eliminated: Engine, transmission, diesel fueling, emission control

Replaced by: Mostly sealed, maintenance-free components Single battery pack for all loads

Operation: Much like before

## *And Charging that's Easier than You Think*



- Standard, onboard: 240 VAC single, 60-amp breakers
- Fast charging for sites with much higher energy usage
- No battery swaps - plug in the trucks to charge
- Most sites already have electrical capacity needed

**Charging specific to and dedicated by vehicle type and OEM**



# DHL Supply Chain

- DHL @ Bolingbrook, IL
  - One of the 1<sup>st</sup> fleets to use Class 8 CNG tractors in IL, Oct 31, 2011
  - Acted as internal SME for CNG
- Worked with Orange EV to approve the construction and first commercial deployment of **an all-electric yard truck**
  - Identified re-build candidate – “dead” 2004 unit
  - Secured grant money
  - First one on the ground October 5, 2015
  - Second one on the ground December 22, 2016
- **Current state. All electric - no diesel yard trucks.**
  - **2 electric in place of 2 diesels. Battery packs: one each of the 160 and 80 kWh**
  - **Trucks shared single charging station for two years.**
  - **Units effectively interchangeable; daily usage varies supporting 24x7 site**



# *Benefits – in DHL’s words from 9-2017 Fall ATA*

## **Drivers**

- Almost total noise reduction
- No engine heat - One unit with A/C and one without
- No grime and/or fumes from exhaust
- No need to “re-gen”

## **Operational and Financial**

- No more on-site fueling needed
- No oil or fuel spills/leaks in yard
- Contribution to company’s emission goals
- Less Maintenance; fewer things to go wrong





# Results/Tracking

DAILY						
Date	Sparky 1		Sparky 2		Total	
	Miles	Hours	Miles	Hours	Miles	Hours
Monday, April 03, 2017	13.10	9.78	15.00	13.61	28.10	23.39
Tuesday, April 04, 2017	10.30	8.64	12.70	13.62	23.00	22.26
Wednesday, April 05, 2017	7.40	7.40	12.70	14.92	20.10	22.32
Thursday, April 06, 2017	12.70	13.51	13.50	8.51	26.20	22.02
Friday, April 07, 2017	20.70	18.11	8.40	5.11	29.10	23.22
Saturday, April 08, 2017	10.90	11.17	9.40	10.52	20.30	21.69
Sunday, April 09, 2017	26.50	14.63	2.70	6.94	29.20	21.57
Monday, April 10, 2017	4.80	7.04	15.20	14.18	20.00	21.22
Tuesday, April 11, 2017	14.00	14.55	17.70	7.64	31.70	22.19
Wednesday, April 12, 2017	23.20	15.15	12.20	7.49	35.40	22.64
Thursday, April 13, 2017	19.00	14.62	15.70	7.12	34.70	21.74
Friday, April 14, 2017	26.90	18.53	9.90	3.71	36.80	22.24
Saturday, April 15, 2017	14.60	15.46	7.40	5.45	22.00	20.91
Sunday, April 16, 2017	5.00	4.87	7.60	15.94	12.60	20.81
Monday, April 17, 2017	20.20	14.07	4.30	5.74	24.50	19.81
Tuesday, April 18, 2017	6.00	7.82	13.00	14.70	19.00	22.52
Wednesday, April 19, 2017	5.90	9.73	14.70	12.39	20.60	22.12
Thursday, April 20, 2017	10.00	13.70	9.60	8.82	19.60	22.52
Friday, April 21, 2017	5.00	7.70	8.10	11.52	13.10	19.22
Saturday, April 22, 2017	15.20	18.51	1.40	3.55	16.60	22.06
Sunday, April 23, 2017	2.00	4.58	11.30	17.80	13.30	22.38
Monday, April 24, 2017	4.80	8.71	8.80	13.26	13.60	21.97
Tuesday, April 25, 2017	10.90	14.65	6.70	7.26	17.60	21.91
Wednesday, April 26, 2017	9.20	13.73	6.10	8.07	15.30	21.80
Thursday, April 27, 2017	17.10	21.42	0.60	0.50	17.70	21.92

Two EVs share one charging station

Replaced two diesel units, primary and backup

Estimated savings = \$40,584/year (2 units, 2017 costs)



*THANK YOU!*



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