

# Balqon E-30 Electric Terminal Tractor Development & Demonstration Project

**Technology Manufacturer**  
Balqon Corporation

**Co-Participants**  
Port of Los Angeles  
South Coast Air Quality Management District (SCAQMD)



## Background

The Balqon E-30 Electric Terminal Tractor was built as a demonstration vehicle, co-funded by the Port of Los Angeles and SCAQMD, and designed specifically for drayage operations. Developed by the Balqon Corporation as a Port of Los Angeles initiative, the prototype E-30 all-electric terminal tractor successfully completed cargo terminal tests during 2008.

## Project Objective

Fleets of hundreds of yard tractors, powered mainly by diesel and propane fuel, move thousands of containers each day between the Port's docks and terminal backland. The objective of the E-30 Electric Terminal Tractor demonstration project was to prove the performance capabilities and commercial feasibility and practicality of using zero-emission electric terminal tractors to perform this function.

## Technology Description

Designed specifically for short-haul or drayage operations, this heavy-duty terminal tractor demonstrated the capability to pull a 60,000 pound cargo container at a top speed of 45 mph, and has a range between 30 to 60 miles per battery charge. The battery charger was designed to charge up to four electric trucks simultaneously in four hours. Key design goals for the Balqon E-30 electric terminal tractor are highlighted below:

<b>Vehicle Performance</b>	Maximum speed 45 mph; unloaded grade 10%, loaded 5%; Max GCWR 125,000 lbs; Range: unloaded 150 miles; fully loaded range 90 miles
<b>Vehicle Dimensions (inches)</b>	Overall – 210" X 96" X 120"; wheelbase 135"; fifth wheel height 46"; front wheel overhang 44", rear wheel overhang 31"
<b>Electric Motor</b>	300 hp rated 230 volt AC electric motor connected to flux vector variable frequency controller; 300% peak load rating
<b>Traction Controller</b>	Proprietary flux vector motor controller 240 KW liquid cooled; integrated CAN BUS and self-diagnostic system
<b>Traction Battery</b>	280 kW-hr lead acid battery pack, 336 Volt; battery management system monitors battery cell performance
<b>Battery Charger</b>	100 KW multi-vehicle fast charger; 4 charging ports standard; priority smart charge algorithm based on vehicle state of charge

### **Benefits**

The Balqon E-30 is a zero emission electric vehicle using electric motors for motive power and batteries for energy storage; thus, tailpipe emissions for this low-speed electric terminal tractor are zero.

On a “kilowatt-hour of energy” cost basis, the Balqon electric truck is projected to cost approximately 20 cents per mile to operate. A typical class 8 diesel truck could cost anywhere from four to nine times as much, depending on the cost of diesel fuel and truck duty cycle.

### **Results**

Following the completion of cargo terminal tests during 2008, the Harbor Department purchased 14 electric terminal tractors from Balqon as part of the “Green Terminal” program. The Green Terminal program also included the production of one on-road electric truck. In total, the Port of Los Angeles invested approximately \$5 million to purchase the electric drayage trucks.

A follow-on study was conducted to evaluate the capability of new lithium-ion battery technology for use in the Balqon electric demonstration units. This project is titled the Balqon Lithium-Ion Battery Demonstration.

### **Project Costs**

The development and demonstration of the Balqon electric terminal tractor was co-funded by the Port of Los Angeles and SCAQMD at a total cost of \$527,000.

