Fleet Conversion: Diesel to CNG

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CalPortland Company Overview

- Founded in 1891 – Nearly 127 years in business
- Producer of Cement, Concrete, Concrete Products, Aggregates and Asphalt
- Supplier of Building Materials, Construction Services & Trucking
- 150+ Facilities in Western U.S. & Canada & growing
- ~2850 Employees
- One of the largest suppliers of construction materials in the Western US
- CalPortland® received its fourteenth consecutive ENERGY STAR® Award this year. As an ENERGY STAR Partner since 1996, CalPortland remains committed to demonstrating and promoting energy efficiency within the construction materials and manufacturing industry.

What is a Ready Mix Plant???

- Ready-mix concrete is concrete that is manufactured in a batch plant, according to a set engineered mix design. Ready-mix concrete is typically delivered by in-transit mixers which delivers concrete in a plastic state to the site.
- Ready mix concrete typically consists of water, air, portland cement, aggregate and sand.

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Project Background

- Why did we do this???
- CARB on road rule requires all diesel powered trucks 14,000 pounds and higher Gross Vehicle Weight with older than 2010 year model engines be replaced between 12-31-19 and 12-31-22 based on engine year model.
  - Had a large amount of trucks that were due for replacement. Rather than buy diesel CalPortland asked what is cleaner than a Tier IV engine???
  - Approximately 1/3 of the CARB TRUCRS fleet was converted and is no longer subject to the diesel standards since CNG far exceeds the standards.

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CalPortland Compressed Natural Gas

CNG ready mix truck being loaded with concrete at the Alameda Ready Mix Plant

- Catalina Pacific, a CalPortland Company, is a ready mix supplier in the heart of Los Angeles.
- Throughout the second half of 2017, Catalina Pacific replaced the entire fleet with 118 Kenworth T880S-mounted 10.5 cyd McNeilus Bridgemaster Transit models, running Cummins Westport Near-Zero ISL G natural gas engines.
- This was timed with EPA and SCAQMD (Prop 1B) incentives for diesel power replacements with new low emission engine profiles below the 2010 EPA thresholds.

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About the Trucks

- The ISL G NZ meets the EPA and CARB's certification for low NO_x standards of 0.02 g/bhp-hr.
- The near-zero emissions technology integrated into a Kenworth T880S mixer allows for ayload as well as ability.

n the adjacent picture, l twin vertical (72 Diesel uivalent) compressed s system offers a low nfiguration.

a large risk. This mixer ally designed from the or near zero CNG

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Project Management

- CalPortland Engineering Services was tasked with designing, permitting, procuring, managing and installing (2) CNG fueling stations at the Alameda and Normandie Ready Mix plants.
- The fueling stations' design began in May of 2017 and the second fueling station was commissioned in June of 2018.

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About the Equipment

- Alameda
  - (2) 200 HP CNG Ariel Compressor Units
  - (2) ASME storage spheres
  - Priority panel for time fill and storage
  - Mechanical desiccant natural gas dryer
  - (1) dedicated fast fill dispensing point
  - (40) time fill dispensing points
  - Site controller, station fuel monitoring and remote monitoring with email notification
- Normandie
  - (2) 125 HP CNG Ariel compressor units
  - (1) ASME storage sphere
  - Priority panel for time fill and storage
  - Mechanical desiccant natural gas dryer
  - (1) dedicated fast fill dispensing point
  - (23) time fill dispensing points
  - Site controller, station fuel monitoring and remote monitoring with email notification

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Site Preparation

- Due to an aggressive budget, we completed all site preparation in house.
- All concrete demolition, trenching, grading and electrical conduits/conduit sleeve installation was completed with SoCal personnel.
- Throughout all excavation of both projects we only hit (1) 4” copper water main which we repaired that day.

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Electrical Installation

- At Alameda and Normandie, utility transformers needed to be upgraded to 750 KVA and 1000 KVA respectively while avoiding disruptions to operations. To put in perspective a typical household has a 200 amp service being fed by a 15 KVA transformer.
- Both sites upgraded to 1600 A and 2500 A Eaton switchgears with Digitrip RMS main circuit breakers.
- (2) 350 A and (2) 250 A combination starter panels
- EZEIO submetering system installed at both locations.

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Mechanical/Structural Installation

- Utility provided (1) 6” HDPE gas line and meter set.
- All stainless steel gas piping was completed by Ozinga energy.
- (2) ½” stainless steel lines fuel all of Normandie and Alameda’s trucks overnight.
- JW Power provided all compression equipment

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Performance

- Alameda
  - Compressors produce 445 scfm at 30 psi supply.which equates to roughly 3.1 DGE/min (diesel gallon equivalent).
  - Alameda's logic is programmed to have the slow fill run between hours 8 pm-4 am. Fueling the fleet takes roughly 6-7 hours on an average day.
  - Fast filling takes about 8-10 minutes.
- Normandie
  - Compressors produce 270 scfm at 42 psi supply which equates to 2.1 DGE/min.
  - Normandie's logic is programmed to have the slow fill run between hours 11 pm-8 am. Fueling the fleet takes roughly 3-4 hours on an average day.
  - Fast filling takes around 12-14 minutes.

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AB2061

Near-zero-emission and zero-emission vehicles

GROSS WEIGHT	
UNIT	**MAXIMUM**
Vehicle Combination	80,000 pounds
AXLE WEIGHTS	
UNIT	**MAXIMUM**
Single Axle	20,000 pounds
Axle Group: less than 8'-6" (8-feet-6-inches) between outer axles	34,000 pounds

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Renewable Natural Gas and Environmental Benefits

- Renewable Natural Gas (RNG) is a biogas which has been upgraded to a quality similar to fossil natural gas and having a methane concentration of 90% or greater.
- RNG, is an ultra-clean and ultra-low-carbon natural gas alternative made from the methane that is captured when organic waste from food scraps, animal manure and sewage is broken down, captured and refined.
- California is home to 8 of the top 10 most polluted cities in the United States, where air quality fails to meet the federally mandated standards for healthy air.
- The leading source of urban air pollution is the 3.5 million diesel semi-trucks that transport 70% of all manufactured and retail goods throughout California each day.
- Reduced impact on toxic emissions over diesel.

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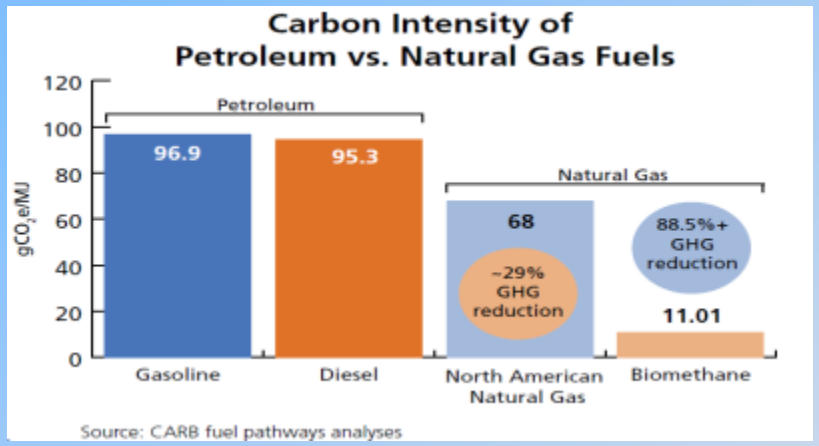
Solution for CARB Regulations

- Natural Gas Vehicles provide a pathway to meeting both California's legally mandated near-term GHG cuts and long-term goals.
- Heavy-duty vehicles fueled by natural gas are recognized by the California Air Resources Board (CARB) as a method of reducing GHG emissions.
- CARB's goal is to reduce GHG emissions 80% by 2050. Renewable Natural Gas is the only near-zero carbon fuel that could meet this regulation in the future.



ISL G Cummins Westport Engine Exceeds CARB's Regulations

	NOx g/bhp-hr	Particulate Matter (PM) g/bhp-hr
Standard	0.20	0.01
Certified	0.13	0.002

PM is 80% below the standard
NOx is 35% below the standard

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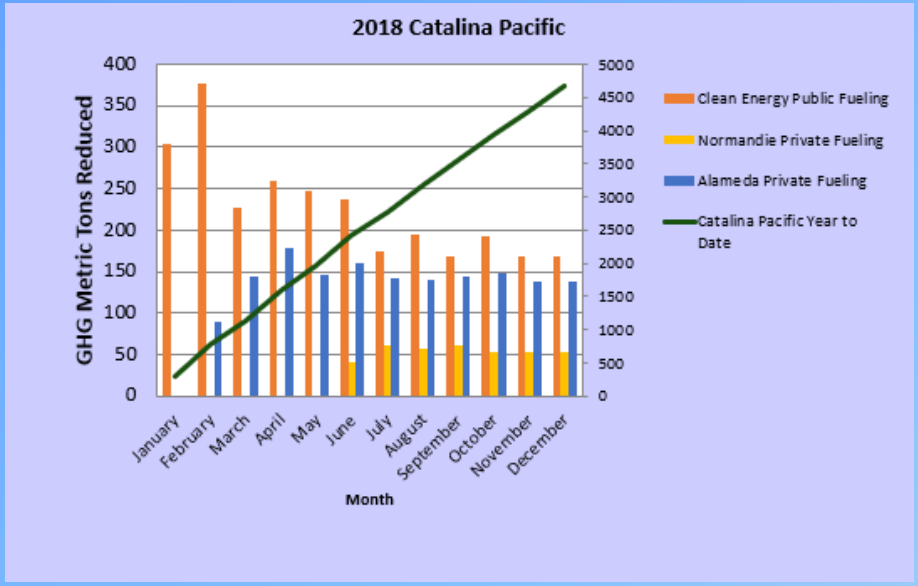
Environmental Impact



	CNG Alameda Reduction (Metric Tons)	CNG Clean Energy Reduction (Metric Tons)	CNG Normandie Reduction (Metric Tons)	Catalina Pacific Year to Date Reduction (Metric Tons)
January	0	303	0	303
February	90	376	0	769
March	145	227	0	1141
April	179	259	0	1579
May	145	246	0	1971
June	161	236	41	2409
July	142	175	62	2787
August	140	196	58	3180
September	143	168	62	3552
October	147	193	53	3945
November	139	168	52	4304
December	139	168	52	4662

Projected Reductions

- Renewable Natural Gas
  - The LCFS (low carbon fuel standard) program was an early action item of AB 32: Global Warming Solutions Act of 2006. It regulates transportation fuel providers, requiring a 10% reduction in the carbon intensity (CI) of fuels sold by 2020 and an 80% reduction by 2050. Credits can be generated on the production and utilization of fuels with a lower CI than gasoline or diesel.
  - CalPortland currently has a contract in place to purchase a minimum of 90% Redeem, Renewable Natural Gas provided by Clean Energy. CalPortland is currently generating credits for “Blue Gas” (i.e. fossil natural gas), and green gas (i.e. renewable natural gas).
  - The RNG we are currently consuming has a CI of 43.25 and the baseline is currently 93.55 for gasoline and 98.44 for diesel.
  - By displacing 800,000 gallons of gasoline with Renewable Natural Gas, CalPortland will mitigate over 4660 metric tons of GHG emissions, equivalent to removing 984 cars off the road or planting 119,348 trees.

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Financial Benefits

- Natural Gas (CNG) represents almost a 50% savings over petroleum products such as gasoline and diesel fuel. Over the last decade, the average cost per gallon of gasoline in the United States has risen approximately 140%.
- It is estimated that the United States has well over a 100 year supply of natural gas.
- A well-established pipeline infrastructure exists in the United States to deliver natural gas to almost every urban area and most suburban areas.
- CNG does not contain lead, so spark plug life is extended because there is no fouling. CNG does not dilute or contaminate crankcase oil, so intervals between oil changes and tune-ups are extended.
- CalPortland has seen a monthly fuel savings of $100,000 per month.

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Overall Benefits

- Reduced GHG impact
- Reduced transit toxic emissions
- Fuel Savings
- Reduction in maintenance costs
- Truck engine noise reduction
- Decreased operator involvement

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Questions?