

HYDRAGEN™ REEFER TESTING 2017



Executive Summary

With the support of a major Canadian grocery chain, dynaCERT conducted testing of its proprietary carbon emission reduction technology. The plan is to develop a new *HydraGEN™* unit specifically sized to be used on smaller diesel engines with a focus on the refrigerated trailer (Reefer) market.

The testing was conducted to evaluate the use of *HydraGEN™* Technology to reduce carbon emissions and improve fuel economy of a diesel-powered reefer trailer that is used to haul perishable goods in a cold climate environment. These trailers are used around the world in both truck-hauled units and container units moved by large ocean-going ships.

A summary of the most significant findings can be found in Table 1 below. Please note that the temperatures were recorded per the trailer control system in Fahrenheit degrees.

Three months of testing and data collection were performed to date on a reefer trailer. This trailer was equipped with a Thermo-King 4-cylinder, 2.1L engine operating an air conditioning chiller system. The engine controller had two operational levels, a low speed to maintain the set temperature and a high speed to reach the set temperature. Engine properties can be found in Table 2 below. The test location was the outdoor parking lot at 501 Alliance Avenue Toronto ON Canada with uncontrolled environmental conditions that ranged from low temperatures and rain to cloudless sky and high temperatures.

As the engine operated in the different climatic conditions and for different operating set points, the changes to the fuel consumption, reefer temperature, and exhaust properties: temperature, excess air, burn efficiency and losses, and gas composition (oxygen, carbon dioxide, carbon monoxide, nitric oxide, nitrous oxide, total NOx, and sulphur dioxide content) were monitored on an hourly basis for 8hr periods per day.

Table 1: Summary of average and maximum savings calculated for each phase and separate set of conditions.

Conditions	Property	Trial Max Savings	Trial Average Savings
Phase 1.1 Set Temp 32°F 15A current Doors closed	Fuel Consumption	28%	26%
	Carbon Dioxide (CO ₂)	49%	44%
	Carbon Monoxide (CO)	55%	51%
	NOx	35%	30%
Phase 1.2 Set Temp 0°F 15A current Doors closed	Fuel Consumption	15%	13%
	Carbon Dioxide (CO ₂)	31%	24%
	Carbon Monoxide (CO)	45%	41%
	NOx	14%	11%
Phase 1.3 Set Temp -15°F 15A current Doors closed	Fuel Consumption	17%	13%
	Carbon Dioxide (CO ₂)	34%	24%
	Carbon Monoxide (CO)	36%	29%
	NOx	22%	12%
Phase 2.1 Set Temp 0°F 15A current Doors open	Fuel Consumption	17%	16%

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