ElectraCold,LLC

Hydraulic Driven Generators and Fully Electric TRU's

Executive Summary

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INTRODUCTION TO TRU's:

Semi-trucks pulling refrigerated trailer units (TRUs), used for keeping fresh and frozen foods and other goods cool, have been using gas or diesel engines since 1938. Keeping a refrigerated load at its correct temperature is critical. These loads are very sensitive to temperature variation. Should the loads spoil, losses can equate to millions of dollars. However, there are problems associated with diesel TRUs, primarily harmful toxic exhaust emissions, greenhouse gas and particulate matter. In addition, operation of the TRU diesel engines creates significant noise pollution. This can be a considerable concern in populated areas as refrigerated deliveries often occur during the late evening and early morning hours. The on/off cycling of these diesel engines generates the noise most urban areas are attempting to control. Because of this noise pollution, many local communities as well as State and Federal Governments seek to limit their use. Also, refrigerated warehouse districts are typically located in low-income areas and the high emissions and noise emitted by diesel TRUs have led to environmental justice concerns. The exhaust from those engines, and that design, has resulted in more than 650,000 tons of carbon emissions being expelled into the atmosphere every year in just the United States. It is also a fact that about 95% of the reasons the existing units fail is due to the diesel engine, or related parts. These factors illustrate the need to investigate alternative approaches to conventional TRU designs and operating strategies.

Regulations and technology-based idling alternatives help address the truck idling issue, but diesel TRUs continue normal operation with very little restrictions. There are currently only limited regulations in place to limit TRU operation specifically. In fact, regulating these units may be difficult in that the value of many of these refrigerated loads exceeds several million dollars. However, California's Air Resources Board (CARB) has taken the initiative to institute emission regulations specific to TRUs. Currently, the EPA regulates engines rather than the TRU itself. CARB has not only proposed establishing strict limits on small diesel engine exhaust emissions, it also requires warehouse owners to report on the use of TRUs at warehouses with 20 or more loading docks serving refrigerated areas. Oregon and Washington are in the process of copying CARBs regulations.

One approach to minimizing these impacts is to use electricity to power these TRUs. These units can be driven by electricity in two specific configurations, as a hybrid diesel-electric standby TRU or as an all-electric TRU (eTRU). The hybrid diesel-electric standby refers to a primarily diesel-driven mechanical TRU with electric plug-in capability while parked. This is different than the configuration of a true eTRU; however, they are both similar in operation.

The eTRU uses electric powered (versus mechanically driven) components that are powered by either a plug-in connection or, when over-the-road, by a separate diesel generator mounted under the trailer which provides the required electrical power to the eTRU. The ElectraCold solution to this is a hydraulic driven generator (no diesel) mounted behind the truck cab which would provide all the necessary power to any eTRU available including the fully electric ElectraCold models.

As with any new technology, barriers exist that slow the introduction of this technology into the market place. Hybrid diesel electric standby TRUs have been offered in the United States in the past, but were not readily adopted by the refrigerated transport industry. This lack of market penetration was due to several factors including higher product and maintenance costs, lower reliability and limited infrastructure for both electricity and repairs. In addition, electrical connection standards have not been established, preventing the development of standardized systems, which could substantially lower production and design costs for these units.

The eTRUs have been introduced with some success in Europe, where at least 60% of all TRUs are either electrically driven or are equipped with electric standby capability. The European eTRUs are designed specifically for the market they serve and can not be directly exported into the U.S. without a significant redesign. The units sold in Europe are designed for the European electric supply, which does not match that of the United States. Also, the eTRUs being sold in Europe typically refrigerate trailers and straight trucks that are much shorter than the 53-foot trailers common in the United States. Also, these eTRUs are designed to operate on different cooling cycles, as ambient European temperatures generally differ from U.S. temperatures. The trucking industry in Europe is much different, as trucks can often complete a delivery without an overnight stop, therefore offering an opportunity to operate on electricity for many more hours.

As diesel fuel approaches $4.00 per gallon, fleets transporting refrigerated goods are investigating methods to reduce fuel consumption. Using electricity while at the warehouse can substantially reduce their consumption of diesel fuel. A standard diesel unit will consume about 24 gallons per day. If the unit was used 5 days a week it would save approximately 6,240 gallons annually. At $4.00 per gallon, this equates to an annual savings of $24,960. Add in the savings in maintenance and the increase in load carrying capability and the eTRU will pay for itself in less than twelve to eighteen months. The added advantage is the unit does not produce carbon emissions and will not be subject to present, or future regulations. Furthermore, the eTRUs have a longer expected lifespan and higher resale value, which combine to make the purchase and use of an eTRU even more economical.

In light of these facts, a comprehensive market and technical assessment was undertaken to evaluate the potential for eTRUs in New York State and across the United States. As part of this study, emission reduction potential was investigated, optimal operational specifications were considered and the business cases for current diesel-electric hybrids and redesigned eTRUs were investigated.

Based on the analysis, the study findings can be summarized as follows:

TRU systems of the future will have to be cost-competitive on a life-cycle basis relative to the next-best alternative if they are to effectively compete in the marketplace. These new units will

have to be more efficient and more environmentally friendly to comply with future environmental regulations. Further, there is a strong possibility that these new systems will have an electric option to comply with new anti-idling restrictions in key urban markets.

eTRUs appear to be a promising technology whose time in the U.S. has arrived. This conclusion is based upon the operational cost analysis of diesel-driven TRUs, the localized emission and noise elimination benefits, the successful operation of these units in Europe, and the interest demonstrated by the refrigerated transport industry.

Warehouses and trailer parking areas can be easily retrofitted to incorporate the electrical service required to operate eTRUs on electricity. High-voltage service exists at many of these facilities due to the electrical requirements of the refrigeration equipment. The engineering and installation of the electrical distribution and wiring may be provided to the facility at a reduced cost to the owner of the refrigerated warehouse. This conclusion is based on discussions with electric utilities indicating that the increased use of electricity will offset the cost of engineering and installation.

Regulations may require the adoption of these units in environmentally sensitive areas. CARB and EPA have proposed stringent emission regulations and local regions have discussed restricting the operation of diesel-powered TRUs. Oregon and Washington are preparing to copy and implement the same regulations.

BUSINESS SUMMATION:

The object of ElectraCold, LLC is to produce a highly dependable tractor driven generator that will be mounted on the rear of the cab to supply a fully electric refrigeration system for long and short distance delivery of frozen or chilled products. The design of the hydraulic generator and fully electric transport refrigeration unit (eTRU) incorporates major parts that are easily obtainable throughout the area of operation of the units. The units are manufactured in such a way that the average mechanic can look at the units and understand their operation and be able to repair them. The mechanical parts are designed for the average truck mechanic to understand without special schooling. The refrigeration unit is designed and constructed using standard refrigeration practices similar to any stationary equipment used in the average grocery store unit with the exception of construction materials and practices common to transportation units.

Repair facilities are in place in North America and Europe. There are presently over 700 repair stations for truck and trailer maintenance. About half of those centers are dedicated to the existing competition’s products. They depend on these centers to provide installation, service and sales for their units. The present network would not be as critical to the fully electric driven units because of the simplicity and ease with which an owner operator or company staff could repair or maintain them. It is an established fact that 95% of the failures in the existing diesel driven units from the competition are engine related. The average refrigeration mechanic would be qualified to work on the eTRU without any further factory training which is required by Thermo King and Transicold.

ElectraCold's power generation system will be compatible with existing 220/440 volt three phase power outlets along with the existing TRUs, and containers in use today.

The next phase of development requires testing of the prototype manufacturing model on the company owned Volvo truck and trailer. The final testing needs to be done without interference from any outside company to keep it protected while waiting for the utility patent. The patent should be granted around July of 2019. Upon successful testing, the truck can be used to demonstrate the unit to potential customers and eventually be used in truck equipment shows.

Many of the parts in both the generator set and the refrigeration unit are "off the shelf" and will result in a great deal of savings to any customer who uses an ElectraCold refrigeration system in their fleet. The easy maintenance and low cost of operation will give the customer an advantage over their competition.

One of the leading reasons for a customer to choose a fully electric driven unit, in addition to the savings in labor and maintenance, are the savings in diesel fuel. As a "green" solution, it can not be compared to any other options. The average life expectancy of the ElectraCold units should exceed 10 years of normal use.

ELECTRIC HYDRAULIC DRIVEN GENERATOR.

A fully electric unit requires a power source on-board the vehicle. ElectraCold developed, and tested, an 18 kW generator system in 2015/16 based on designs from prior years supplying equipment to commercial fishing vessels. That unit now has over 200,000 thousand miles on it. The generator system provides a continuous 18 kW throughout the entire engine operating limits from idle to full RPM.

Testing of the efficiency of the hydraulic driven generator was accomplished by a Volvo dealership in Eugene, Oregon. The results of that testing confirmed the projections of savings in fuel that ElectraCold has been promoting. At engine idle the burn rate increased 2.5 tenths of a gallon (1/4 of a gallon) per hour with the generator running while the refrigeration unit was on maximum cooling load. On the highway, under normal operating conditions, the fuel burn increased by 1.5 to 2.0 tenths of a gallon per hour. The normal fuel consumption of running an existing diesel powered refrigeration unit ranges between 1 and 1.5 gallons per hour. The reduced fuel burn of .75 to 1.25 gallons per hour results in a significant savings. The yearly maintenance for the hydraulic system requires the replacement of a spin-on filter. The hydraulic driven generator is rated to run about 100,000 hours (app.12 years) before any major maintenance should be required. The savings on maintenance alone is good reason to use the hydraulic driven generator system.

The hydraulic generator has been designed and constructed to run continuously. It is the only system presently designed to accomplish that task. Different sizes could be offered with applications in many other industries along with military applications.

The patent pending solution for driving the generator set would provide even greater savings on fuel. The basis of the patent is the capture of kinetic energy from the drive train. The variable volume pressure compensated hydraulic pumps are self governing without any electrical components. The engine driven pump is mounted on the gear train at the engine equipped mounting option available on almost all modern diesel engines used in class 8 trucks. The gear train hydraulic pump would supply most of the energy during normal long haul operations. The fuel consumption is expected to be less than 1/10 of a gallon per hour.

FUNDING REQUIREMENTS:

The present owner has provided the initial funding over a span of 35 years while manufacturing and selling marine fish boat refrigeration. Phase 1 has been completed and Phase 2 needs to be completed as soon as possible.

Phase 2 includes a limited R&D and manufacturing facility. The facility would be set up to build five hydraulic generators and refrigeration units. There would also be a section to thoroughly test each unit. The purpose of the initial manufacturing facility, in part, is to standardize the manufacturing process. That process could then be transferred to any other facility where the units per day could be increased to meet the demand of potential customers. It is hoped that a customer like Wal-Mart, with over 14,000 trailers, could be encouraged to test the “Greenest” unit available. The amount needed to accomplish this phase is $200K and would include all funds needed to pay all the necessary expenses for the coming year. Approximately $72,000 would be dedicated to labor with about $75,000 for parts and material. Fixed expenses for insurance, rent and utilities would be about $25,000. The projections for funding are made with the understanding that the manufacturing startup would be limited for the first 90 days due to the lead time to get equipment and material. Employees will be added, and trained, as required to fulfill potential sales. That would leave about $28,000 for any expansion or testing certification(s) required to complete Phase 2.

This funding requirement is based on a projected need for 5 finished systems that will be used as “introductory” units for potential customers. They would then be expected to pay the invoice price within 90 days followed by a provisional order for more units. While the required parts and materials are being ordered and the facility is being organized, one or two of the initial employees will concentrate on contacting potential customers with the express purpose of getting feedback on the idea of purchasing an ElectraCold unit and as a possible customer for one of the “introductory” units.

The ElectraCold fully electric transport refrigeration system in presently valued at $10M based on the total cost for any company to get a similar product to this stage of completion. For investing purposes in Phase 2, the evaluation has been set at $2M. Once the funding has been dedicated, ElectraCold, LLC will be incorporated as a C corporation with stock authorized and issued. In the event further funding is required, the Board of Directors will set the value of stock. The $200K will purchase 10% of ElectraCold, Inc. with the understanding that the investor(s) will have first option to purchase any further interest in the corporation. It is also understood that one investor would be on the Board of Directors if so desired by the investor. Total investment by any investor(s) will not exceed 49% without the clear and written authorization of the founder, Gene Holt, or his heirs.

SUMMATION:

United Technologies and Ingersoll Rand own the two major companies that provide transport refrigeration equipment to most of the world. ElectraCold has the unique opportunity to supply any, or all, of these units with the necessary electrical power required based on many years of experience. There are no other companies offering a hydraulic generator designed to run 24 hours a day 7 days a week.

The present make-up of the company includes 3 experienced workers who have been involved with the manufacturing of refrigeration equipment and hydraulic generators for more than twenty years. The business will primarily be a manufacturing enterprise with in-house training of employees. ElectraCold can be thought of as a "start-up" due to the lack of business and limited facilities but, in reality there has been a vast amount of R&D already accomplished. However, this same structure allows the relocation of the business quickly to just about any location with minimal cost.

EXIT STRATEGY:

The exit strategy could consist of two options. ElectraCold, LLC will be a serious disruptive product for the two existing transport refrigeration suppliers. Because the existing market in the US alone is over $2B a year, one, or both, could elect to purchase ElectraCold, LLC. Their business model depends on their distributors who in turn rely on the continued maintenance of the units supplied by them. Transicold and Thermo King can not eliminate the diesel engine from their units and still maintain their distribution network. ElectraCold, on the other had, does not need a distribution network and can sell directly to their customers through 3 to 5 regional outlets. The regional outlets would not have to be bigger than about 4,000 sq.ft. The second option would be to just continue to build, sell and service the complete line of truck transport refrigeration units that would consist of three basic sizes, 5hp, 10hp and 15hp. The projected retail price for a complete 15hp ElectraCold system is $29,500.

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