

Award Description	Research Methodology	Measurement Criteria
<p>Frost & Sullivan's Technology Innovation Award is bestowed upon a company (or individual) that has carried out new research, which has resulted in innovation(s) that have or are expected to bring significant contributions to the industry in terms of adoption, change, and competitive posture. This award recognizes the quality and depth of a company's research and development program as well as the vision and risk-taking that enabled it to undertake such an endeavor.</p>	<p>To choose the award recipient, Frost & Sullivan's analyst team tracks innovation in key hi-tech markets. The selection process includes primary participant interviews and extensive primary and secondary research via the bottom-up approach. The analyst team shortlists candidates on the basis of a set of qualitative and quantitative measurements. The analysts also consider the pace of research and technology innovation, and the significance or potential relevance of the innovation to the overall industry. The ultimate award recipient is chosen after a thorough evaluation of this research.</p>	<p>In addition to the methodology described above, there are specific criteria used to determine the final rankings. The recipient of this award has excelled based on one or more of the following criteria:</p> <ul style="list-style-type: none"> • Significance of the innovation(s) in the industry, and across industries (if applicable) • Potential of the products of innovation(s) to become industry standard(s) • Competitive advantage of innovation vis-à-vis other related innovations • Impact (or potential impact) of innovation(s) on company or industry mind share and/or company bottom line • Breadth of intellectual property related to the innovation(s), that is, patents, scientific publications, papers in peer-reviewed journals.

**2007 North American Frost & Sullivan Award for Technology Innovation
Award Recipient: Turbine Truck Engines, Inc.**

The 2007 Frost & Sullivan North American Technology Innovation Award in the field of automotive turbines goes to Turbine Truck Engines, Inc. in recognition of its development of a turbine engine for use in heavy-duty trucks. The turbine engine is meant as a replacement for the conventional heavy-duty piston engine in trucks and may prove to be a better alternative.

A number of turbine engine concepts were developed for automotive use in the 1960s and 1970s. A number of factors including material limitations and fuel efficiency prevented them from replacing the conventional piston engine even though the turbines exhibited a very high power to weight ratio and would have made a difference in either performance or carrying capacity in heavy duty applications.

Introduction

The internal combustion piston engine has been around for more than a century. In that time a number of applications have become dependent on it. Things we take for granted, like ground transportation and electricity, depend on the piston engine. In the last hundred years, a number of alternate designs have been tried and while they

have had some measure of success, they have not replaced the piston engine. Turbine engines, now the mainstay of aviation, were tried in automotive applications but high fuel consumption and thermal management issues precluded their usage.

Truck Turbine Engines, Inc. is a Florida-based company that has been in business from 2000. It was primarily set up to commercialize the technology developed by Alpha Engines Corporation. They have been developing engines that can beat current engines in terms of efficiency and maintenance. The company has developed four prototypes and is currently on its fifth generation prototype. The engines are designed for heavy-duty usage with fewer moving parts and hence will be more reliable than piston engine. On the strength of these factors, they might be able to move into the market.

Technology Overview

Turbine engines are the power plants of choice in the aviation industry. They were able to displace piston engines largely because they are more reliable and require less maintenance. Their high power to weight ratio also made it possible to build heavier aircraft that could carry more passengers.

Turbines are conceptually very simple and have a lower number of moving parts. They consist of compressors that compress the incoming air, a combustor where the air and fuel are mixed and burned, and an exhaust. The exhaust also has a set of blades that run the compressors.

The engine developed by the company on the other hand is slightly different. A housing encloses a turbine rotor. The rotor is connected to two combustion chambers on opposite sides. Fuel and air are fed to the chambers through a manifold. When sparked, the combustible mixture explodes and exits the chambers through nozzles. These nozzles are directed onto the rotor that then spins. The combustion in one chamber also cuts off the fuel supply momentarily and redirects it to the other chamber, enabling cyclic combustions.

Innovative Features

The company calls its engine the Detonation Cycle Gas Turbine engine and it features a number of interesting characteristics. Theoretically, this engine should burn less than current piston engines and because it has no pistons or valves, it requires no lubrication oil and has fewer maintenance requirements. It is also air-cooled and quite light for its power. Being a turbine it can also operate on a number of fuels and because of this multifuel capability can be used on whichever fuel is the most economical in the region. It is also cleaner and should easily clear emission regulations.

Best Practices

The company has employed a judicious mixture of good engineering with manufacturability, an issue that has been the bane of most unconventional designs in the last century. While the parts are different from those in the other engines, they are not new per se. As such, manufacturability should not be an issue. The company is also strong on the intellectual property front with a US patent on "Detonation Cycle Gas Turbine Engine System Having Intermittent Fuel and Air Delivery" granted in December 1999.

Conclusion

Turbine Truck Engines, Inc. presents an interesting alternative to heavy-duty piston engines for the trucking market. With a number of generations of engines under its belt, the company has developed expertise with these engines. Recognizing the company's platform design and its potential to impact the heavy duty engine sector, Frost & Sullivan is pleased to award the Turbine Truck Engine, Inc. the 2007 Technology Innovation Award in the field of automotive turbine technologies.

About Best Practices

Frost & Sullivan Best Practices Awards recognize companies in a variety of regional and global markets for demonstrating outstanding achievement and superior performance in areas such as leadership, technological innovation, customer service, and strategic product development. Industry analysts compare market participants and measure performance through in-depth interviews, analysis, and extensive secondary research in order to identify best practices in the industry.

About Frost & Sullivan

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