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FUEL TECHNOLOGY[®]

LIFT your performance.

Company Overview

Technology Development and Commercial Operations

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FUEL TECHNOLOGY[®]

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INTERNATIONAL FUEL TECHNOLOGY || Company Overview

INTRODUCTION

International Fuel Technology, Inc. (IFT), a United States corporation headquartered in St. Louis, Missouri, has developed, tested, and filed for international patent protection on a new technology that increases the efficiency of liquid hydrocarbon fuels by 4-7% on average without requiring reconfiguration of the engine or refining infrastructure.

IFT products have been tested worldwide in automobile, truck, power generation, and rail engines. The company now has representative offices and customers in the United States, United Kingdom, Europe, South Africa, India, Republic of the Philippines and Australia.

IFT and its testing partners and customers are not aware of any other product or technology available in the commercial market (or in development) that provides comparable fuel efficiency improvement and related benefits.

The purpose of this memorandum is to provide a brief summary of the development of the Technology and the science supporting it.

DEVELOPMENT OF THE TECHNOLOGY

For the last six years a team of UK and US scientists working for International Fuel Technology, Inc., a publicly listed United States fuel science and research company, has been developing and testing a surfactant (surface active agent) approach to improving fuel efficiency and related fuel performance characteristics. In 2002 the preliminary formula developed by the team had its first successful test in a truck fleet, followed by improvements of the formula, and other successful tests in automobile, truck, rail, and power generation.

As a result of this success IFT has filed for patent protection on its formulations (the Technology) and is now focused on rapid commercial development targeting large-volume fuel consumers in the trucking, power generation and railroad sectors. In 2005-2006 the Company has established representative offices in 14 countries in North and South America, Europe, Africa, Asia and Australia and has accelerated its testing and government approval/licensing efforts in a number of other countries.

The demand for the Technology is based on several factors: it provides significant fuel savings without any damage to or reconfiguration of engines, it reduces emissions and it solves or improves a number of related combustion issues such as lubricity and co-solvency – as well as reducing engine maintenance and it is immediately available to defray rising fuel costs.

SCIENTIFIC BACKGROUND

Additives are used for a variety of reasons, but primarily to meet specification requirements, prevent degradation during storage, and enhance performance and often to aid brand differentiation and recognition. IFT competes in this market, but also supplies its products into the emerging market of alternative fuels where the additives act as a co-solvent as well as a performance improver.

These two market segments are quite different, but their dynamics are inter-related, as the growth of alternative fuels is usually dependent on replacing those derived from crude oil. The continuing drive towards a more efficient and cleaner global environment (legislated or not) will undoubtedly be matched by increased investment and innovations such as the IFT formulation.

IFT additives are manufactured and blended in ISO 9002 and ISO 14001 certified plants in the U.S. owned by Air Products and Chemicals, Inc. As markets develop in other parts of the world, manufacturing sites may be set up closer to demand locations.

Unlike traditional fuel additives, which are predominantly hydrocarbon based – derived from petroleum sources, IFT's proprietary technology is entirely based upon surfactant chemistry. A complex mixture of chemical molecules which, when blended into distillates or gasoline, positively alter the composition and make-up of the finished fuel, while maintaining the basic fuel specifications.

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These resulting changes add to the performance of the fuel, have been proven to significantly reduce harmful emissions like carbon monoxide (CO) and environmental emissions including carbon dioxide (CO₂) and nitrogen oxides (NO_x), increase fuel efficiency (mile per gallon), decrease black smoke and particulates, and enable excellent fuel lubricity throughout the engine and fuel system. The technology's efficacy has been demonstrated and confirmed by various independent laboratories worldwide, including the U.S. government-certified Southwest Research Institute in San Antonio, Texas.

DIESEL APPLICATION: DiesoLIFT™

DiesoLIFT™, the blend developed specifically for diesel fuel, is designed to create a repairable mono-layer within the fuel system, homogenize any free inherent water within the host fuel, and deliver an enhanced spray pattern to the point of combustion for more complete burning. The advent of low-sulfur, low aromatic fuels has led to more free water than before (as aromatics and sulfur harbor water) and made DiesoLIFT™ more desirable in the market. This product is specifically designed to enhance performance and give peace of mind to users of cleaner distillate fuels.

The precise purpose of the Technology is to protect the fuel pump and lines from resistance (low aromatic and sulfur fuels have low lubricity) and deliver the fuel to the point of combustion in the best condition possible to achieve the best spray pattern possible at the injector. The technology also shows great efficacy when the blend has a low initial boiling point or when there is a desire to reduce the final boiling point, which is known to reduce emissions.

As IFT makes commercial progress, product ranges will be expanded to support both the technology and the various industries into which they are sold. The versatility of the chemistry/technology developed by IFT has already proven to be of immense value and this will continue to be a major selling point and benefit to new industrial segments.

As mentioned, IFT has undergone extensive testing on distillate technologies at Southwest Research Institute. SwRI is one of the most accredited independent emissions testing laboratories in the world. As a result, several technical papers have been published and presented in many peer-reviewed conferences throughout the world.

FUEL FLOW AND COMBUSTION

Surface active compounds in IFT technology decrease the energy requirements to create area in liquid-air interfaces. Therefore, IFT technology promotes fuller combustion. Combustion is a chemical reaction between a fuel and the oxygen contained in the air. It is a fast reaction and its completeness, for the same mass of fuel being burned, depends on the fuel area exposed to air. The larger the area, the more complete the combustion. IFT technology helps atomize the fuel to a larger degree than the unadditized fuel, thus generating a spray pattern with much larger interface area per unit mass of fuel, which leads to a more complete burn and more energy extracted per mass of fuel. Since IFT technology extracts more energy from the fuel than the case of unadditized fuel, the net result is improved fuel efficiency, which translates into more kWh/g (bench) or more mi/gallon (field).

Carbon monoxide (CO) emissions are the result of incomplete combustion of fuel. Since IFT technology promotes fuller combustion of fuel, its use results in lesser emissions of carbon dioxide. The same reasoning applies when observing the reduction in particulate matter emissions. With respect to NO_x and CO₂ emissions, even if the IFT technology would not reduce these emissions, if calculated on an energy produced (bench) or km run (field), there would be a decrease in both NO_x and CO₂ emissions due to the fuel efficiency obtained with the IFT technology.

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As fuel containing IFT technology flows through tubes and injection nozzles, the fuel surface in contact with the walls of tubes and nozzles forms a repairable mono-layer that builds a boundary layer that drags the fuel flow at the walls. This results in improving lubricity and both immediate and long-term savings on maintenance. This phenomenon helps to maintain the mechanical integrity of the nozzles and tubes, which will contribute to added fuel efficiency improvement in the long-run.

The surface active nature of the IFT technology also adds detergency features to the additized fuel. This means that the additized fuel cleans the environment in which the fuel flows and keeps it unpolluted after the filters made dirty by the initial flush of additized fuel are changed.

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