KAG Canada Reduces Fuel Cost by 18% While Reducing CO2 Emissions by 13%

IFS' Multi-Fuel Retrofit Technology for Heavy-Duty Trucks Case Study

BACKGROUND

KAG Canada is the Canadian service group for Kenan Advantage Group, Inc. (KAG). KAG is North America's largest tank truck transporter and logistics provider. KAG Canada encompasses Westcan Bulk Transport, RTL Construction, Paul's Hauling, Connectrans Logistics, and Valley West Transport.

With a focus on heavy-duty (HD) transport (weight in excess of 80,000 lbs [36,000 kg]), KAG Canada strives to increase operational efficiencies while reducing greenhouse gas (GHG) emissions in order to meet industry, stakeholder, and customer demands.

CHALLENGE

The last few years have been challenging for the trucking industry. Inflation has increased KAG Canada's input and operational costs, but its customers are pushing back on any price increases, even those required to cover these increased costs. Additionally, customers and governments are asking KAG Canada to reduce its carbon footprint, which, to date, has been very difficult to do in the HD trucking industry, especially in an economically viable way.

By focusing on cost control and economic efficiencies, KAG Canada hopes to reduce GHG emissions in an economically viable way.

SOLUTION

KAG Canada selected Innovative Fuel Systems' (IFS) patented and proprietary Multi Fuel Technology Platform (MFTP™) to reduce GHG emissions and fuel costs. MFTP™ is a retrofit system that can be used on existing trucks, and it allows a diesel engine to offset diesel fuel usage with cleaner burning fuels such as natural gas (in the form of compressed natural gas [CNG]), renewable natural gas (RNG), or hydrogen.

In Q1 2021, MFTP™ was installed on 5 brand-new 2021 Peterbilt (Paccar MX-13 engine) trucks with the goal to replace an impactful amount of diesel with cleaner burning and cheaper CNG.

Using a Super-B truck trailer with 63,500 kg (140,000 lbs) gross volume weight (GVW), these trucks were hauling fuel between Edmonton and Calgary for Shell Canada and another large multinational customer.

These trucks equipped with MFTP™ technology have continued to work this commercial route for more than 4.5 years, and KAG Canada has expanded its operations using MFTP™ technology for its commercial business for Shell Canada in Southern Ontario.



Figure 1: KAG Canada truck equipped with MFTP™ (Source: IFS).

RESULTS AND BENEFITS

During more than 4.5 years of commercial operation, KAG Canada was able to fully and effectively test the MFTP™ technology in various weather conditions, seasons, and operating conditions. Rigorous testing showed more than 18% in fuel cost reductions and more than 13% in lifecycle CO2 reductions.

Fuel Cost Reductions The primary factor in recognizing fuel savings and GHG reductions is the ability to maximize the displacement of diesel with a cleaner burning CNG. After rigorous testing and data collection over a 1-month period between November and December 2022, it was determined that IFS' patented proprietary MFTP™ technology was displacing 40.2% diesel fuel with cleaner burning CNG. This was an average diesel displacement, meaning that this was the total diesel displacement for the entire run (going fully loaded one direction and returning empty, which is typical on a HD truck run).

By using IFS' MFTP™ technology and factoring in a diesel fuel cost of $1.40CAN/L ($5.30CAN/gallon) and a compressed natural gas cost of $0.75CAN/DLE ($2.84CAN/DGE), KAG Canada reduced its fuel costs by more than 18%. The unit fuel cost price reduction and savings were $0.14CAN/km[1] ($0.23CAN/mile).

After wages, fuel costs are typically the largest expense for a HD trucking company, so an 18% savings in fuel costs makes a significant impact.

GHG Emissions Reduction and ESG Benefit

To accurately reflect real-world emissions, IFS data was sourced from the Environmental Protection Agency (EPA)-approved Urban Dynamometer Driving Schedule (UDDS) driving cycle conducted at the ESW America Inc. test facility in April 2023. The UDDS cycle simulates a typical driving cycle. For the analysis, only data within the range of a 40.2% substitution load were considered to ensure a precise representation of overall highway driving conditions. Subsequently, vehicle emissions data were integrated with fuel production data from GHGenius[2] to assess the total lifecycle emissions of diesel-only operations versus MFTP™ operations. Using IFS' MFTP™ technology, KAG Canada was able to achieve a 13.2% reduction in CO2 emissions.

Operational Performance

All of KAG Canada's professional drivers who drove the MFTP™-equipped HD trucks reported absolutely no change in truck performance between 100% diesel fuel operation and diesel/CNG fuel operation. HD truck power was unchanged.

Run Time, Service, and Maintenance

IFS' MFTP™ is designed to be non-intrusive and require virtually no servicing or maintenance. MFTP™ did not obstruct or impede any part of the engine controller unit (ECU), virtually eliminating any chance of performance or maintenance issues.

Over KAG Canada's 4.5 years operating IFS' MFTP™ technology, there were no performance-related issues.

An engine oil analysis confirmed the engine showed no abnormal or accelerated engine wear, and the engine oil was in excellent condition.

"Our truck drivers have not reported any operational issues, and we've not experienced any impactful issues related to the MFTP™ technology."

Jordan Hiltz, Fleet Manager, Western Canada, KAG Canada



Figure 2: KAG Canada truck (Source: KAG Canada).

[1] Assuming fuel consumption of 55L/100km (4.28 mpg).

[2] GHGenius for lifecycle analysis of transportation fuels. https://www.ghgenius.ca/

Total Cost of Ownership

IFS' MFTP™ kit can easily be transferred from a retired truck to another truck; consequently, fleet owners can amortize the cost over multiple trucks, further reducing the total cost of ownership (TCO).

Once a truck is retired from the fleet and ready to be sold, the IFS MFTP™ kit is simply transferred to another truck, leaving the retired truck to be sold with no depreciable cost related to the MFTP™ kit.

Importantly, IFS' MFTP™ technology is a retrofit technology that can be used on existing trucks, while most other technologies that reduce GHG emissions require the purchase of a new truck.

WARRANTY

IFS' MFTP™ technology does not void the OEM engine warranty, and IFS' warranty covers any damage resulting from its technology.

TECHNOLOGY LEADERSHIP

"KAG Canada is focused on reducing our carbon footprint while continuing to provide cost efficiencies and operational excellence to our customers. IFS' MFTP™ technology has effectively reduced our CO2 emissions and fuel costs without impacting truck performance, and as a result, we plan to rollout the MFTP™ technology at our other locations in Canada."

Chris Chapman, VP of Fleet Services, KAG Canada

All similar competing technologies that use a multi-fuel approach on existing engines mix the alternative fuel (e.g., CNG, RNG, hydrogen) in the air intake manifold, which is an inferior mixing method. Conversely, IFS' MFTP™ is the only commercial "in-cylinder mixing" dual-fuel technology.

IFS' MFTP™ sequentially injects the energy equivalent amount of an alternative fuel into the combustion cylinder (in-cylinder mixing), which is a more efficient and cleaner method than those used by competing technologies because it eliminates alternative fuel slippage (unburned fuel). Additionally, there is no combustible mixture outside the cylinder, and the fuel to each cylinder is precisely controlled. This approach delivers the best fuel efficiency and diesel displacement.

PERFORMANCE VERSUS OTHER SOLUTIONS

With a focus on reducing its carbon footprint, KAG Canada has considered HD electric and HD hydrogen fuel cell truck technologies.

HD Electric Truck Technology

Currently, HD electric trucks are not being considered for several reasons:

1. Travel range and efficiency reduced by battery charging times.
2. Significantly higher upfront purchase costs and uncertainty on total cost of ownership.
3. Much heavier batteries decrease payload for each truck.
4. Lack of charging infrastructure.

HD Hydrogen Fuel Cell Truck

Currently, HD hydrogen fuel cell trucks are not being considered for several reasons:

1. Significantly higher upfront purchase costs and uncertainty on TCO.
2. Hydrogen fuel cost is much higher than diesel, thus constraining economics.
3. Lack of hydrogen fueling infrastructure.
4. Extra weight decreases payload.

Currently, electric and fuel cell technologies impact operational and economic efficiencies. KAG Canada will consider these technologies as they mature and overcome issues around TCO, payload reduction, and fueling costs and times.

IFS technology provides both fuel savings and GHG reductions, while providing favourable TCO.

NEXT STEPS: COMPLETE IMPLEMENTATION

After validating the performance, fuel savings, and GHG-reducing ability of IFS' MFTP™ technology over 4.5 years of operation, KAG Canada plans to convert its fleets at various locations throughout Canada.