



Cummins and Tula Announce Collaboration Demonstrating the Benefits of Diesel Dynamic Skip Fire (dDSF™)

dDSF Shows Potential to Reduce Tailpipe NO_x Emissions while Simultaneously Reducing CO₂

COLUMBUS, Ind. and SAN JOSE, Calif., April 22, 2020 – Cummins Inc. (NYSE: CMI) and Tula Technology, Inc., a tech leader in improving propulsion efficiency and reducing emissions in passenger cars, today announced their collaboration on a significant technical demonstration of diesel Dynamic Skip Fire (dDSF™). By using dDSF software to control cylinder deactivation, Cummins and Tula have demonstrated significant reductions in emissions and fuel consumption.

“At Cummins, it’s our mission to power a more prosperous world. We do this by helping customers succeed through innovative and dependable products that are good for the customer and the environment. We will continue to innovate the diesel engine system to make it lighter, more reliable, powerful and fuel-efficient, and we are encouraged by the progress demonstrated in this collaboration and what it could mean for future diesel technology,” said Lisa Farrell, Director, Advanced System Integration, Cummins Inc.

The project started in early 2019 with the goal of optimizing cylinder deactivation strategies for diesel engines, which could result in emission reduction benefits. Advancements through the project are expected to help address future, more stringent NO_x regulations.

The collaboration work was carried out on a Cummins X15 Efficiency Series 6-cylinder diesel engine, which offers class-leading fuel economy. The joint development team modified the engine system to integrate and leverage Tula’s Dynamic Skip Fire (DSF®) control algorithms to command combustion or deactivation on a cylinder event basis. On the challenging low-load cycle being proposed by the California Air Resources Board, modeling of dDSF technology predicted reductions in tailpipe NO_x (oxides of nitrogen) emissions while simultaneously reducing CO₂ (carbon dioxide).

The reduction of tailpipe NO_x is achieved primarily by optimized exhaust temperature control, resulting in dramatically improved conversion efficiency of the aftertreatment system. The technology achieves CO₂ reductions through improvements in combustion and reductions in pumping work. Further, dDSF delivers improved tailpipe emissions while simultaneously reducing fuel consumption, allowing for further optimization of these critical parameters.

“Our partnership with Cummins has given us the opportunity to expand our DSF technology beyond its success in gasoline engines. Demonstrating the capability to improve fuel efficiency while also achieving very effective emissions control is extremely important for all diesel engine applications in the future,” said R. Scott Bailey, president and CEO of Tula Technology.

Cummins and Tula have released their joint paper “Diesel Dynamic Skip Fire (dDSF®): Simultaneous CO₂ and NO_x Reduction” for the 2020 Vienna Motor Symposium, which presented and quantified the success of dDSF in increasing efficiency and reducing CO₂ and NO_x. The paper reflected the successful partnership and collaboration between Cummins and Tula in evaluating dDSF for the diesel market. The collaboration will

continue with exploring future system optimization and viability to control noise, vibration and harshness in commercial vehicle applications.

About Cummins Inc.

Cummins Inc., a global power leader, is a corporation of complementary business segments that design, manufacture, distribute and service a broad portfolio of power solutions. The company's products range from diesel, natural gas, electric and hybrid powertrains and powertrain-related components including filtration, aftertreatment, turbochargers, fuel systems, controls systems, air handling systems, automated transmissions, electric power generation systems, batteries, electrified power systems, hydrogen generation and fuel cell products. Headquartered in Columbus, Indiana (U.S.), since its founding in 1919, Cummins employs approximately 61,600 people committed to powering a more prosperous world through three global corporate responsibility priorities critical to healthy communities: education, environment and equality of opportunity. Cummins serves its customers online, through a network of company-owned and independent distributor locations, and through thousands of dealer locations worldwide and earned about \$2.3 billion on sales of \$23.6 billion in 2019. See how Cummins is powering a world that's always on by accessing news releases and more information at <https://www.cummins.com/always-on>.

About Tula Technology, Inc.

Silicon Valley-based Tula Technology provides innovative award-winning software controls to optimize propulsion efficiency and emissions across the mobility spectrum, including gasoline-powered, diesel, alternative fuel, hybrid, and electric vehicles. Tula's culture of innovation has resulted in breakthrough technology and a robust global patent portfolio of 140+ patents and another 120+ patents pending. Tula Technology is a privately held company backed by Sequoia Capital, Sigma Partners, Khosla Ventures, GM Ventures, Delphi Technologies, and Franklin Templeton. More information is available at www.tulatech.com.

Contacts:

Cummins Inc.
Jon Mills
Director, External Communications
Jon.mills@cummins.com

Tula Technology, Inc.
Ram Subramanian
Principal Marketing Strategist
ram@tulatech.com

Media:

Financial Profiles, Inc.
Debbie Douglas
Senior Vice President
ddouglas@finprofiles.com
(949) 375-3436