HOW THE WAR IN UKRAINE AFFECTS THE OEM OFF-HIGHWAY INDUSTRY

From raw materials to alternative fuels, the industry and compressors in equipment are undergoing changes.

OEM OFF-HIGHWAY

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INTRODUCTION

Russia's invasion of Ukraine has worsened global problems that have been in place since the pandemic. Recently, Richard Demirjian, president of T/CCi (a compressor manufacturer), discussed the many effects of the war in Ukraine. These include the supply chain in general and specifically the original equipment manufacturer (OEM) off-highway industry. He also talked with the OEM Off-Highway team about changes to compressors caused by shifts in power options and a move to alternative fuels in off-highway vehicles.

SUPPLY CHAIN & RAW MATERIALS

According to Demirjian, logistics and supply chain problems already existed because of the COVID-19 pandemic and other drivers. This worsened as the invasion of Ukraine began.

"A LOT OF OUR CUSTOMERS WERE SOURCING PRODUCT IN UKRAINE. WE'VE SEEN SHUTDOWNS AT SEVERAL OF THEM, BOTH ON-HIGHWAY AND OFF-HIGHWAY CUSTOMERS," DEMIRJIAN SAID.

Still others have products and materials that come through Russia. A recent OEM Off-Highway article featured information from a March 23, 2022, GlobalData survey. "The invasion into Ukraine has led to widespread backlash against Russia … As a result, many global companies have decided to reduce, suspend or end operations in Russia. Many of those are construction companies."

Construction OEMs Hitachi, Komatsu, JCB, Caterpillar and John Deere suspended their Russian operations. As companies minimize or eliminate relationships with and receiving goods from Russia-based companies, it causes another supply-chain problem point. Finding other sources for these required materials adds to the struggle to manufacturing products.

According to an article by Marina Mayer, editor in chief of *Food Logistics*, "The Russia/Ukraine War has also shut down the operations of several third-party logistics providers in Ukraine, putting all goods coming in and out to a standstill. And goods scheduled to import into Ukraine are now be rerouted to other countries such as Poland to help aid the Ukrainians who've fled their native country to safety elsewhere."

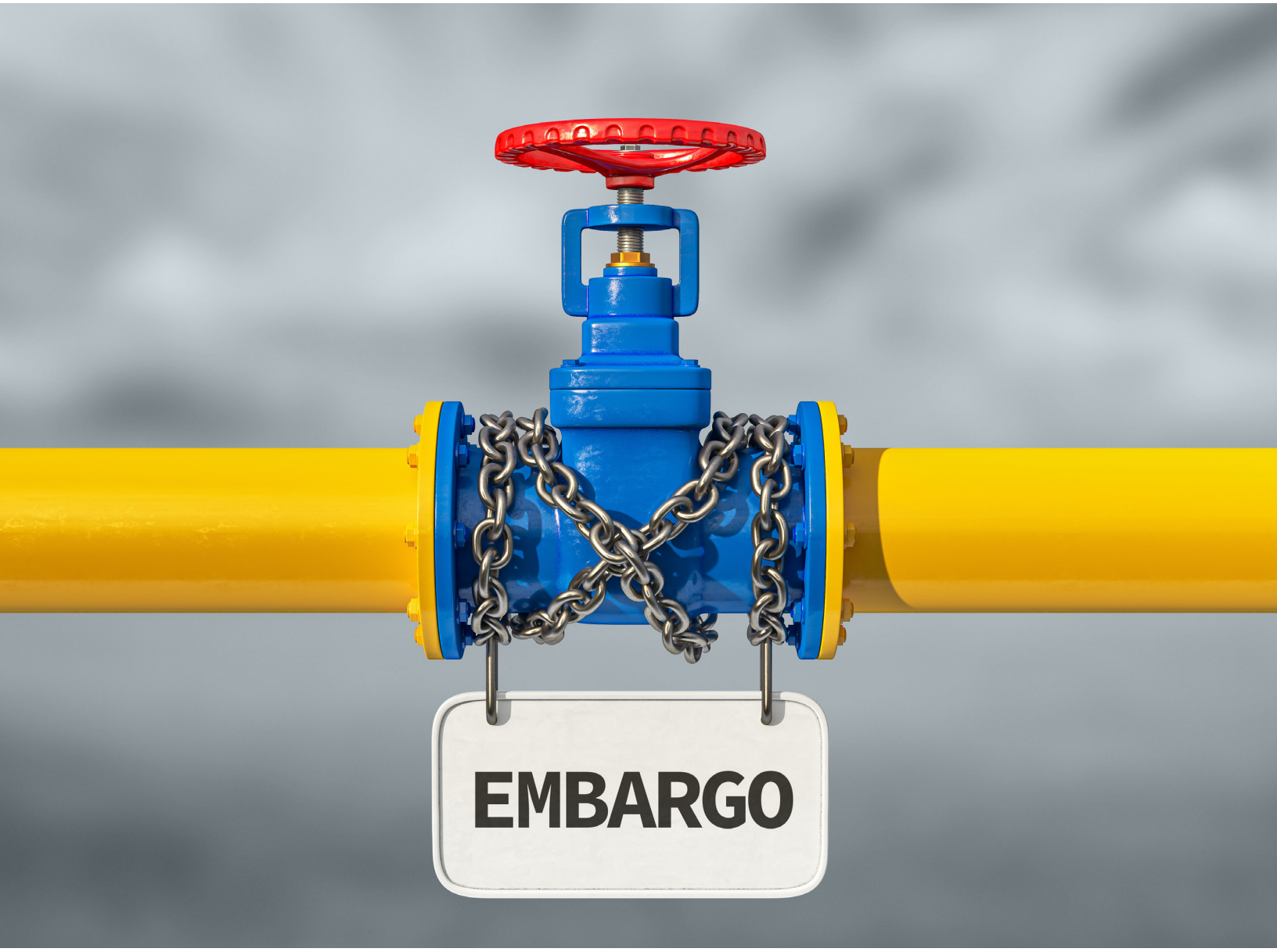
RUSSIAN OIL & GAS DEPENDENCY

In addition to these short-term supply chain issues, the move to electrification has intensified, particularly in the European Union (EU), which depends heavily on Russian oil and natural gas. On March 8, 2022, President Biden banned imports of oil and gas from Russia to the U.S. After this ban, President Biden increased new drill leases and announced that 1 billion barrels per day would be released from the strategic petroleum reserves. Even as these events occurred, OEMs ramped up the drive to hybrid, electric and alternative power sources.

While moving to electrification, the EU seeks other options for fossil fuels as well. A recent article from the World Economic Forum said, "On 8 March, the EU announced a plan to end all Russian energy imports by 2030. This could cause energy costs to soar, but the EU said it will protect businesses and consumers in the bloc by using price regulation, state aid and taxation."

"ELECTRIFICATION HAS BEEN SPURRED TO GET AWAY FROM FOSSIL FUELS WITH RUSSIAN DEPENDENCE. IT'S HIGH IN EUROPE,"

– Demirjian



ALTERNATIVE FUELS

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In addition to electrification, the off-highway industry is investigating every alternative fuel choice to move away from fossil fuel dependency.

"For off-highway equipment alternative power sources, [we will] have to look for everything," Demirjian said. "It's not like the automotive industry where they seem to be focused on the battery electric vehicle (BEV)."

Heavy-duty equipment manufacturers, such as Caterpillar, CNH Industrial and John Deere, are looking at the electric battery as one new power source. However, according to Demirjian, they are also researching fuel-cell hydrogen and all aspects of alternative fuels. Biodiesel and hydrogenated vegetable oils are also fuel sources being researched and used by OEM designers.

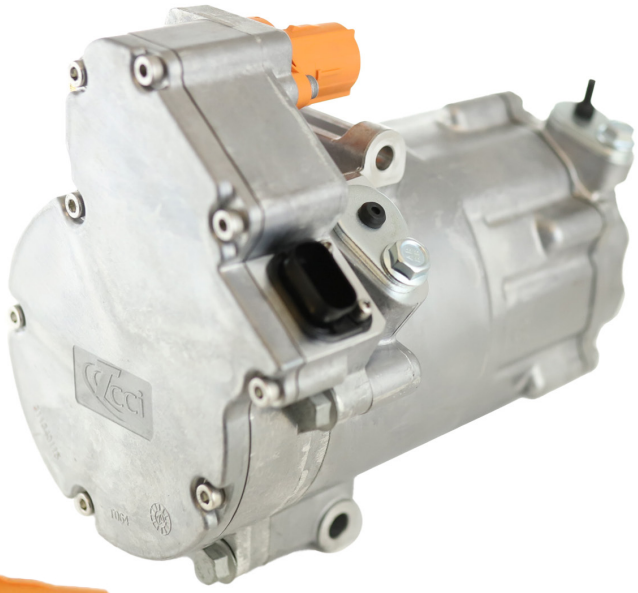
"You know BEV might be winning the battle out there in the short term. But long-term, it's going to have to be a combination of all types of alternative fuels," Demirjian said.

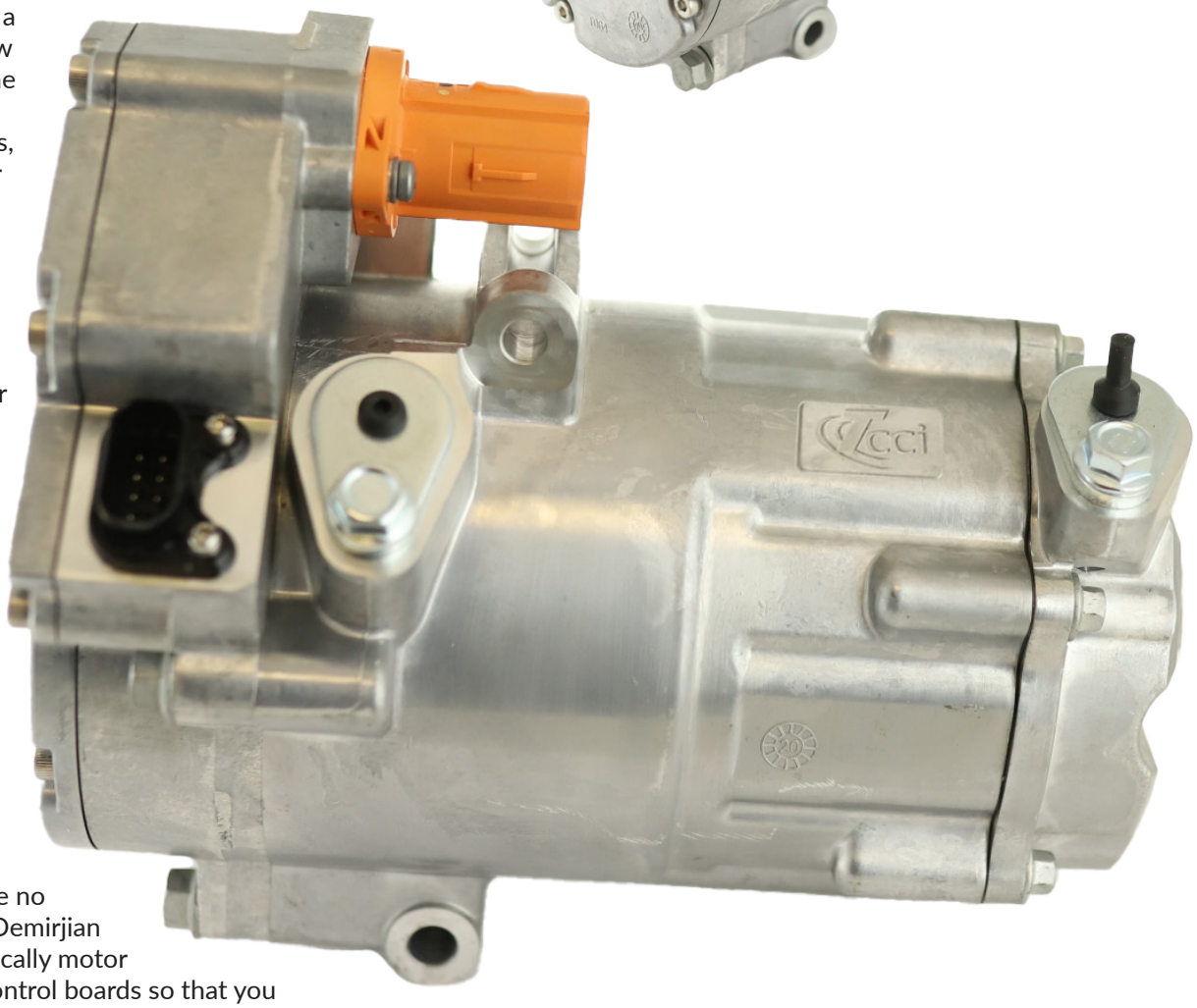
COMPRESSORS & NEW POWER SOURCES

Traditionally, compressors pull energy from an engine. They mount to the diesel-powered engine, and they're driven by the main engine belt. The engine turning and pumping drives the compressor to cool the operator cab. In electrical or alternative-fuel vehicles, a compressor is used to cool the cab as well.

"You still need the cab cooling," said Demirjian, "which becomes important for all the electronics. Autonomous driving [technology] and all that you have in the system needs to be kept cool."

Cooling is more important for alternative power, especially electrical components. For example, in a BEV, those batteries must be kept within a 25°C to 30°C narrow bandwidth. If not, the batteries degrade quickly. If this occurs, they don't hold their charge anymore.

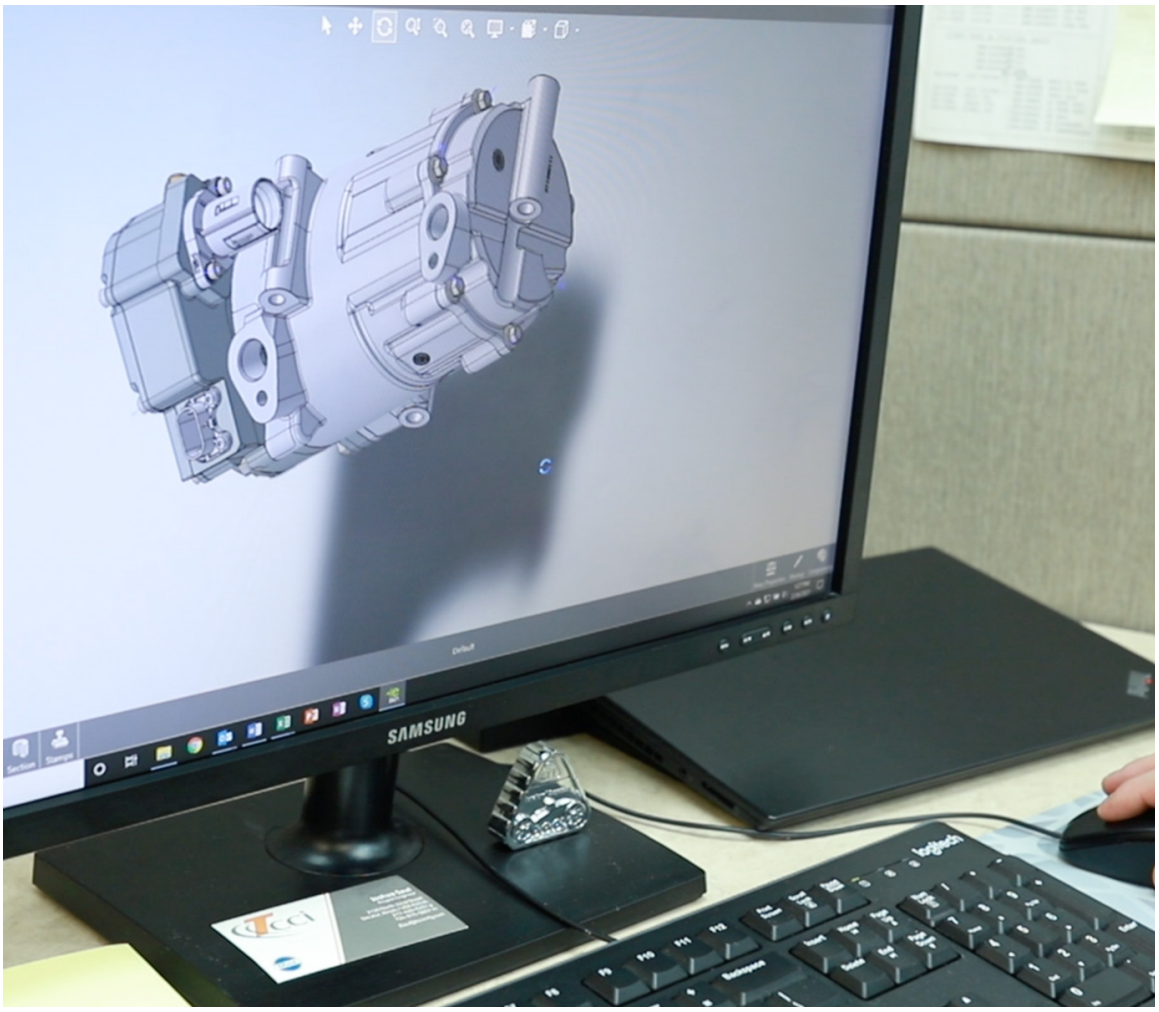




According to Demirjian, off-highway OEMs often include a separate compressor or multiple compressors to cool the powertrain in a BEV. Then a separate compressor strategy must be included just to cool the operator cab.

"Then you've got to create two different systems with two [separate] compressors that are no longer belt driven," Demirjian said. "They're electrically motor driven with smart control boards so that you have a whole logic around controlling the compressor and feedback for those systems."

TIMING THE COMPRESSOR CONVERSATION



"WE CONDUCT ELECTROMAGNETIC COMPATIBILITY (EMC) OR ELECTROMAGNETIC INTERFERENCE (EMI) TESTING ON THE VEHICLE AT THE COMPONENT LEVEL BUT ON THE VEHICLE AS WELL, WHICH HAS TO HAPPEN AHEAD OF TIME."

– Demirjian

In a traditional diesel-powered vehicle, the compressor for cab cooling is often a last-minute configuration. The designers know what they need and whether it will fit. Demirjian indicated that there is not much upfront design work required with a traditional system.

"But we're working with the original equipment manufacturers (OEMs) right now for vehicles that are launching in 2025 and 2026 on these alternative fuel vehicles trying to figure out what the strategy is," Demirjian said.

Compressor manufacturers must get involved with OEM teams working on nontraditional systems about a year and a half earlier than they do for a traditional diesel-powered vehicle. With electrification, when the engine does not power the compressor, high voltage is involved. Electrical signals and pulsations occur between all the equipment, so engineers must consider how a compressor affects all the electronics. This system and its cooling must be mapped out early in the system design process.

OUTSIDE INFLUENCES

In addition to the direct challenges faced by OEM off-highway engineers, they must navigate global influences over which they have no control. As the Russian invasion of Ukraine continues, it will affect global economies, supply chains other factors. Collaborating with suppliers early in the process helps ensure that designs meet end-user needs. It also increases the chances of technologies like compressors are delivered on time.

RESOURCES

"Report: Impact of OEMs Suspending Russian Operations"
OEM Off-Highway, March, 23, 2022 ***Read Now***

"What is the EU doing to end its reliance on Russian energy?"
World Economic Forum, April 26, 2022 ***Read Now***

"Russian Invasion Creates Ripple Effect Through Supply Chains"
Food Logistics, March 7, 2022 ***Read Now***

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