

YOUR LOW GWP NAVIGATION PARTNER™



Providing lubricant & technology solutions to enable a more sustainable future.



OUR ABILITY TO ENABLE THE ADOPTION OF LOW GWP REFRIGERANTS THROUGH OUR PRODUCTS, OUR SERVICES, AND OUR EXPERTISE WILL HELP CREATE A MORE SUSTAINABLE FUTURE & REDUCE THE IMPACT OF GLOBAL WARMING

FOREWORD



Mike Costello, Ph. D.

CPI Fluid Engineering
Director of Strategic Research & Innovation

Overview

The Montreal Protocol was established in 1987 to stop the production and import of ozone depleting substances, mainly CFCs, and reduce their concentration in the atmosphere to protect the earth's ozone layer. Subsequently, the Kigali Amendment in 2016 was aimed at the phase-down of hydrofluorocarbons (HFCs) to reduce carbon emissions by cutting their production and consumption. The refrigeration and air-conditioning industry has diligently worked to meet the challenges of these regulations. These two agreements have effectively driven the direction of the working fluid technology in the refrigeration and air conditioning industry over the last 30+ years, and CPI has led the charge since the beginning. In the future, as we move toward the goal of working fluids with zero ozone depletion (ODP), zero global warming potential (GWP) and high efficiency, CPI is well positioned to meet any lubrication challenge.

Industry

Recent developments in carbon emission regulations (low GWP), safety standards, refrigerant charge limits, and efficiency requirements in the refrigeration industry has required an agile and versatile approach to meet the next set of industry challenges. CPI's 50 years of experience in compressor lubrication technology can help navigate our customers through the complexity in this rapidly changing environment. CPI has combined their unique position as both a lubricant and lubricant additive supplier to bring its technical, sales, logistics, and marketing resources to support

this evolving industry.

Capabilities

CPI is poised to react to the rapidly changing environment converting to low GWP refrigerants. Our cutting-edge analysis technology in refrigeration applications, as well as chemical performance testing, allows CPI to be a leader in developing new lubricant technology. Additionally, we have staffed our state-of-the-art facilities with chemists and engineers that can address the needs of the rapidly changing refrigeration industry. CPI is fully equipped to handle any chemical, physical, analytic, engineering, or application challenge that is presented by our customers.

Environmental

CPI is committed to providing sustainable solutions to meet the needs of the present refrigeration industry without compromising the social, economic, and environmental well-being of the community. CPI wants to be the best steward that we can be of our assets by contributing to a better planet and adding value for our stakeholders. Our Icematic® product line is specifically designed to meet these new challenges and will be the standard bearer for future developments, now and for decades to come.



WE ENHANCE Modern Life



CPI leverages 50 years of industry experience, technical expertise, and a global network of partners to provide solutions that help customers and industry partners meet the challenges of an ever-evolving regulatory landscape.

Shortening Lower GWP Timelines

The 2016 Kigali Amendment to the Montreal Protocol, which entered into force in 2019 and has been ratified by more than 120 countries, will reduce the production and consumption of hydrofluorocarbons (HFCs) by more than 80 percent over the next 30 years. Both developed and developing countries have taken on regulatory commitments to reduce production and consumption of HFCs, which are potent greenhouse gases contributing to global warming. Adding complexity, each country or region has its own phasedown schedule in terms of implementation.

- The European Union has been leading the world in phasing down fluorinated gases, which are mostly HFCs. The EU regulation aims to reduce HFCs emissions by two-thirds by 2030.

- China, the world's largest producer of refrigerants, has indicated that it will accept the Kigali Amendment to the Montreal Protocol to phase down HFCs in a global summit in Apr 2021.
- Most recently, the U.S. EPA announced its proposal in May 2021 to phase down the production and consumption of HFCs, which will reduce the production and import of HFCs in the United States by 85% over the next 15 years.



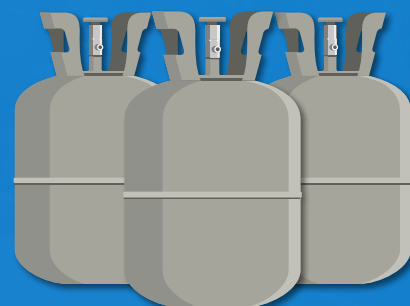
CPI Fluid Engineering will enable sustainable & efficient expansion of modern comforts to growing economies around the world.

Meeting the Demands of Population Growth & Economic Expansion

Global population numbers continue to trend upwards, with some estimates that suggest the world may have upwards of 11 billion people by the end of this century. Growth of the middle class (socioeconomic status), while likely to remain stagnant in some countries/regions, is expected to continue expanding vigorously in Asia Pacific and some areas in the Middle East and North Africa. This expansion of the middle class provides many opportunities for its members to access modern comforts like refrigeration and air conditioning. However, it also presents considerable challenges at the same time.

Meeting the increased demand for modern comforts in these regions requires expansion of infrastructure and ensuring reliability of energy grids. CPI will continue to work with key industry partners to research and innovate sustainable solutions that improve efficiency within refrigeration and air conditioning systems, and enable lower GWP refrigerants to be utilized. Balancing the modernization of these regions, and elsewhere across the globe, with a long-term strategy is crucial to avoid further harm to our environment. *Enhancing Modern Life* is not just our vision for the present, but rather an ongoing commitment to all future generations.

CPI Fluid Engineering Leads the Refrigeration Industry Into the Future



Enabling Low GWP Adoption

We collaborate with our customers and industry partners to enable the adoption and use of low GWP refrigerants that have less environmental impact and therefore reduce the effects of global warming.



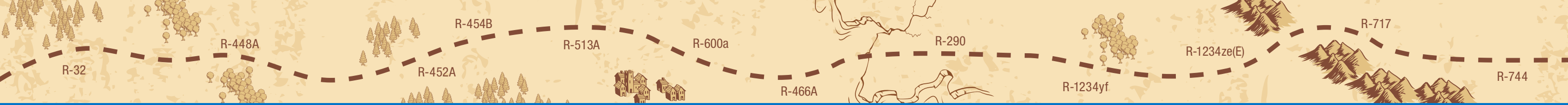
Utilizing Our Resources

CPI leverages its people, facilities & equipment, 50 years of industry experience, and our relationship with The Lubrizol Corporation to drive our innovation and ability to solve our customers' most complex challenges.



Driving Sustainability

Providing lubricant & technology solutions that sustainably enable the use of lower GWP refrigerants and allow more efficient operation of refrigeration equipment will positively impact our environment.



Your Low GWP Navigation Partner™

Selecting the right partner is a critical decision for OEMs, refrigerant gas manufacturers, and other refrigeration industry stakeholders navigating through the complex low GWP landscape. The ideal partner collaborates to understand the challenges, provides guidance, and delivers innovative solutions. CPI is uniquely positioned to enable the adoption of low GWP refrigerants by utilizing our world-class resources to create a more sustainable future.

Enabling the Adoption of Low GWP Refrigerants

So many factors play a role in the choosing of both the low GWP refrigerant and the oil. The compressor type (recip, scroll, etc.) and the way in which it is used (air conditioning, light commercial, etc.) really help to determine what refrigerant to use. If it's a retrofit compressor, the refrigerant used originally can be very helpful in determining what the new replacement refrigerant should be. Additionally health and safety factors often play a role in which refrigerant a compressor manufacturer will choose. Concerns regarding flammability or toxicity of the refrigerant can often affect a manufacturer's decision. Once the refrigerant is chosen, both the refrigerant used, as well as the compressor's designed operating conditions will determine what the appropriate oil is for the application.

Our 50 years of experience navigating through the changes the refrigeration industry has seen makes us an ideal partner to guide our customers through the transition to low GWP refrigerants. We are base oil agnostic, meaning that we will develop and recommend the best lubricant for a customers system rather than force-fitting an existing solution. Our research and development team and labs have a wide range of technology at their disposal to help our customer's make the best decision. As a division of The Lubrizol Corporation, we have access to powerful testing capabilities and a robust supply chain to develop long term lubricant solutions.



Utilizing Our World-Class Resources

Partnering with CPI offers unique advantages to our customers and industry partners. We maintain the agility of a small to medium-sized company, while leveraging the resources and almost 100 years of history of The Lubrizol Corporation. This combination allows us to adapt to changing market demands by leveraging the facilities, equipment, expertise, and human talent required to meet new challenges.

CPI continues to expand our capabilities to support the refrigeration industry. We are currently not only expanding our in-house bench performance testing, but we are currently constructing a new compressor lab at our Midland, MI facilities to perform in situ system testing. This testing should enable us to understand our customers' systems wear, oxidation, corrosion, hydrolytic stability, and lubricant transport issues. Additionally, we are completing the construction of a fully functioning refrigeration performance testing lab in Shanghai, China. This lab will serve to reduce our response times by allowing rapid analysis and reporting.

Our breadth of technical excellence reaches across a variety of fields. CPI not only has a fully equipped refrigeration lubricant lab capable of performing all the specialized industry testing including sealed tube stability

(ASHRAE 97), floc point, miscibility, and Daniel plots (Pressure-Viscosity-Temperature - PVT), but also has wet method capabilities to analyze any lubricant sample for degradation. CPI also has the ability to analyze a variety of new and used lubricant samples using a variety of advanced techniques, including, NMR, IR, ESI-MS, GC-MS, and ICP, which complement our traditional methods. These advanced techniques allow CPI to rapidly determine the root cause of lubricant failures and identify appropriate solutions.

CPI has spent many years in the refrigeration industry building our technical team to complement our extensive testing capabilities. Our team of chemists, engineers, and professionals have developed reputations as experts in the refrigeration industry and are available to solve problems and create custom solutions. Our team is able to provide chemical, analytic, thermodynamic, and engineered solutions for a wide array of refrigeration systems. Our Technology Applications and Services (TAS) group is available to provide customer recommendations and product information, while our Strategic Research and Innovation (SRI) Group develops lubricants for new applications.

Creating A Sustainable Future

CPI has developed lubricant technology that partners with the low GWP refrigerant technology that our customers are using as part of a joint effort to reduce greenhouse gas emissions and global warming. Our lubricants are designed to improve system efficiency,



allowing refrigeration and air conditioning systems to operate using less energy, a growing concern in emerging economies. You can find our oils throughout the cold chain, ensuring food and other perishable goods remain viable from harvest/production to consumption. This helps to lower food waste, a contributor to CO₂ emissions.

Many of our customers have sustainability missions, setting out to make the world a cleaner place. One way this can be achieved is by the adoption of lower GWP refrigerants. By providing our customers the lubricant technology to support the use of low GWP refrigerants, we are mutually contributing to both their sustainability goals and targets, as well as our own.

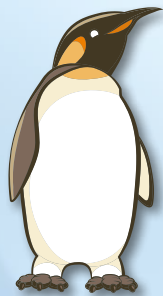
Together, Lubrizol and CPI Fluid Engineering are on a mission to **Create Smarter**. Ozone-depleting refrigerants such as chlorofluorocarbons and hydrochlorofluorocarbons (CFCs & HCFCs) were phased out in favor of hydrofluorocarbons (HFCs), which are widely used in air conditioning and refrigeration units today. However, HFC refrigerants have some of the highest global warming potential among greenhouse gases. Faced with increasing regulations, manufacturers of these systems are migrating toward low global warming potential gases. The Create Smarter initiative provides tremendous opportunity for Lubrizol to develop new formulations of high-performance fluids and lubricants that reduce the environmental impact in both production and use.



Refrigeration and A/C Application Guide

LUBRICANT BRANDS

Icematic



Emkarate



Other CPI Brands



		REFRIGERATION			AIR CONDITIONING			
		Commercial	Industrial	Appliance & Light Commercial	Packaged A/C	Room A/C	Chillers	Automotive
NATURALS	R-744							
	R-717							
HYDROCARBONS	R-600a							
	R-290							
	R-1270							
HFC	R-32							
	R-407F							
HFO	R-1234yf							
	R-1234ze(E)							
	R-1233zd(E)							
HFO BLENDS & OTHER	R-466A							
	R-448A							
	R-449A							
	R-450A							
	R-452A							
	R-452B							
	R-454A							
	R-454B							
	R-454C							
	R-455A							
	R-513A							
	R-514A							
	R-515B							



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