No question that the phase-out of ozone-depleting CFC refrigerants has been a positive step toward preserving our environment.

But it left users of the new generation of alternative refrigerants - specifically, HFCs - scratching their heads: *If mineral oils would not work with HFCs, what would?*

From the first hint of the CFC phase-out, scientists at CPI Engineering Services recognized the potential for synthetic lubricants. They immediately began the search for a synthetic lubricant that would meet the needs of the newer refrigerants.

The result? The SOLEST® line of lubricants—the first line of polyol ester lubricants developed in the United States specifically to serve compressors operating with environmentally safe HFC refrigerants.

SOLEST® lubricants feature excellent chemical and thermal stability, good refrigerant miscibility, and a superior structure to improve wear resistance and operating life. Additionally, SOLEST® lubricants are backed by an experienced technical sales and support staff, so you're assured of getting the right lubricant for your application.

Retrofit information is available.

As CFC and HCFC refrigerants are phased out, you'll need to replace or retrofit your existing lubricant with an alternative such as SOLEST polyol ester lubricant. This is a critical step, and here's why:

Existing mineral oil lubricants are not miscible with HFCs. Even when the mineral oil lubricant has been drained from a system and replaced with a synthetic SOLEST lubricant, residual mineral oil may make up as much as 10 percent of the lubricant charge. This can severely affect the miscibility of the SOLEST lubricant, which can lead to fouling or coating of the evaporator and can reduce the operating efficiency to unacceptable levels.

To prevent mineral oil contamination, it is essential that as much mineral oil as possible be removed from your system. We have developed a retrofit procedure to assure proper removal. This retrofit information is available from your CPI® Fluid Engineering representative.

This application guide covers only a few of the many possible lubricants for various applications. Please consult your OEM and CPI for specific information on our complete product line as well as viscosity recommendations.

CPI is a world leader in the synthetic lubricants industry with operations in North America, Europe, Africa and Asia Pacific regions. In addition to our Solest® lubricants, CPI offers lubricants for any refrigeration application including domestic and automotive air condition, commercial and industrial refrigeration and low Global Warming Potential (GWP) refrigerants such as Carbon Dioxide, Hydrocarbons and Ammonia. CPI also offers a comprehensive range of Industrial Lubricants for Process gas, Hydrocarbon gas, Air Compressors, Vacuum Pumps, Hydraulics, Gears, Chains, Turbine, Landfill Gas, Field Gas, Chemical Process and many NSF H1 & H2 Food Grade applications. CPI is ISO 9001 and RC 14001® accredited and earned the 1993 Stratospheric Ozone Protection Award from the Environmental Protection Agency. Also registered for the manufacture of Halal, Kosher and Pareve products.

SOLEST® POLYOL ESTER LUBRICANTS

Application and Compressor Type

- HFC, HCFC, HFO Refrigeration
- Reciprocating, Screw, Rotary, Scroll, Centrifugal Compressors

Features and Benefits

Thermally stable
Improved oil management
Corrosion protection

Excellent bearing lubrication
Optimized System performance
Environmentally friendly
Excellent lubricity

Longer system life
Efficiency gains
Enhanced system reliability and reduced down-time
Longer compressor life
Reduced operating costs
Biodegradable
Increased efficiency & reduced cost of operation

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Lubricants that perform with today's environmentally safe refrigerants

SOLEST®
POLYOL ESTER LUBRICANTS

Performance-Tested Physical Properties

SOLEST® lubricants are designed for standard factory fill of air-conditioning and industrial refrigeration equipment, as well as for OEM retrofitting operations. CPI's laboratory studies and OEM compressor bench tests have afforded a product line specifically designed to meet key system needs. SOLEST® lubricants are not hazardous under 29 CFR 1910.1200. They provide improved properties over conventional mineral oils in all aspects, including viscosity index, flash and fire points, and pour point.

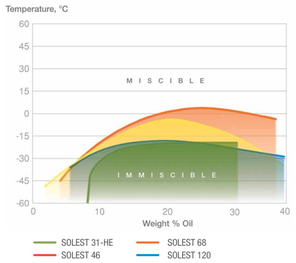
Typical Properties1 of SOLEST® Lubricants

Property	22	31-HE	LT-32	46	68	120	170	180	220	370
ISO VG	22	32	32	46	68				220	370
Viscosity, cSt.										
@ 40°C	21.7	32.7	33.1	49.5	66.3	127.7	175.2	175	233.3	393.1
@100°C	4.5	5.7	5.7	6.9	8.9	12.7	16.5	17.8	18.4	26.1
@100°F	12.4	35.9	36.4	55.1	73.9	144.8	198.8	195.2	267.9	455.3
@210°F	4.5	5.8	5.8	7.1	9.1	13.1	17	18.3	19	27
Viscosity Index	121	115	112	93	108	90	93		86	89
Density @ 20°C g/ml	0.9936	0.9372	0.9636	0.966	0.9552	0.9492	0.9516	0.9756	0.9528	0.9600
Density, lb/gal	8.28	7.81	8.03	7.8	7.96	7.91	7.93	8.13	7.94	8.00
Pour Point,	-60	-51	-52	-45	-43	-33	-30		-27	-21
°C(°F)	-76	(-60)	(-62)	(-49)	(-45)	(-27)	(-22)		(-17)	(-6)
Flash Point,	232	240	240	235	263	251	268	285	268	296
°C(°F)	(450)	(465)	(465)	(455)	(505)	(485)	(510)	(545)	(515)	(565)
Fire Point,	266	263	260	260	293	271	287	310	287	324
°C(°F)	(510)	(505)	(500)	(500)	(560)	(520)	(550)	(590)	(550)	(615)
Specific Gravity	0.995	0.939	0.965	0.937	0.957	0.951	0.953	0.97	0.955	0.961
Dielectric										
Strength, kV										
ASTM D 877		32.1	48.2	43.6	49.4	47	46.6	42	41.8	47.47

Miscibility of SOLEST Lubricants with R-134a

Outstanding Miscibility

The performance of an HFC system is optimized when the lubricant and refrigerant mix to form a single, clear phase (that is, they are miscible). Miscibility lowers the viscosity of the lubricant carried through the system, so the lubricant can more efficiently return to the compressor. Mineral oils are not miscible with HFCs. SOLEST® lubricants, on the other hand, have been specially designed to be miscible, as demonstrated in the data shown.



Simplified Lubricant/Application Selection

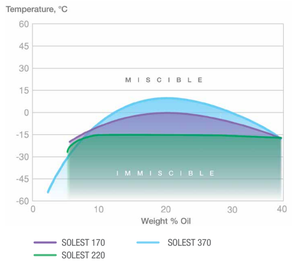
CPI has worked with OEMs to provide products to meet all the needs of the modern refrigeration system. Through this effort, we've been able to identify lubricants that meet a compressor's specific requirements and needs. This application guide covers only a few of the many possible lubricants for specific applications. Consult your OEM or CPI for specific information on our complete product line as well as viscosity recommendations.

SOLEST Series Application Guide

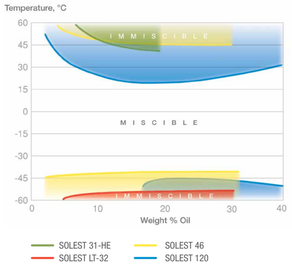
	Residential Air Conditioning		Industrial & Commercial Refrigeration & Air Conditioning			
	Recip.	Rotary	Centr.	Recip.	Screw	Scroll
SOLEST® 22	✔	✔	✔	✔		✔
SOLEST® 31-HE	✔	✔	✔	✔		✔
SOLEST® LT-32	✔	✔	✔	✔		✔
SOLEST® 46	✔	✔	✔	✔	✔	✔
SOLEST® 68	✔	✔	✔	✔	✔	✔
SOLEST® 120			✔	✔	✔	
SOLEST® 170			✔	✔	✔	
SOLEST® 180			✔	✔	✔	
SOLEST® 220			✔	✔	✔	
SOLEST® 370			✔	✔	✔	

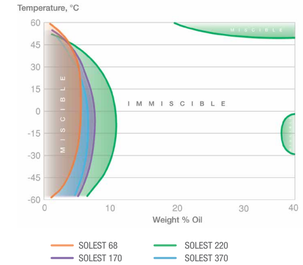
Excellent Thermal Stability

Sealed tube results (ASHRAE-97) indicate that SOLEST® lubricants provide excellent stability in the presence of HFC refrigerants. In addition to outstanding stability, these lubricants show no adverse effects to metals and other materials of construction.



Miscibility of SOLEST Lubricants with R-404A





Hygroscopicity

The term "hygroscopic" refers to a substance that can readily absorb moisture from the air. All the polyol ester lubricants, including SOLEST® products, will absorb more water than the mineral oils they are replacing.

High levels of moisture in a refrigeration system can adversely affect system performwmance. However, by following good working practices and minimizing the time a lubricant is exposed to the air, the lubricant will maintain low levels of moisture.

Water Absorption of SOLEST® Series Stored in Open Containers