DuPont™ ISCEON® 9 Series

REFRIGERANTS

Technical Information

DuPont™ ISCEON® 39TC® (R-423A)

Properties, Uses, Storage, and Handling

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DuPont™ ISCEON® 39TC®
Properties, Uses, Storage, and Handling

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Introduction

Background

Refrigerant 12 (CFC-12) has been used as a refrigerant in various refrigeration, industrial cooling, air conditioning, and heating applications for over five decades. However, the production of R-12 has been phased out in developed countries and will be phased out in developing countries over the next several years.

DuPont™ ISCEON® 39TC® Refrigerant Description

ISCEON® 39TC® is a blend of HFC-134a and HFC-227ea that has been developed as a zero ODP replacement for CFC-12 in existing centrifugal chillers.

The composition of ISCEON® 39TC® is as follows (wt%):

	HFC-134a	HFC-227ea
ISCEON® 39TC®	52.5	47.5

Table 1 lists the chemical names and formulae of the components that make up ISCEON® 39TC®.

Uses

ISCEON® 39TC® performs similarly to CFC-12 over a wide range of operating conditions. It is designed primarily for retrofit of existing R-12 centrifugal chillers.

Performance Comparison

Table 2 provides a performance comparison of ISCEON® 39TC® and CFC-12 based on field experience and thermodynamic property data. ISCEON® 39TC® will provide equal or slightly lower cooling capacity (0 to 5%) while operating at lower discharge temperature and the same discharge pressure. Energy efficiency is very similar for both refrigerants. Actual performance will vary depending on system design and operating conditions.

Table 2
Performance Comparison

	CFC-12	ISCEON® 39TC®
Discharge Temperature, °C (°F)	79 (174)	68 (154)
Discharge Pressure, kPa (psia)	1110 (161)	1110 (161)
Temperature Glide, °C (°F)	0	<1 (<2)

Test Conditions:

43°C (110°F) Condenser
4°C (40°F) Evaporator

Physical Properties

General physical properties for ISCEON® 39TC® are shown in **Table 3**.

Additional thermodynamic and physical property data may be found in other DuPont publications.

Table 1
Components of ISCEON® 39TC®

Component	Chemical Name	Formula	CAS Number	Molecular Weight
HFC-134a	1,1,1,2-Tetrafluoroethane	CF_3CH_2F	811-97-2	102
HFC-227ea	1,1,1,2,3,3,3-Heptafluoropropane	CF_3CHFCF_3	431-89-0	170

Table 3
General Property Information, ISCEON® 39TC®

Physical Property	Unit	ISCEON® 39TC® (R-423A)
Molecular Weight	g/mol	126
Vapor Pressure at 77°F (25°C)	kPa abs psia	609 88
Boiling Point (1 atm.)	°C °F	–24 –11
Critical Temperature	°C °F	99.5 211.1
Critical Pressure	kPa abs psia	3587 520.3
Critical Density	kg/m^3 lb/ft^3	531 33.1
Liquid Density at 25°C (77°F)	kg/m^3 lb/ft^3	1278 79.8
Density, Satd. Vapor at 25°C (77°F)	kg/m^3 lb/ft^3	35.8 2.23
Specific Heat, Satd. Liquid at 25°C (77°F)	kJ/kg·K Btu/lb·F	1.313 0.314
Specific Heat, Vapor at 25°C (77°F) (1 atm.)	kJ/kg·K Btu/lb·F	0.832 0.199
Heat of Vaporization at Normal Boiling Point	kJ/kg Btu/lb	175.2 75.3
Thermal Conductivity at 25°C (77°F)		
Liquid	W/m·K Btu/hr·ft·F	0.0703 0.0407
Vapor (1 atm.)	W/m·K Btu/hr·ft·F	0.00145 0.00836
Viscosity at 25°C (77°F)		
Liquid	MPa·s	0.208
Vapor (1 atm.)	MPa·s	0.0120
Flammability Limit in Air (1 atm.)	vol%	None
Ozone Depletion Potential	CFC-11 = 1.0	0
Global Warming Potential	CO_2 = 1	2060
TSCA Inventory Status	Included	Yes
Inhalation Exposure Limit*	ppm (8 and 12 hr. TWA)	1000

* The exposure limit is calculated based on the DuPont Acceptable Exposure Limit (AEL) for each component of the refrigerant blend. AEL is an airborne exposure limit established by DuPont that specifies time-weighted average concentrations to which nearly all workers may be repeatedly exposed without adverse effects during 8 and 12 hour workday and a 40-hour work week.

Chemical/Thermal Stability

Stability with Metals

Stability tests for refrigerants with metals are typically performed in the presence of refrigeration lubricants. This test is run in sealed glass tubes at temperatures much higher than those encountered in refrigeration and air conditioning systems and is therefore referred to as an accelerated aging test. Results of sealed tube stability tests for CFC-12/mineral oil and alkylbenzene lubricants have shown long-term stability in contact with copper, steel, and aluminum. And the fact that CFC-12/mineral oil and alkylbenzene systems have been performing in the field in air conditioner and refrigeration systems for the last 50 years verifies the results from these stability tests.

HFC-134a with POE lubricants have been tested extensively in the lab and in millions of pieces of equipment in commercial use, and has proven to have very good stability in a broad range of applications. High temperature stability tests were conducted with HFC-227ea (without lubricants) in the presence of commonly used metals such as copper, steel and aluminum. These tests were conducted at 175°C for two weeks and HFC-227ea was found to be very stable. Since ISCEON® 39TC® is a blend of HFC-134a and HFC-227ea, it is expected to provide similar stability as that of the individual components.

Thermal Decomposition

Like CFC-12, ISCEON® 39TC® will decompose when exposed to high temperature or flame sources. Decomposition may produce toxic and irritating compounds, such as hydrogen fluoride. The decomposition products released will irritate the nose and throat. Therefore, it is important to prevent exposure to decomposition products by following DuPont Material Safety Data Sheet (MSDS) recommendations for handling.

Compatibility Concerns If CFC-12 and ISCEON® 39TC® Are Mixed

CFC-12 and ISCEON® 39TC® are chemically compatible with each other. This means they do NOT react with each other and form other compounds. However, when these refrigerants are mixed by accident or deliberately, they will form mixtures that can be difficult to separate. Mixtures of CFC-12 and this refrigerant cannot be separated in on-site recycle machines or in typical facilities of an off-site reclaimer. These mixtures will have to be disposed of by incineration.

Also, mixtures of CFC-12 and ISCEON® 39TC® could have higher pressure than either refrigerant, and will have performance properties different than either refrigerant alone. Therefore, we do not recommend mixing CFC-12 and this refrigerant in any system.

Materials Compatibility

Because this refrigerant will be used in many different applications, it is important to review materials of construction for compatibility when designing new equipment, retrofitting existing equipment, or preparing storage and handling facilities. The following compatibility data is for ISCEON® 39TC® with some elastomers and plastics commonly found in air conditioning and refrigeration systems.

Compatibility with Elastomers

Compatibility results are listed in **Table 4** for HFC-227ea with various elastomers. It should be recognized that these data reflect compatibility in sealed tube tests, and that refrigerant compatibility in real systems can be influenced by the actual operating conditions, the lubricant, the nature of the polymers used, compounding formulations of the polymers, and the curing or vulcanization processes used to create the polymer. Polymers should always be tested under actual operating conditions before reaching final conclusions about their suitability.

The data shown in **Table 4** are based on samples of each elastomer subjected to aging in a sealed tube in the presence of the refrigerant. The aging occurred for two weeks at room temperature. Physical properties of the sample elastomers were measured before aging, and were re-measured after aging (measurements were taken 24 hours after removal from the refrigerant).

Compatibility with Plastics

Compatibility results are listed in **Table 5** for HFC-227ea with various plastics. It should be recognized that these data reflect compatibility in sealed tube tests, and that refrigerant compatibility in real systems can be influenced by the actual operating conditions, the lubricant, the nature of the plastics used, and the actual product formulations. Plastics should always be tested under actual operating conditions before reaching final conclusions about their suitability.

The data shown in **Table 5** are based on samples of each plastic subjected to aging in a sealed tube in the presence of the refrigerant. The aging occurred for two weeks at room temperature. Physical properties of the sample plastics were measured before aging, and were re-measured after aging (measurements were taken 24 hours after removal from the refrigerant).

Tables 6 and **7** provide the same information for HFC-134a with various elastomers and plastics.

Although the elastomers and plastics were not tested with the refrigerant blend, the data from the separate tests provide good guidance regarding compatibility with these elastomers and plastics.

Table 4
Compatibility of HFC-227ea With Selected Elastomers

Elastomer	Linear Swell, %	Weight gain, %	Hardness Change, units
Butyl	0	0.37	0
Nordel® EPDM	0.2	1.44	1.6
Neoprene W	0.05	0.66	0
NBR	0	1.86	4.0
Hypalon® CSM	0.19	1.41	2.4
Viton® A	9.49	26.83	–44.0
Epichlorohydrin homopolymer	0.15	0.08	5.5
FA polysulfide	0.05	0.06	6.9
Hytrel® polyester (TPE)	1.33	5.71	4.6

Table 5
Compatibility of HFC–227ea With Selected Plastics

Plastic	Weight gain, %	Surface Condition
High density polyethylene (HDPE)	0.11	No Change
Polystyrene (PS)	–0.03	No Change
Polypropylene (PP)	0.06	No Change
Acrylonitrile–butadiene–styrene (ABS)	–0.03	No Change
Polycarbonate (PC)	–0.1	No Change
Polymethyl methacrylate (PMMA)	*	*
Nylon	–0.17	No Change
Teflon® PTFE	5.23	No Change

* Partly dissolved, deformed and destroyed

Table 6
Compatibility of HFC–134a With Selected Elastomers

Elastomer	Linear Swell, %	Weight gain, %	Hardness Change, units
Butyl	< 1	5	–6
Nordel® EPDM	< 1	3	–4
Neoprene CR	–0.5	2	–3
NBR	–1	4	–5.0
Hypalon® CSM	–0.5	2	–2
Viton® A	15	48	–13.0
Epichlorohydrin homopolymer	–0.5	2	–2
FA polysulfide	–1	1	0
Hytrel® polyester (TPE)	2	8	0

Table 7
Compatibility of HFC–134a With Selected Plastics

Plastic	Weight gain, %	Surface Condition
High density polyethylene (HDPE)	< 1	No change
Polystyrene (PS)	1	No change
Polypropylene (PP)	< 1	No change
Acrylonitrile–butadiene–styrene (ABS)	< 1	No change
Polycarbonate (PC)	< 1	No change
Polymethyl methacrylate (PMMA)	No Data	No Data
Nylon	< 1	No change
Teflon® PTFE	2	No change

Compatibility with Desiccants

In refrigeration systems, keeping the refrigerant and lubricant free of moisture is very important. Dryers filled with moisture-absorbing desiccant are typically used to prevent moisture accumulation. ISCEON® 39TC® is compatible with driers used for other standard HFC refrigerants.

Lubricants

Lubricant selection is based on many factors, including wear characteristics and material compatibility. When using ISCEON® 39TC® it is recommended to make a single change to a POE lubricant of equivalent viscosity. Since ISCEON® 39TC® is tolerant of large amounts of residual mineral oil in POE, system flushing is not normally required after changing the original lubricant to POE.

Safety

Decomposition

What causes decomposition?

Refrigerants will decompose when exposed to high temperatures from flames or electric resistance heaters. Decomposition may produce toxic and irritating compounds, such as hydrogen fluoride.

How can I tell if a refrigerant has decomposed?

The strong odors released from the decomposed refrigerant will irritate the nose and throat. The irritating fumes released from decomposition will provide early warning and will likely result in an attempt to evacuate the area. Follow all DuPont recommendations for refrigerant handling to prevent refrigerant decomposition and other hazards.

Are decomposition products hazardous?

Yes. The acidic vapors produced are dangerous and the area should be evacuated immediately and ventilated to prevent exposure to personnel. Anyone exposed to the decomposition products should be taken to fresh air and medical treatment sought immediately. The exposure area should not be re-entered until it is deemed safe by the appropriate authorities.

Inhalation Toxicity

Is ISCEON® 39TC® toxic?

This refrigerant has an excellent safety profile and can be safely used when it is handled in accordance with DuPont recommendations, and when exposures are maintained at or below recommended exposure limits, such as the DuPont Acceptable Exposure Limit (AEL).

What is an AEL?

An AEL is an acceptable exposure limit established by DuPont. AELs specify a time-weighted average (TWA) airborne concentration for which nearly all workers may be repeatedly exposed without adverse effects during an 8- or 12-hour day or 40-hour work-week, throughout a working lifetime. In practice, short-term exposures should not exceed three times the established exposure limit (AEL, PEL, TLV, or other index), or 1,250 ppm, – for more than 30 total minutes during a workday, whichever is lower.

What are common symptoms of overexposure?

Inhaling high concentrations of refrigerant vapors may with time,cause temporary central nervous system depression with narcosis (sleepiness), lethargy, and weakness. Other effects that may occur include dizziness, a feeling of well-being or intoxication, and a loss of coordination. Continued inhalation of refrigerant vapors at high concentrations may produce heartbeat irregularities (cardiac sensitization), unconsciousness and, with gross overexposure, even death.

A person experiencing any of the initial symptoms should be moved to fresh air immediately and kept calm and quiet. If not breathing, give artificial respiration. If breathing is difficult, use oxygen. Call a physician immediately.

What is cardiac sensitization?

As with many other halocarbons or hydrocarbons, ISCEON® 39TC® in the presence of high blood levels of the body's adrenaline may result in serious heart irregularities and possible death, an effect known as cardiac sensitization.

In experimental cardiac sensitization screening studies, test animals were exposed to various levels of refrigerant vapor followed by injection of high levels of epinephrine (adrenaline). Cardiac sensitization associated with ISCEON® 39TC® is well above any concentrations expected in the workplace, and ranges from 20,000 to 150,000 ppm or higher in laboratory animals. By comparison, a cardiac sensitization response is observed with CFC-11 and CFC-12 under similar experimental conditions at approximately 5,000 and 50,000 ppm and higher, respectively.

Because of possible disturbances of cardiac rhythm, catecholamine drugs such as epinephrine should be considered only as a last resort in life-threatening emergencies.

Can inhaling ISCEON® 39TC® vapors cause suffocation?

If a large release of refrigerant occurs, vapors can concentrate near the floor or in low areas and displace available oxygen, causing suffocation. In the event of a large spill or leak, always wear proper respiratory and other personal protective equipment. Canister type respiratory masks do not provide adequate protection when entering an enclosed space with high levels of refrigerant vapors. These should be used for escape purposes only. Use self-contained breathing apparatus or an air-line respirator when entering confined areas such as tanks or basement areas where vapors may have accumulated. Test all work areas for available oxygen using appropriate monitoring equipment before entering. Place a second employee outside the work area when you enter, and use a lifeline to that employee.

How can I work safely on systems in enclosed areas?

1. Make sure all relief and purge vent piping is routed outdoors, and away from all air intakes to the building.

2. Make certain the area is well ventilated. Use auxiliary ventilation such as blowers or fans, if necessary, to disperse refrigerant vapors.

3. Test the work area for available oxygen before entering enclosed areas. **Do not use a leak monitor to test for oxygen.** A refrigerant leak detector will not tell you if adequate oxygen is present to sustain life.

4. Install refrigerant leak detection and oxygen monitoring equipment in the work areas. For a discussion of leak detection equipment, see DuPont technical bulletin ARTD-27A. Also, refer to ASHRAE Standard 15-1994, "Safety Code for Mechanical Ventilation," for ventilation and air monitoring requirements for equipment rooms.

What should I do if a large refrigerant leak or spill occurs?

Do not attempt to enter the area to repair equipment until the vapors are dispersed, OR until you are equipped with proper breathing apparatus. Evacuate everyone until the area has been ventilated. Use blowers or fans to circulate air at the floor level and in any basement or low areas.

Is the deliberate inhalation of ISCEON® 39TC® dangerous?

Intentional misuse or deliberate inhalation of this refrigerant may disrupt heart rhythm and **cause death without warning.** This practice is extremely dangerous.

Can I smell ISCEON® 39TC®?

Most refrigerants have such a faint odor that they can be difficult to detect even at dangerous levels. Do not use smell as a test for safe levels of refrigerants in a work area. Frequent leak checks and air monitoring are the only adequate ways to determine that areas are safe for entry and work.

Skin and Eye Contact

Is skin or eye contact with ISCEON® 39TC® hazardous?

At room temperature, refrigerant vapors have little effect on skin or eyes.

Always wear protective clothing, including long-sleeve clothing and gloves, when there is a risk of exposure to liquid refrigerants. Protection should include goggles and face shield to protect the eyes. If liquid refrigerant enters your eyes, flush them with plenty or water, then seek medical attention immediately.

Is frostbite a possible hazard?

In liquid form, this refrigerant can freeze skin or eyes on contact, causing frostbite. If you are splashed with liquid, immediately remove all clothing that contains refrigerant to prevent additional freezing. Soak the exposed area in lukewarm water, not cold or hot. Do not use dressings or ointments. Then seek medical attention immediately.

Flammability

ISCEON® 39TC® contains two nonflammable components and remains nonflammable during shipping, handling, storage, use, and if it leaks from a system. It has been assigned a safety classification of A1 based on flammability tests conducted according to ASHRAE guidelines.

Combustibility of ISCEON® 39TC®

ISCEON® 39TC® is not flammable in air at temperatures up to 100°C (212°F) at atmospheric pressure. However, mixtures of this refrigerant with high concentrations of air at elevated pressure and/or temperature can become combustible in the presence of an ignition source. It can also become combustible in an oxygen enriched environment (oxygen concentrations greater than that in air). Whether a mixture containing this product and air, or this product in an oxygen enriched atmosphere becomes combustible depends on the inter-relationship of 1) the temperature, 2) the pressure, and 3) the proportion of oxygen in the mixture. In general, ISCEON® 39TC® should not be allowed to exist with air above atmospheric pressure or at high temperatures; or in an oxygen enriched environment. **For example: this refrigerant should NOT be mixed with air under pressure for leak testing or other purposes.**

Refrigerants should not be exposed to open flames or electrical heating elements. High temperatures and flames can cause the refrigerants to decompose, releasing toxic and irritating fumes. In addition, a torch flame can become dramatically larger or change color if used in high concentrations of many refrigerants including R-12, as well as many other refrigerants. This flame enhancement can cause surprise or even injury. Always recover refrigerants, evacuate equipment, and ventilate work areas properly before using any open flames.

Based on the above information, the following operating practices are recommended.

- Do Not Mix With Air For Leak Testing
  - Equipment should never be leak tested with a pressurized mixture of ISCEON® 39TC® and air. Pressurized mixtures of dry nitrogen and ISCEON® 39TC® can be used for leak testing.
- Bulk Delivery and Storage
  - Tanks should normally be evacuated prior to initial filling, and should never be filled while under positive air pressure.
  - Tank pressure should never be allowed to exceed the maximum allowable working pressure when filling with ISCEON® 39TC®. Relief devices on either the tanks or the supply system should be present and in good operating condition.
  - Tank pressures should be monitored routinely.
  - Air lines should never be connected to storage tanks.
- Filling and Charging Operations
  - Before evacuating cylinders or refrigeration equipment, any remaining refrigerant should be removed by a recovery system.
  - Vacuum pump discharge lines should be free of restrictions that could increase discharge pressures and result in the formation of combustible mixtures.
  - Cylinders or refrigeration equipment should be evacuated at the start of filling, and should never be filled while under positive air pressure.
  - Filled cylinders should periodically be analyzed for air (nonabsorbable gas or NAG).
- **Refrigerant Recovery Systems.** Efficient recovery of refrigerant from equipment or containers requires evacuation at the end of the recovery cycle. Suction lines to a recovery compressor should be periodically checked for leaks to prevent compressing air into the recovery cylinder during evacuation. In addition, the recovery cylinder pressure should be monitored, and evacuation stopped in the event of a rapid pressure rise indicating the presence of air. The recovery cylinder contents should then be analyzed for NAG, and the recovery system leak checked if air is present. Do not continue to evacuate a refrigeration system that has a major leak.

Air Monitors and Leak Detection

Service personnel have used leak detection equipment for years when servicing equipment. Leak detectors exist not only for pinpointing specific leaks, but also for monitoring an entire room on a continual basis for the absence of oxygen or presence of refrigerant. There are several reasons for leak pinpointing or area monitoring, including: conservation of refrigerants, protection of valuable equipment, reduction of fugitive emissions, and protection of employees.

Prior to the purchase of a detector or monitor, make sure you consider your requirements or criteria for the monitor such as sensitivity, detection limits, and selectivity.

Types of Detectors

Using selectivity as a criteria, leak detectors can be placed into one of three categories: nonselective, halogen-selective, or compound-specific. In general, as the specificity of the monitor increases, so does the complexity and cost. Other methods used to find leaks are to add fluorescent additives to the system or coat the suspect area with a soapy-water solution and look for soap bubbles.

A detailed discussion of leak detection is given in bulletin ARTD-27A.

Nonselective Detectors

Nonselective detectors are those that will detect any type of emission or vapor present, regardless of its chemical composition. These detectors are typically quite simple to use, very durable, inexpensive, and usually portable. However, their inability to be calibrated, long-term drift, lack of selectivity, and lack of sensitivity limit their use for area monitoring.

Halogen-Selective Detectors

Halogen-selective detectors use a specialized sensor that allows the monitor to detect compounds containing fluorine, chlorine, bromine, and iodine without interference from other species. The major advantage of such a detector is a reduction in the number of "nuisance alarms"—false alarms caused by the presence of some compound in the area other than the target compound.

These detectors are typically easy to use, feature higher sensitivity than the nonselective detectors (detection limits are typically <5 ppm when used as an area monitor and <0.05 oz/yr when used as a leak pin-pointer), and are very durable. In addition, due to the partial specificity of the detector, these instruments can be calibrated easily.

Compound-Specific Detectors

The most complex detectors, which are also the most expensive, are compound-specific detectors. These units are typically capable of detecting the presence of a single species without interference from other compounds.

Storage and Handling

Proper shipping name for ISCEON® 39TC®: Refrigerant Gas, N.O.S. (contains 1,1,1,2-tetrafluoroethane and heptafluoropropane).

Hazard class: Nonflammable Gas

UN/NA no.: UN 1078

In the U.S. ISCEON® 39TC® is available in nominal 125 pound returnable cylinders. The specifications are shown in **Table 8** below.

Shipping Containers outside the U.S.

For information on shipping containers in your specific region, contact your local DuPont refrigerant distributor.

Bulk Storage Systems

DuPont can supply storage systems to its ISCEON® 39TC® customers. The systems are prefabricated, tested, and ready to install on-site. The units are designed to optimize economy, efficiency, and safety in the storage and dispensing of these refrigerants. The delivered systems include all components, such as storage tanks, pumps, piping, valves, motors, and gauges, as an integrated unit. All systems are equipped with the DuPont Fluorochemical Emission Elimination Delivery (FEED) system to prevent emissions during deliveries and with dual pumps to provide an installed spare. The units are skid-mounted and require only placement on a concrete pad and connection to electrical and process systems.

Table 8
Specifications of U.S Shipping Container for DuPont™ ISCEON® 39TC®

Water Capacity	Dimensions	DOT Specification	Color	PMS #	123 lb Water Capacity*
123	55 in. high x 10 in. OD	4BA300/4BW300	Blue	292	125

* Net weight of ISCEON® 39TC® in the cylinder

A typical bulk storage system is shown in **Figure 1**.

Your DuPont Marketing Representative can arrange for guidance on site selection, purchase, installation, start-up, and maintenance.

Converting Bulk Storage Tanks from CFC-12 to ISCEON® 39TC®

Before switching from CFC-12 to this refrigerant, the existing storage equipment must be checked to verify that it is adequate. Storage tanks built to the specifications of the American Society of Mechanical Engineers (ASME) Pressure Vessel Code are required to have a metal nameplate indicating each tank's maximum allowable working pressure (MAWP). The rating must be 150 psig (1035 kPa abs) or higher for ISCEON® 39TC® service. The set pressure and capacity of the relief devices on the top of the tanks must also be verified and changed, if necessary.

Note: Some bulk storage tanks currently in service for CFC-12 may NOT suitable for ISCEON® 39TC® due to an inadequate pressure rating.

If suitable, we recommend that storage tanks be completely emptied of all CFC-12 liquid and vapor before introducing ISCEON® 39TC®. In general, converting a storage tank from CFC-12 requires:

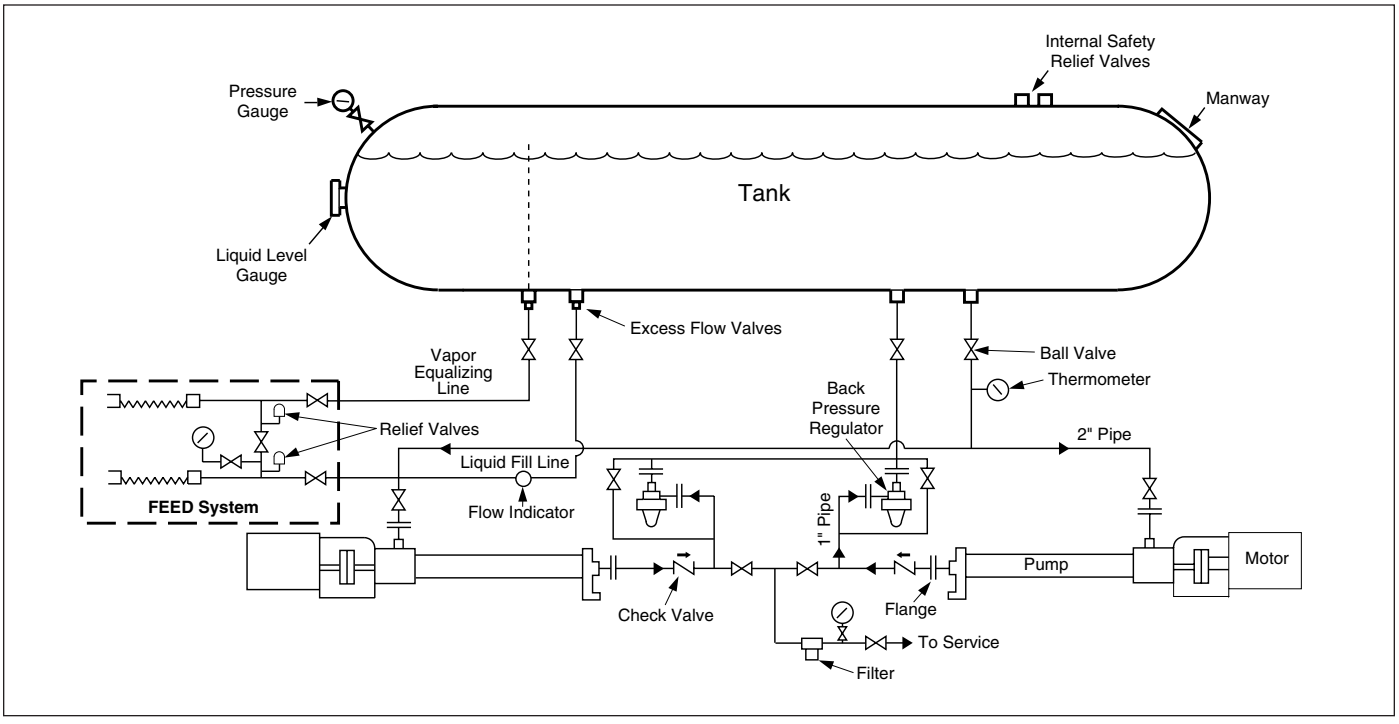
1. Removing CFC-12 from the storage tank, lines and equipment.
2. Evacuating the storage tank to 25 in of mercury vacuum (16.7 kPa abs) and purging with compressed dry nitrogen.
3. Making necessary repairs to the tank after initial evacuation and purging.
4. Repeating step 2 until CFC-12 and moisture analyses are within acceptable limits.
5. Refilling system with the appropriate refrigerant.

The preceding is a simplified outline of what is actually a lengthy procedure. Your DuPont Marketing Representative can assist in obtaining the equipment, instrumentation, and technical assistance to safely and effectively make the conversion.

Material Compatibility Concerns

Most metal components suitable for use with CFC 12 are also compatible with ISCEON® 39TC®, including standard types of carbon steel, aluminum, and copper. Some elastomeric or nonmetallic components suitable for CFC-12 may not be adequate. Therefore, all elastomeric or nonmetallic components throughout the system must be identified and their compatibility with ISCEON® 39TC® verified. See Material Compatibility section. For complete reliability, any component that cannot be properly identified should be replaced.

Figure 1. Typical Bulk Storage System



In a fluorocarbon storage system, elastomers are most commonly found in:

- Packing and seats of manual valves
- Pressure-relief device seats
- Flange and manway gaskets
- Mechanical pump seals
- Wet-end pump gaskets and O-rings
- Filter O-rings
- Sight-flow indicator gaskets
- Back-pressure regulator diaphragms and O-rings

Handling Precautions for ISCEON® 39TC® Shipping Containers

The following rules for handling refrigerant containers are strongly recommended:

- Use personal protective equipment, such as side shield safety glasses, gloves, and safety shoes when handling containers.
- Avoid skin contact with liquid refrigerant, because it may cause frostbite.
- Never heat a container to a temperature higher than 52°C (125°F).
- Never apply direct flame or live steam to a container or valve.
- Never refill returnable cylinders without DuPont consent. DOT regulations forbid transportation of returnable cylinders refilled without DuPont authorization.
- Never use a lifting magnet or sling (rope or chain) when handling containers. A crane may be used when a safe cradle or platform is used to hold the container.
- Never use container for rollers, supports, or any purpose other than to store these refrigerants.
- Protect containers from any object that will result in cut or other abrasion in the surface of the metal.
- Never tamper with the safety devices in the valves or containers.
- Never attempt to repair or alter containers or valves.
- Never force connections that do not fit. Make sure the threads on the regulators or other auxiliary equipment are the same as those on the container valve outlet.
- Keep valves tightly closed, and valve caps and hoods in place when the containers are not in use.
- Store containers under a roof to protect them from weather extremes.
- Use a vapor recovery system to collect refrigerant vapors from lines after unloading a container.

Recovery, Reclamation, Recycle, and Disposal

Recovery

Recovery refers to the removal of ISCEON® 39TC® from equipment and collection in an appropriate external container. As defined by the Air Conditioning and Refrigeration Institute (ARI), a U.S. organization, recovery does not involve processing or analytical testing. This refrigerant may be recovered from refrigeration equipment using permanent on-site equipment or one of the portable recovery devices now on the market. The portable devices contain a small compressor and an air-cooled condenser and may be used for vapor or liquid recovery. At the end of the recovery cycle, the system is evacuated to remove vapors. In the United States, the Environmental Protection Agency (EPA) sets standards for recovery equipment. Before purchasing a specific recovery unit, check with the manufacturer to be sure that it can be used to recover these refrigerants.

Reclamation

Reclamation refers to the reprocessing of used ISCEON® 39TC® to new product specifications. Quality of reclaimed product is verified by chemical analysis. In the United States, this refrigerant is included in the DuPont refrigerant reclamation program. Contact DuPont or one of its refrigerant distributors for further information.

Reclamation offers advantages over on-site refrigerant recycling procedures, because these systems cannot guarantee complete removal of contaminants. Putting refrigerants that do not meet new product specifications back into expensive equipment may cause damage.

Recycle

Refrigerant recycle refers to the reduction of used refrigerant contaminants using devices that reduce oil, water, acidity, and particulates. Recycle is usually a field or shop procedure with no analytical testing of refrigerant. Before using one of these devices with ISCEON® 39TC®, consult the manufacturer to confirm compatibility.

Disposal

Disposal refers to the destruction of used ISCEON® 39TC®. Disposal may be necessary when this refrigerant has become badly contaminated with other products and no longer meets the acceptance specifications of DuPont or other reclaimers. Licensed waste disposal firms are available for this purpose. Be sure to check the qualifications of any firm before sending them used ISCEON® 39TC®.

For Further Information: (800) 235-7882

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