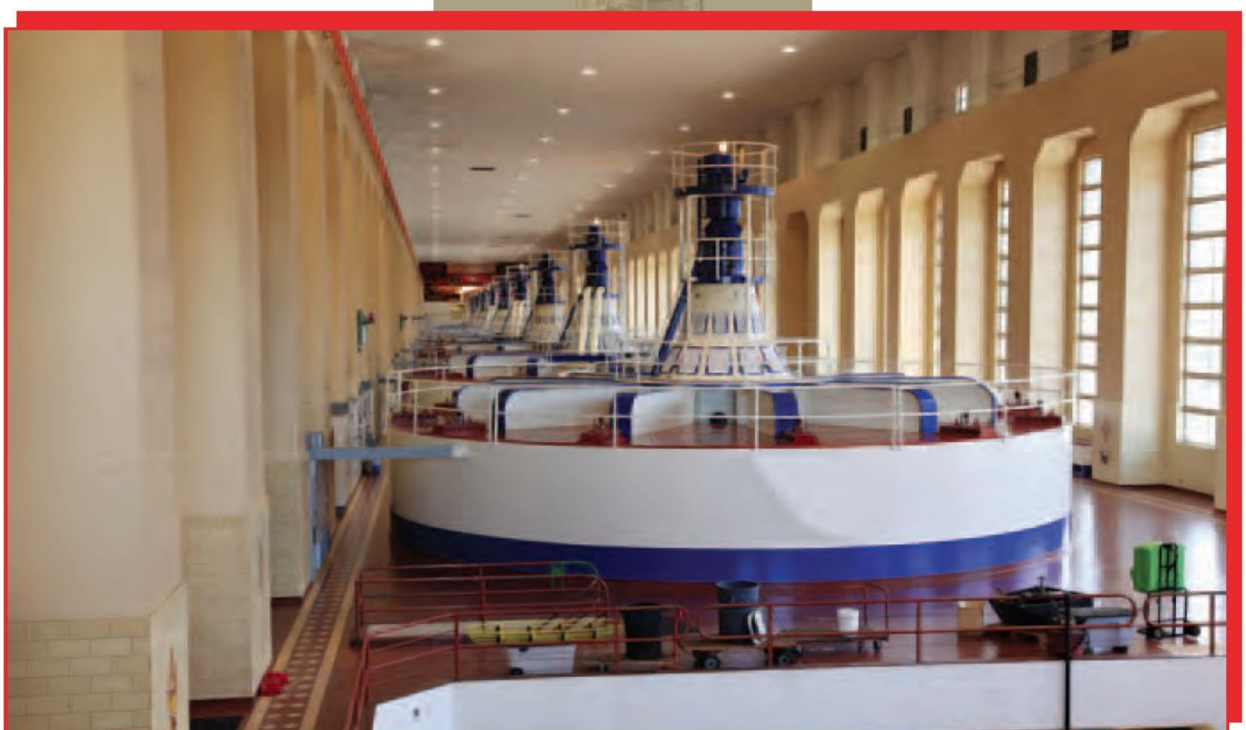
inControl Systems Inc.

Low Pressure CO_2 Systems



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LOW PRESSURE CO_2 FIRE SUPPRESSION SYSTEM FOR FIRE PROTECTION

Low pressure carbon dioxide (CO_2) systems are specialized fire suppression systems designed to maintain the carbon dioxide supply at 0° F and 300 psig in an insulated, refrigerated pressure storage unit. These storage units contains the amount of CO_2 required to stop fire.

inControl Systems' Low-Pressure CO_2 Fire Suppression Systems are *Factory Mutual* approved to meet all present codes and standards.

We offer complete equipment/engineering packages or complete turn key installations including detection and control systems. Our product line includes horizontal and vertical tanks ranging in sizes from 3/4 ton to 60 tons, ½" through 8" master/selector valves, and a complete line of total flood and local application nozzles that can protect from 2 feet above the hazard up to 20 feet above the hazard.

CO2 LOW PRESSURE STORAGE UNITS

Our low-pressure carbon dioxide system is stored mostly as a liquid at approximately 300 psi (2070 kPa) and 0ºF (- 17.8ºC). It is maintained at this pressure and temperature by mechanical refrigeration. When needed, operation of the refrigeration system cools and condenses CO_2 vapor in the vapor space of the unit, thus converting it to liquid and reducing the pressure. The storage unit is very well insulated, keeping to a minimum the heat transfer to the CO_2 from the warmer ambient air of the storage location. A slight rise in storage pressure from this heat input starts the refrigeration cycle described herein. Stored as a liquid at an ambient temperature of 70ºF (21ºC) carbon dioxide has a vapor pressure of approximately 850 psi (5865 kPa). Thus, high pressure cylinders are used for storage, designated as *High Pressure CO_2*. This brochure explains low pressure storage and describes the wide range of storage units available. The storage of CO_2 in the "Low Pressure" state has numerous advantages over cylinder storage.

ADVANTAGES OF LOW PRESSURE CO2

Effective: Low pressure CO_2 is effective on a wide range of flammable and combustible materials in both surface and deep-seated fires, which adds up to greater uniformity and predictability.

Fast: Carbon dioxide is a colorless and odorless three-dimensional clean agent. Within seconds, it penetrates the entire hazard area to smother combustion.

Non-damaging: CO_2 is normally harmless to equipment, materials and property. It does not cause spoilage, requires no clean up and leaves no residue, thus minimizing downtime after a fire.

Non-conductive: CO_2 does not conduct electricity and is three-dimensional.

Economical: When a hazard requires multiple discharges or when CO_2 requirements exceed 4000 lbs. (1818 kg) of agent [2000 lbs. (909 kg) for main discharge and 2000 lbs. (909 kg) for reserve], the overall system cost is less than a high pressure CO_2 system.

Efficient: Low pressure CO_2 chokes off combustion quickly. The dry ice "snow" in the discharge allows "local application" protection of non-enclosed hazards.

Compact: Storage units are compact and often installed outdoors to conserve floor space. Capacities range from 1-1/4 tons (1.13 MT) to 60 tons (54.5 MT) or more.

OPTIONS

- Coal tar epoxy for coating the interior shell of the tank (for use in salt-water environment)
- Sight Glass
- Proportioner prepiped onto tank assembly
- Red epoxy finish
- Custom fabrication of specialty materials, dimensions and capacities
- Actuated valves for water/concentrate
- Stainless steel or brass trim
- Insulation and heat tracing packages

APPLICATIONS

Typical hazards protected by carbon dioxide systems are:

• Printing Plants • Transformer Vaults/Electrical Cabinets • Power Plants • Dip Tanks • Rolling Mills • Coating Machines • Exhaust and Fume Handling Systems • Flammable Gas or Liquid Storage Areas • Generators • Inerting Applications • Coal handling, grinding, and storage systems • Data processing centers • Flammable materials storage • Shipboard machinery spaces and cargo holds • Telecommunications

WHY CO2?

Carbon dioxide is a standard commercial product that is commonly used for carbonated beverages, for fast freezing food, for medical purposes, for purging pipes and tanks, as well as for extinguishing fires. It is readily available in most cities and seaports throughout the world. For more than 80 years carbon dioxide has been used for fire protection purposes. The NFPA standard for fire extinguishing systems was initiated in 1928 and was first adopted in 1929. It has been revised approximately 26 times since, and represents the accumulated knowledge and experience of those who have designed and used CO2 systems for fire extinguishing purposes.

low pressure CO_2 systems

Low pressure CO_2 system is a specialized fire suppression system designed to maintain the carbon dioxide supply at 0° F and 300 psig in an insulated, refrigerated pressure storage unit. This storage unit contains the amount of CO_2 required to protect a specific hazard.

inControls' Low Pressure CO_2 Fire Suppression Systems are Factory Mutual approved to meet all present codes and standards.

We offer complete equipment/engineering packages or complete turn key installations including detection and control systems. Our product line includes horizontal and vertical tanks ranging in sizes from 3/4 ton to 60 tons, ½" through 8" master/selector valves, and a complete line of total flood and local application nozzles that can protect from 2 feet above the hazard up to 20 feet above the hazard.

A low pressure CO_2 system is a specialized fire suppression system designed to maintain the carbon dioxide supply at 0° F and 300 psig in an insulated, refrigerated pressure container ("Storage Tank"). This tank contains the amount of CO_2 required to protect the largest single hazard and any number of back-up discharges required by the authority having jurisdiction.

CO_2 low pressure storage units

The inControl Low Pressure Carbon Dioxide System carbon dioxide (CO_2) stored, mostly as a liquid, at approximately 300 psi (2070 kPa) and 0ºF (- 17.8ºC). It is maintained at near this pressure by mechanical refrigeration. When needed, operation of the refrigeration system cools and condenses CO_2 vapor in the vapor space of the unit, thus converting it to liquid and reducing the pressure. The storage unit is very well insulated, keeping to a minimum the heat transfer to the CO_2 from the warmer ambient air of the storage location. A slight rise in storage pressure from this heat input starts the refrigeration cycle described herein. Stored as a liquid at an ambient temperature of 70ºF (21ºC) carbon dioxide has a vapor pressure of approximately 850 psi (5865 kPa). Thus, high pressure cylinders are used for storage and it is designated is High Pressure CO_2. This brochure explains low pressure storage and describes the wide range of storage units available. The storage of CO_2 in the "Low Pressure" state has numerous advantages over cylinder storage. The features of this storage and the resultant advantages continue over the following pages.

advantages

economy

Low Pressure units store liquid CO_2, to as much as 100 tons (90,900 kg) or more, in a single lightweight vessel filled to over 90% of its water capacity. In contrast, cylinders have a maximum capacity of 100 lbs. each (filled to 68% of their water capacity). This results in lower storage costs for high capacity systems.

multiple hazard protection

Low Pressure Systems facilitate the design of simultaneous protection of more than one hazard from one piping system. Multiple Discharge Capability A second (or multiple) discharge, based on storage unit capacity, is immediately available without any switchover to the reserve. Reserve Supply A reserve supply is easily obtained by merely increasing the storage unit size; no complicated manifolding and valving is required. After one discharge, the reserve supply provides uninterrupted protection during the interval preceding recharge of the unit to full capacity.

hazard-engineered protection

You can measure our experience by the diversity of applications, the technical sophistication, and system performance represented by a range of commercial and industrial special hazard applications. CO_2 is used in the extinguishment of fires involving flammable liquids, electrical hazards, engines utilizing gasoline and other fuels, ordinary combustibles such as paper and wood, and hazardous solids, as well as in the extinguishment and prevention (inerting) of fires in applications that include cement plants, coal pulverizers, coal storage silos and bunkers, and coal handling, grinding and storage systems. Systems can be specifically engineered to fit the unique fire protection requirements of these.

large scale & multiple hazard protection

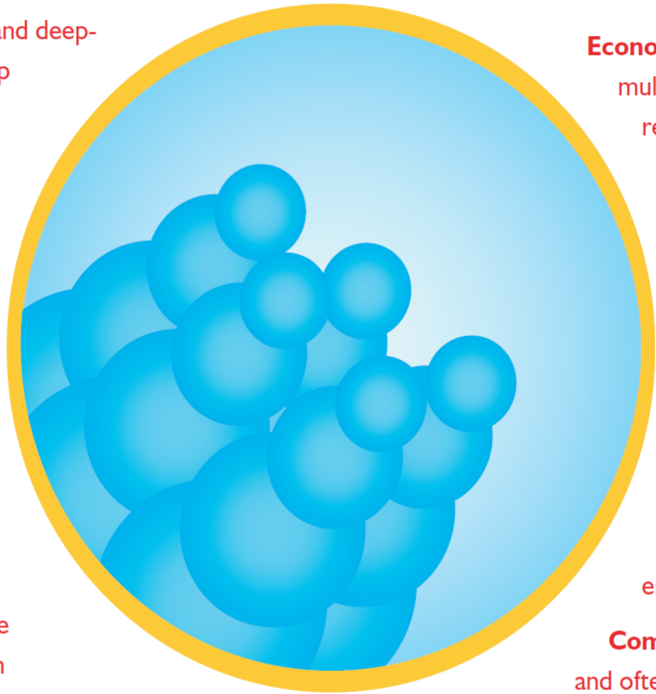
An automatic, fixed-installation low pressure carbon dioxide fire protection system consists of a single insulated refrigerated pressure vessel with performance engineered controls to protect multiple hazards or afford frequent discharges for high risk hazards.

low pressure CO_2 is:

Effective... Low pressure CO_2 is effective on a wide range of flammable and combustible materials in both surface and deep-seated fires, which adds up to greater uniformity and predictability.

Fast... Carbon dioxide is a colorless and odorless three-dimensional clean agent. Within seconds, it penetrates the entire hazard area to smother combustion.

Non-damaging...CO_2 is normally harmless to equipment, materials and property. It does not cause spoilage, requires no clean up and leaves no residue, thus minimizing downtime after a fire.



Non-conductive...CO_2 is electrically nonconductive and three-dimensional.

Economical... When a hazard requires multiple discharges or when CO_2 requirements exceed 4000 lbs. (1818 kg) of agent [2000 lbs. (909 kg) for main discharge and 2000 lbs. (909 kg) for reserve], the overall system cost is less than a high pressure CO_2 system.

Efficient... Low pressure CO_2 chokes off combustion quickly. The dry ice “snow” in the discharge allows “local application” protection of non-enclosed hazards.

Compact... Storage units are compact and often installed outdoors to conserve floor space. Capacities range from 1-1/4 tons (1.13 MT) to 60 tons (54.5 MT) or more.

A Low Pressure CO_2 system consists of:

Storage, valve & discharge components...

Components consist of a storage unit, valve assemblies, piping, and discharge nozzles. All equipment meets exacting specification and quality standards.

Control panels, detection and alarms...

The control panel is used to monitor the detection and accessories, as well as control the audible and visual alarms and discharge functions.

CO_2 storage units...

A quantity of CO_2 sufficient to extinguish the type of fire anticipated is stored. The gas is released into the piping distribution network upon system actuation. Liquid carbon dioxide in the storage unit is maintained by refrigeration at approximately 300 PSI (20.68 Bar) pressure at 0°F (-18°C). The refrigeration system employs the nonozone depleting refrigerant R-404A...

Vaporizers...

For hazards where liquid carbon dioxide is inappropriate, vaporizers are utilized to provide a continuous and predictable supply of vaporous CO_2.

Hose reels...

Low pressure CO_2 hose reels with hand lines can be connected to the storage unit for additional protection. With a capacity for a high discharge rate and up to a 30 foot (9 meter) range from the nozzle.

System Safety

Carbon dioxide systems are designed in accordance with NFPA (National Fire Protection Association) standards, which require a minimum carbon dioxide concentration of 34%. These design concentrations will not support human life. Visual and audible warnings must be provided to alert occupants to vacate the area prior to discharge.

As CO_2 will tend to migrate to low lying areas near the protected hazard after a discharge, careful consideration of means to prevent accidental exposure of personnel to hazardous atmospheres in adjoining spaces must be designed into every system.

An optional wintergreen odorizer can provide an olfactory warning of the presence of carbon dioxide. A CO_2 system discharge will also cause turbulence and noise, and the discharge stream may have considerable force.

Warning signs must be provided to advise personnel what to do when the fire extinguishing system is actuated, as well as provide instructions on how to activate the system manually.

CO_2 Physical and Chemical Properties

CO_2 is an odorless, colorless, inert gas that extinguishes fire primarily by diluting the oxygen that supports combustion. Some cooling is also accomplished. It is used as an extinguishant applied by either the total flood or local application method. In total flooding, the enclosure of the hazard protected is flooded to a proper concentration. In local applications, CO_2 is directly applied in the proper amount at the needed rate to cover the protected hazard. The small "dry ice" particles, created in the discharge, facilitate its projection into the fire and coverage of the hazard protected.

Because CO_2 is 1.5 times heavier than air, it will tend to settle in low-lying areas in the protected hazard as well as flow into adjacent areas outside of the protected space. In the design concentrations required to extinguish fire, CO_2 will not support human life.

An **inControl** Low Pressure CO2 system is a versatile & cost-effective suppression system designed with an extra measure of reliability...

features

- FM Approved
- Wide Range of CO_2 Storage Units
- Available (3/4 Ton to 60 Ton Capacity)
- Hydraulic Program For Piping Design
- CO_2 Storage Units

applications

Typical hazards protected by carbon dioxide systems are:

- Printing Plants
- TransformerVaults/ Electrical Cabinets
- Power Plants
- Dip Tanks
- Rolling Mills
- Coating Machines
- Exhaust and Fume Handling Systems
- Flammable Gas or Liquid Storage Areas
- Generators
- Inerting Applications
- Coal handling, grinding, and storage systems
- Data processing centers
- Flammable materials storage
- Shipboard machinery spaces and cargo holds
- Telecommunications

$LPCO_2$ vs. $HPCO_2$

Low pressure CO_2 and high pressure CO_2 have equal extinguishing capabilities; however low pressure CO_2 storage units have some clear advantages:

- Multiple shot capability - without any switch-over to a reserve system required.
- Reserve supply is easily obtained by increasing the storage unit size. No complicated manifolds or valving is required.
- Hazards may be added to an existing system at any time.
- $LPCO_2$ units do not require hydrostatic testing as do $HPCO_2$ cylinders.
- $LPCO_2$ offers continuous monitoring of the liquid level of CO_2.
- $LPCO_2$ storage requires less floor space and weighs up to 50% less.
- $LPCO_2$ storage units are commonly located outside.
- $LPCO_2$ storage units are easily filled in-place from a CO_2 transport truck, available worldwide, and remain in service during filling. $HPCO_2$ cylinders must be disconnected and transported to a filling plant.
- $LPCO_2$ is 32% more efficient for local application discharges than $HPCO_2$.

inControl Systems Inc.

inControl Systems Inc. is a manufacturer and supplier of complete fire protection, fire detection, flame and gas detection systems. Products and systems from inControl are available on a global basis for the complex projects of today's modern world.

Supplying high quality, cost effective fire solutions to meet international regulatory approvals, for industrial, marine and offshore projects...this is what inControls does.

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