CHEMETRON™ Fire Systems

CARDOX

CO_2 Application Bulletin

CARBON DIOXIDE FIRE SUPPRESSION —

Gas Turbine Generators

The protection of the lubricating and hydraulic oil hazards associated with the operation of a gas turbine is shown on the accompanying drawing.

The protection of gas turbines with carbon dioxide has been a common practice for many years. In many turbine configurations, the turbine is in an enclosure; the enclosure is flooded to a 34% CO_2 concentration and the CO_2 held for the time period required, until the exposed metal surfaces cool below the auto-ignition temperature of the combustibles present. However, in the larger turbines used in the big cogeneration facilities, the turbine is not enclosed, except by the building that contains it. Protection by water spray creates a real problem for the turbine, and at the same time, protection with CO_2 is more difficult because of the lack of an enclosure immediately around the unit.

This problem is dealt with by the local application of carbon dioxide in accordance with the ratings of the nozzles used and NFPA Standard No. 12. Provision is made to maintain CO_2 around the unit for the run-down time of the unit (usually 10 to 20 minutes), plus a safety factor of 10 minutes. The application of CO_2 at the rates required for local application coverage will usually result in low level flooding of the turbine room in a reasonable time period. Because of noise and other considerations, the turbine room is usually well sealed and the CO_2 contained.

While it's been done successfully many times in the past, the concept of low level flooding with carbon dioxide may be new to the reader and deserves a word of explanation.

It is applicable to hazards where the combustible is contained in the lower portion of a room with a relatively high ceiling, and where a long holding time is needed. If done properly, this ends up using much less CO_2 than flooding the entire room.

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A World of Protection

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The process involves:

- First shutting down all ventilation which will exhaust CO_2 or mix it throughout the room.
- Next, the CO_2 must be discharged in such a way that the fire is initially extinguished to prevent the rapid updraft of the open burning from moving the CO_2 up.
- Testing has shown that when an area is flooded with CO_2, the CO_2 will not rise much above the height of the discharge nozzles, if the nozzles are aimed down. The velocity of the CO_2 discharge will entrain any rising CO_2 and force it back toward the bottom of the area. Therefore, the nozzles (not necessarily all of them) should be at the height at which you want to maintain the CO_2 concentration (usually a minimum of 2 feet above the highest combustible).
- Lastly, loss of CO_2 laterally out of the room must be minimized by closing all dampers, doors, etc. If losses occur during the required soak time, (the cooling period), follow-up discharges can be made. The need for these and their duration is determined when the system is tested.

Besides protection of the gas turbine lube-hydraulic oil system, other uses of the CO_2 system would include protection of the fuel preparation equipment if oil is used as fuel, and to supply high capacity low pressure CO_2 hose lines.

Low Pressure CO_2 hose lines — with a high CO_2 discharge rate and projection capabilities of 30-35 feet — are unique fire fighters. They are especially popular for use during maintenance and repair. The unit can be removed from its support, thereby charging the hose, and set alongside the area where any cutting or welding is to take place. In case of fire, the unit can be discharged using the squeeze valve and playpipe. If not used, it can be returned to its bracket at its reel with little or no CO_2 having been used. (The accompanying drawing does not show hose line coverage.)

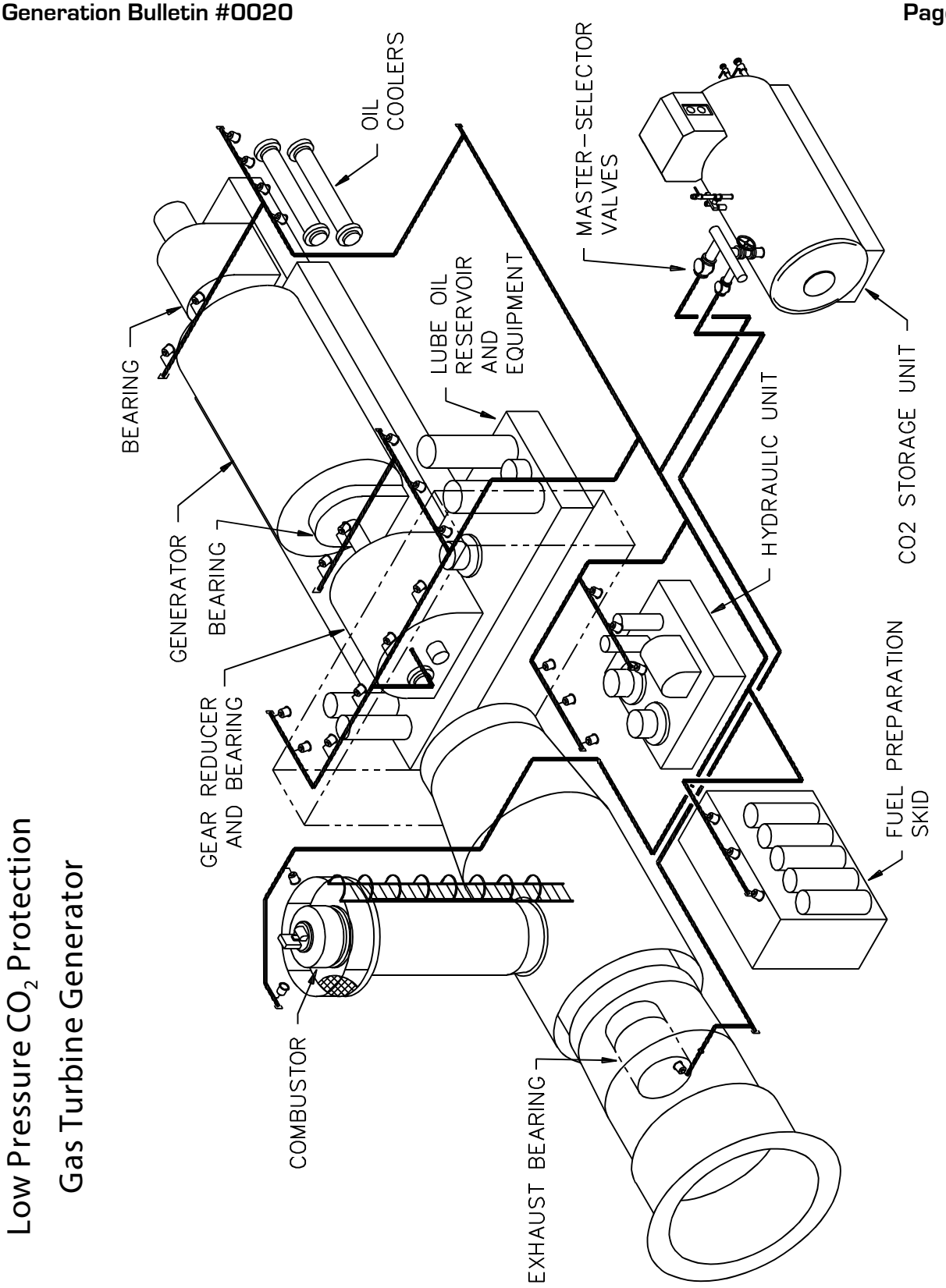
When the carbon dioxide system is designed, the provision for personnel safety must be considered as strongly as the fire protection. A safe system includes provision for:

- Alarms that absolutely, positively indicate that the system is about to discharge.
- Analysis of the CO_2 gas flow to identify where the CO_2 will be after a discharge. (Provision for odorizing the CO_2 may be appropriate.)
- Adequate instructions and training, including warning and instructional signs.

NFPA Standard No. 12 provides good information in this regard.

Detailed design information on this application can be obtained from Chemetr on.

Low Pressure CO_2 Protection
Gas Turbine Generator



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