The most up-to-date, advanced technology provides the ultimate impurity removal and collection efficiency.

Low operating costs are achieved by utilizing new and proven technologies in the area of purification, compression and liquefaction.

System can be designed to recover CO\textsubscript{2} from sources with as high as 99.9\% inlet purity to as low as 90\%.

Yields liquid CO\textsubscript{2} with a purity as high as 99.9\% in the CO\textsubscript{2} stripping system.

- Completely automatic operation provides for minimal operator intervention and capacity control.
- System design, material selection and manufacturing technique provide for easy and reduced maintenance requirements and cost.
- High CO\textsubscript{2} recovery and efficiency yields more CO\textsubscript{2} product, which can then be utilized to enhance product quality or may be sold for increased revenues.
**PRINCIPLE OF OPERATION**

The system is designed to recover CO\textsubscript{2} from various fermentation sources. The processes for CO\textsubscript{2} recovery from the sources are essentially the same other than the amount and type of purification that is employed.

A brief outline of the process, along with process flow diagram, is presented below.

- **Foam Trap** (Separator) – to remove occasional foam carryover from fermentation.

- **CO\textsubscript{2} Booster Compressor** – maintains fermenter pressure and provides positive pressure for purification and compression.

- **CO\textsubscript{2} Scrubber** – provides bulk removal of water-soluble impurities (such as alcohols, ketones, etc.) in an efficient manner using potable water as the scrubbing medium (minimal water consumption).

- **Potassium Permanganate/Water Scrubber** (Optional) – this step is used when the CO\textsubscript{2} is intended for resale or for water/soft drink carbonation. Ensures oxidation and removal of impurities not fully removed in water scrubbing.

- **CO\textsubscript{2} Compressor** – elevates the CO\textsubscript{2} gas pressure to allow for efficient purification, dehydration and liquefaction.

- **CO\textsubscript{2} Aftercooler/Precooler** – reduces the gas temperature to condense and remove a significant amount of water contained in the gas. This maximizes downstream equipment performance and efficiency.

- **CO\textsubscript{2} Deodorizer/Dryer** – provides final trace removal of impurities (such as organic and sulfur compounds) and water vapor (moisture).

- **CO\textsubscript{2} Liquefaction System** – converts the CO\textsubscript{2} gas to a liquid form by use of refrigeration (i.e.: R-22, R-404A, NH\textsubscript{3}, etc.). This allows for convenient storage of the liquid CO\textsubscript{2} product and provides for additional purification of the CO\textsubscript{2} by the partial removal of non-condensable gases (i.e.: O\textsubscript{2} and N\textsubscript{2}).

- **Liquid CO\textsubscript{2} Strippers or Stripping System** (Optional) – is designed to provide a guaranteed liquid CO\textsubscript{2} purity with regard to non-condensable levels (e.g.: <5 ppmv O\textsubscript{2}). It can also allow for earlier collection from fermentation, which increases the quantity of CO\textsubscript{2} recovered.

- **Liquid CO\textsubscript{2} Storage Tank** – receives and stores the liquid CO\textsubscript{2} for reuse or resale.

GIF also supplies liquid CO\textsubscript{2} vaporizers (both Ambient & water heated type), cylinder filling units, liquid CO\textsubscript{2} tanks & mobile tankers.
*Scrubber (KMnO/Water) required in distillery recovery system and optional in Brewery Recovery System. For distillery, additional purification may be needed based on fermentation type.
The diagram illustrates a liquid CO₂ purifying system. The system includes a separator, a reboiler, a subcooler, and a high-purity liquid CO₂ tank. The Legend indicates different streams and components:

- Low Purity Liquid CO₂
- High Purity Liquid CO₂
- High Purity Vapor CO₂
- Low Purity Vapor CO₂
- Refrigerant

*Requirement of these items will be determined by system design inlet CO₂ purity.
**Requirement will be determined based on system design and space availability.