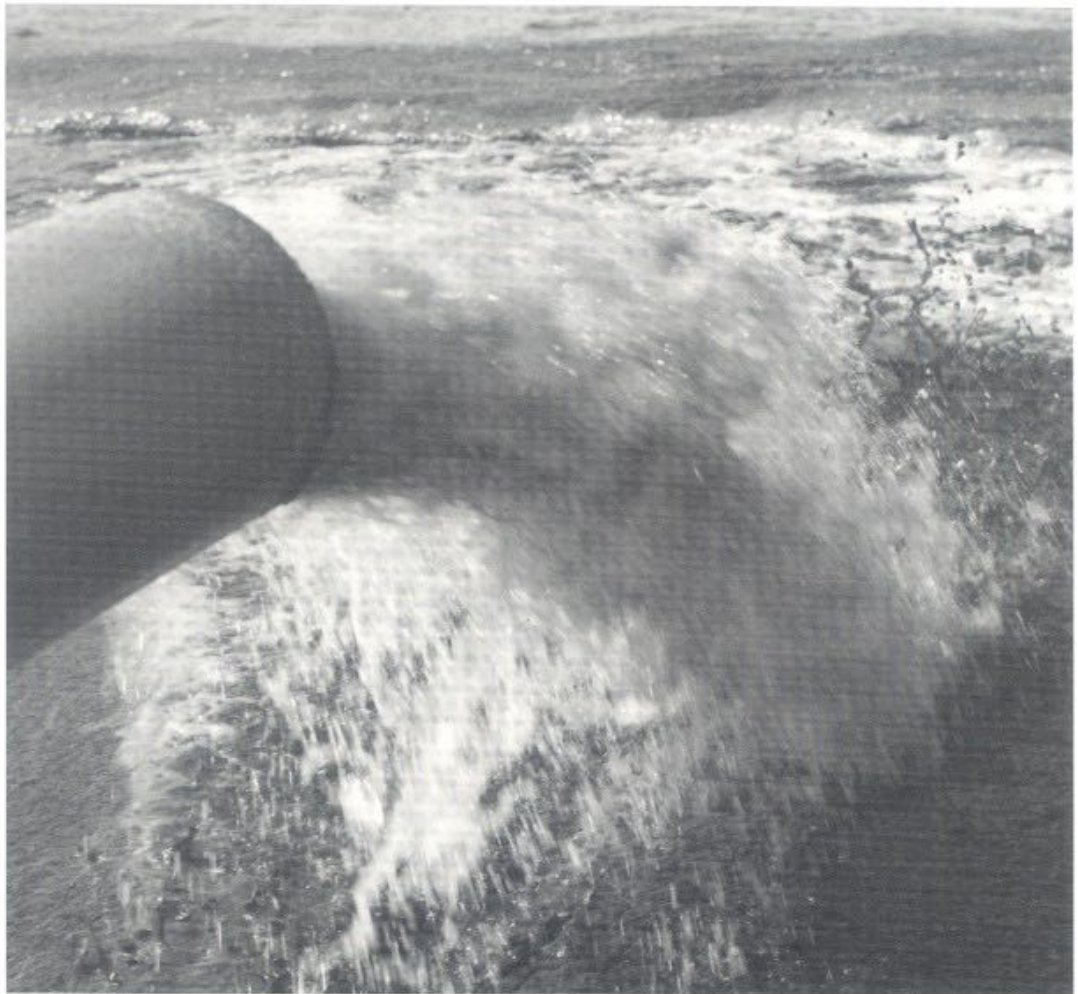


Carbon dioxide is more cost-effective and safer than mineral acids for neutralizing alkaline wastewater.



CARBON DIOXIDE ECONOMICALLY REDUCES AND CONTROLS pH IN WASTEWATER

Manufacturers in a range of industries—pulp and paper, textiles, food processing, metal treating, among many others—produce alkaline effluents that require neutralization prior to discharge or further treatment.

Many of these facilities currently rely on mineral acids, such as sulfuric acid, to reduce wastewater pH. However, a variety of problems is associated with mineral acid use. The most serious are: high chemical usage

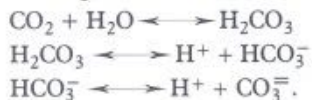
costs; corrosion of piping and equipment that requires expensive, ongoing maintenance and replacement; serious safety hazards posed to operating personnel and the environment; and EPA reporting requirements.

By using carbon dioxide (CO₂) to treat alkaline effluent, industries can cost-effectively avoid many of these problems, while also achieving better process controllability.

HOW CO₂ LOWERS pH

Carbon dioxide, when added to water, acts as an acid to reduce pH.

Dissolved in water, CO₂ forms carbonic acid (H₂CO₃), bicarbonate (HCO₃⁻) and carbonate (CO₃⁼) according to the following reversible reactions:



The free hydrogen ions released by the dissociation of carbonic acid react with the hydroxides present in alkaline wastewater, thus lowering the pH:



CO₂ SAVES DOLLARS

Chemical Cost Savings

- Carbon dioxide, in almost every case, is less expensive pound-for-pound than mineral acids.
- Facilities will use less CO₂ than

acid to achieve the same pH reduction. For example, 1 lb of sulfuric acid will be replaced with a maximum of only 0.9 lb of CO₂.

Maintenance and Equipment Savings

- Carbon dioxide is noncorrosive, unlike mineral acids, and will not harm equipment. Thus, with a CO₂ system, maintenance costs are minimal and equipment life is extended.

IMPROVED CONTROLLABILITY, RELIABILITY AND SAFETY

Superior pH Control

- Sudden changes in pH can be detrimental to wastewater treatment operations. In water treated with CO₂, the bicarbonate acts as a buffer, making it virtually impossible to over treat and create a highly acidic mixture.
- This improved reliability in con-

trolling pH enables facilities to stay in compliance with local and federal regulations.

Safer than Acids

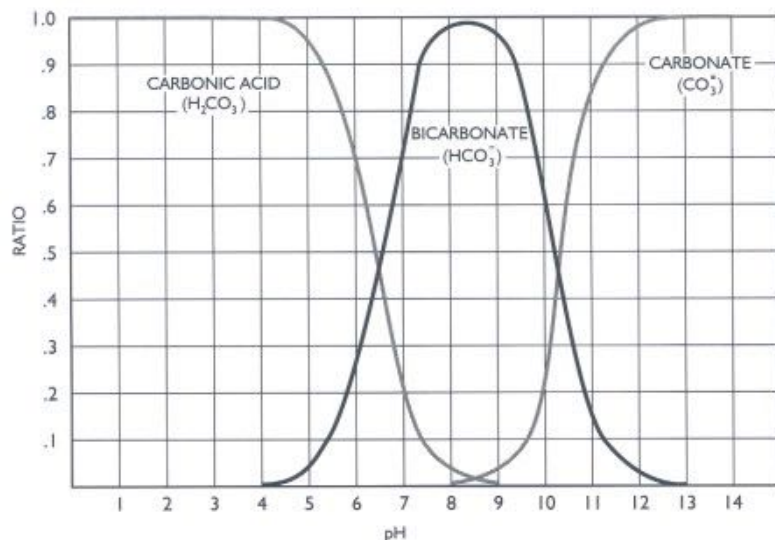
- Unlike mineral acids, carbon dioxide is nonhazardous and noncorrosive. The Occupational Safety and Health Administration (OSHA) requires facilities using sulfuric acid to supply protective clothing, eye protection, showers and eye wash stations in case of accidents.

APPLICATIONS EXPERTISE

Airco has installed over 100 carbon dioxide systems for accurate, reliable and safe pH control. Airco's application engineers will evaluate your current system and recommend the best CO₂ system for you. In addition, as a leading, full-service supplier of gases and gas handling technology, Airco will provide: carbon dioxide and associated storage equipment; installation and start-up support; and operations and safety training.

To learn more about using carbon dioxide to treat alkaline effluent at your plant, contact the Airco Gases regional sales office nearest you, or Airco's Commercial Development department, Water Treatment or Pulp & Paper group, in Murray Hill, NJ; telephone (908) 771-1744.

DISSOCIATION OF CARBONIC ACID



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