

## Isotainers for Quick Response

### Technical Data Sheet

#### Introduction

While dedicated to the North American peroxygens market, Solvay Chemicals brings resources to this continent from far beyond its borders. We are a member of the global Solvay Group of companies, sharing a history of over 140 years experience in the worldwide chemicals industry, and more than a century of peroxygens production.

Today committed professionals engage in peroxygen research and development at Solvay laboratories around the world. Our customers benefit from this international cooperation through new and advanced technologies.

As a leading producer of hydrogen peroxide and persalts in the United States, we operate plants in Deer Park, Texas and Longview, Washington to serve our customers from strategically placed distribution centers.

Solvay Chemicals looks forward to continuing leadership by providing excellent products, services and technologies to the world's peroxygen markets.

#### Isotainers

**Quick Response Service.** Hydrogen peroxide ( $H_2O_2$ ) is a versatile chemical with a wide range of environmental applications. Taking advantage of this versatility is easier than it used to be. Now, in recognition of the short-term temporary or emergency needs of industry, Solvay Chemicals offers a convenient way to use hydrogen peroxide without making a major long-term commitment or capital investment. In most cases, the product can be shipped less than 24 hours after receipt of the order.

Portable tanks, or isotainers, provide a convenient way to deliver, store, and dose hydrogen peroxide (Figure One). Generally used for overseas transport of bulk liquids, these horizontal stainless steel tanks are compatible with liquid hydrogen peroxide, are chassis-mounted (no crane required for unloading), and have bottom outlets which make gravity-feeding possible. The isotainer system will weigh 60,000 pounds when fully loaded with hydrogen peroxide. The unit requires solid, level ground in order to set up. Additionally, access for 40' tank truck deliveries is necessary. Gravity feeding eliminates the need for pumps and electricity in many cases, which makes isotainers ideally suited for applications at remote sites.

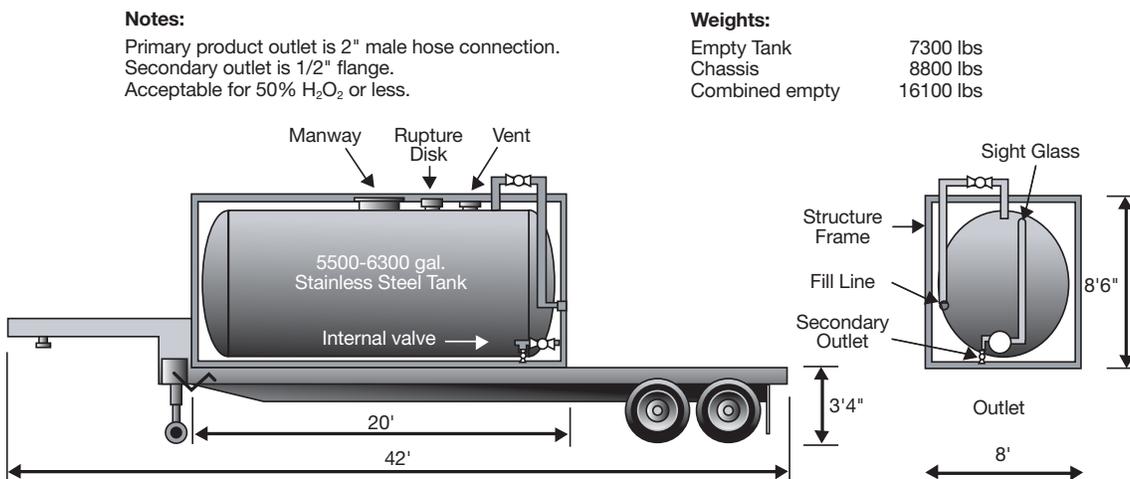
Isotainers are ideal for seasonal hydrogen peroxide requirements, like biological upsets in ponds and lagoons during warm weather; short-term or one-time situations, like soil contamination caused by a railcar spill; or emergency applications, when contaminants must be treated on-site immediately.



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Figure One:



### Peroxide advantages

#### Solvay Chemicals' isotainers offer a convenient way to handle hydrogen peroxide

Hydrogen peroxide can detoxify a broad range of organic and inorganic wastes. Tables One and Two summarize the features of hydrogen peroxide chemistry. Applications continue to grow as other treatment methods become less cost-effective and/or environmentally questionable. Additionally, the isotainer option offered by Solvay Chemicals now increases the practicality of using hydrogen peroxide.

Hydrogen peroxide is economical. It reacts selectively with contaminants, and by adjusting reaction parameters or adding a catalyst, the selectivity can be more easily controlled. Also, because partial oxidation can sometimes reduce toxicity to acceptable levels, less than stoichiometric amounts of hydrogen peroxide can often do the job.

Handled properly, hydrogen peroxide is a safe, effective chemical. Its decomposition products are just water and oxygen. In commercial storage, hydrogen peroxide is quite stable, with a natural decomposition rate of less than 1 % per year.

And, with Solvay Chemicals' isotainers and Quick Response Service, hydrogen peroxide now offers a readily-available, easy-to-use antidote for many pollution problems - especially those related to intermittent sulfide problems, low dissolved oxygen levels, and BOD/COD upsets.

# Hydrogen Peroxide

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Solvay Chemicals hydrogen peroxide presents an economical means of detoxification

**Table One: Summary of hydrogen peroxide chemistry: organic compounds.**

Organic Pollutant	pH	Theoretical Weight Ratio H <sub>2</sub> O <sub>2</sub> : Pollutant 100% Basis	Reaction Time	Catalysts
Amines	Alkaline	0.4-0.8:1	Minutes to Hours	None
Aldehydes	Alkaline	0.6:1	Minutes	None
BOD/COD, TOC	Acid	ca. 2:1	Minutes	Fe <sup>+2</sup>
Hydroquinones	Acid	4:1	Minutes	Fe <sup>+2</sup>
Mercaptans, Disulfides	Alkaline	5:1 mole ratio (weight depends on weight of organic Compounds)	Minutes	Chelated Fe <sup>+2</sup> or Cu <sup>+2</sup> generally required.
Phenols, Substituted Phenols Phenols	Acid	94% of phenol oxidized with 2.5:1 mole ratio: 99.9% with 6:1 mole ratio; total destruction to CO <sub>2</sub> at 14:1 mole ratio.	Minutes to Hours	Fe <sup>+2</sup> required. Extent of phenol destruction depends on H <sub>2</sub> O <sub>2</sub> : phenol ratio. Rate of oxidation depends on Fe <sup>+2</sup> Concentration.

**Table Two: Summary of hydrogen peroxide chemistry: inorganic compounds.**

Inorganic Pollutant	pH	Theoretical Weight Ratio H <sub>2</sub> O <sub>2</sub> : Pollutant 100% Basis	Reaction Time	Catalysts
Chlorine	Alkaline	0.48:1	Seconds	Catalyst not required. Reaction will not work if ammonia is present.
Chromium	Acid	0.98:1	Hours	None
Cyanides	Alkaline	1.31:1	Minutes to Hours	Catalyst not required. Metal cyanides some- what resistant. Iron cyanides cannot be treated by peroxide.
Iron	Neutral	0.30:1	Minutes	None
Nitrous Oxides	Acid	1.25:1	Seconds to Minutes	None
Sulfides	Acid Neutral Alkaline	1.00:1 1.03:1 4.25:1	Minutes Minutes Minutes	Fe <sup>+2</sup> can be used to speed reaction time.
Sulfites	All	0.43:1	Minutes	Catalyst not required.
Thiosulfates	Acid Alkaline	0.15:1 (min) 1.21:1 (max)	Minutes Minutes	Patented Solvay Chemicals, Inc. catalyst can be used in alkaline conditions to reduce mole ratio of H <sub>2</sub> O <sub>2</sub> required.

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#### Hydrogen peroxide: a powerful oxidizer

Table Three shows the relative oxidation potential of common oxidants. Hydrogen peroxide has 1.8 volts of actual oxidizing power and is effective in the oxidation of many contaminants.

Unlike products such as hypochlorite and chlorine gas, hydrogen peroxide does not form chlorinated byproducts.

#### Hydrogen peroxide: a bioenhancer

Hydrogen peroxide is a ready source of dissolved oxygen, useful in sweetening wastewater streams and preventing anaerobic conditions that could lead to sulfide formation downstream. Hydrogen peroxide is an excellent antidote for ponds or lagoons that have gone anaerobic.

Injected with nutrients into contaminated soil or groundwater, hydrogen peroxide accelerates biological activity to speed up the natural degradation of contaminants. Used with biological organisms, hydrogen peroxide aids in the degradation of organics that resist destruction by hydrogen peroxide alone.

As a bioenhancer, hydrogen peroxide is an excellent source of oxygen for biological treatment, and it also solves two major problems that can occur with biological systems. Pretreatment of wastewater with hydrogen peroxide can degrade compounds that are toxic to biological systems, like chlorinated phenols. Post-treatment, or “polishing” of effluents from biological treatment can eliminate those refractory compounds that slip through the biological system unchanged. Because most of this detoxification is biological, only small amounts of peroxide are required.

**Table Three: Summary of hydrogen peroxide chemistry: inorganic compounds.**

Species	Relative Oxidation Power (Cl=1.0)
Fluorine	2.23
Hydroxyl radical	2.06
Atomic oxygen (singlet)	1.78
Hydrogen peroxide	1.31
Perhydroxyl radical	1.25
Permanganate	1.24
Hypobromous acid	1.17
Chlorine dioxide	1.15
Hypochlorous acid	1.10
Hypoiodous acid	1.07
Chlorine	1.00
Bromine	0.80
Iodine	0.54

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#### Typical Solvay Chemicals Quick Response applications

**Emergency BOD reduction.** A Texas petrochemicals complex experienced lagoon problems with BOD going out of control. Odor problems generated complaints from neighboring communities, and something had to be done quickly. Within a few days, Solvay Chemicals had an isotainer on-site, had completed safety and applications training, and had begun peroxide dosing. BOD was quickly reduced and the odor abated.

**Sulfide reduction to meet regulations.** Sampling at a Northwestern paper mill showed sulfide concentrations to be greater than 100mg/L, and regulatory pressures were such that the level had to be brought under control immediately. An isotainer of hydrogen peroxide was quickly delivered; dosing began right away, and the sulfide problem was brought under control.

**Seasonal BOD control.** A Southern forest products company experienced BOD increases during the warm summer months every year. To avoid fines for exceeding permit levels, and to avoid the unnecessary capital expenditure of a year-round, permanent treatment system, this company now applies hydrogen peroxide from an isotainer on a seasonal basis.

**Sulfite reduction.** A Midwestern manufacturer experienced sulfite problems and needed a treatment system immediately. This company now uses hydrogen peroxide to destroy sulfites after they are scrubbed with a caustic solution.

**Plant upset.** A Southern pulp mill suffered a plant upset that caused D.O. to drop to undetectable levels. Quick Response with an isotainer of hydrogen peroxide gave this mill the capability to quickly raise D.O. levels to normal.

**Odor alarm.** A Southwestern tire manufacturer sought help with an odor problem in solar evaporation ponds. Regulatory agencies demanded that the odor problem be fixed immediately. Prompt response with an isotainer of hydrogen peroxide enabled this manufacturer to meet those demands.

**Pretreatment of thiosulfate stream.** A West Coast refinery reduced thiosulfate from several hundred mg/L to less than 50 mg/L to meet the requirements of their POTW. The thiosulfate reduction involved dosing hydrogen peroxide and a patented Solvay Chemicals catalyst system.

**Supplementing D.O.** A mechanical pulp mill uses an effluent treatment system that operates in two stages: anaerobic and aerobic. Plagued by hydrogen sulfide where the switch between systems occurs, the mill solved the problem by dosing hydrogen peroxide.

**Sulfide oxidation.** A paper company had problems with sulfide in sludges from a belt filter press. Because the filter rooms were enclosed, hydrogen sulfide posed a serious threat to workers. Hydrogen peroxide injected into the sludge keeps the airborne sulfide below 1 ppm.

**Removal of cyanide from gold-mining effluent.** Normally, this effluent goes into a tailings pond, where the cyanide is oxidized by ultraviolet radiation present in natural sunlight. Occasionally, however, further treatment is required, and hydrogen peroxide dosed from an isotainer solves the problem. The copper naturally present in the effluent catalyzes the reaction.

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#### Solvay Chemicals is dedicated to customer satisfaction

**Safety.** When properly handled, hydrogen peroxide and peroxygen compounds are safe, easy-to-use chemicals. However, as with most powerful chemicals, improper application or handling could create hazardous conditions or cause injuries to personnel. We strongly recommend you contact Solvay Chemicals before experimenting with, designing, installing or modifying an application system, or otherwise using these chemicals.

**Delivery.** Solvay Chemicals ships product from two North American plant sites and a number of strategically located distribution terminals. We operate a fleet of high-purity aluminum and stainless steel railcars as well as stainless steel tank trucks dedicated to hydrogen peroxide transport.

We also can provide stainless steel ISO containers to deliver, store, and dose liquid hydrogen peroxide. These isotainers are ideal for environmental applications at remote sites, and especially suitable for seasonal or short-term needs. In emergency situations, we can use our Quick Response program to get isotainers of hydrogen peroxide to your site right away. For the information you need, call 1-800-SOLVAY-C.

**Quality.** Solvay Chemicals strives to bring you the best in peroxygen products, service and technology. Exceeding, not just meeting, your expectations is the basis for our pursuit of continual improvement.

To demonstrate our commitment, Solvay Chemicals' Quality Management System is registered to the ISO 9001:2000 International Quality Management System Standard. Our registration encompasses the production and distribution of hydrogen peroxide at both of our manufacturing facilities in Deer Park, Texas and Longview, Washington, as well as administrative activities at our Houston headquarters.

Solvay Chemicals will continue to pursue excellence in everything we do. We dedicate ourselves to this effort because we know that our success depends on satisfying you.

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