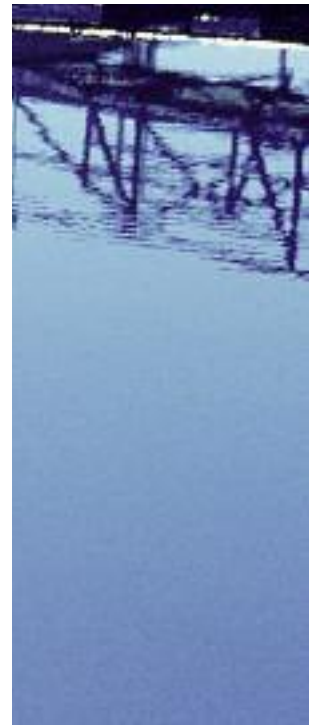




PACT[®] Systems: Cleaning Up Industrial Wastewater in One Step

Water Technologies

SIEMENS



PACT® Systems: Superior Treatment at Lower Cost

If you have to treat industrial wastewater, landfill leachate, highly contaminated surface water or groundwater, take a close look at the PACT® system.

Developed in conjunction with DuPont Co., our PACT® system combines biological treatment and carbon adsorption into a single synergistic treatment step. The result is significant cost and performance advantages over systems such as activated sludge and granular carbon.

There are many other benefits to using a PACT® system. The powdered activated carbon used in PACT® systems improves the performance of biological systems by stabilizing them against upsets and shock loading. PACT® systems control color and odor, and can reduce costs for residuals disposal, and, unlike a membrane bioreactor, can remove soluble organics.

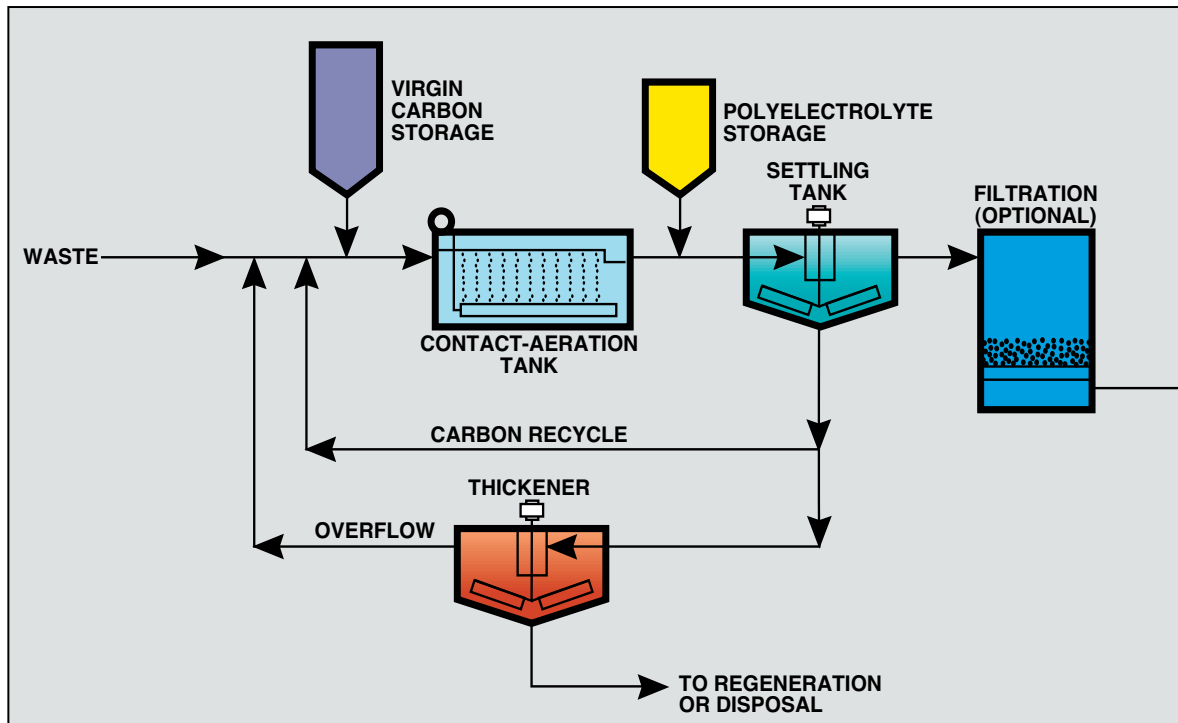
With a PACT® system, you will use far less carbon than with a granular system to achieve equal or better treatment. And, you won't have the problems of prefiltration or column plugging common to granular systems. Further, powdered carbon costs less than granular carbon.

Proven in over 100 installations

PACT® systems are at work today in installations around the world helping users comply with:

- Regulations for organic chemicals, plastics and synthetic fiber (OCPSF) manufacturing discharges.
- The RCRA "land ban" regulations, which forbid land disposal of wastewater, and require treatment of landfill leachates and contaminated groundwater.
- Stringent bio-assay standards for effluent discharges.
- Pre-treatment regulations controlling industrial discharges to POTWs.
- Stringent COD and nitrogen standards for direct effluent discharges.
- Reuse requirements, either directly or as pretreatment for downstream membrane systems

PACT® systems include retrofits as well as new construction. They range from factory-built units treating 600 to 100,000 gallons a day, to field-erected units treating up to one MGD, to custom-designed systems handling as much as 50 MGD. Both single-stage and two-stage PACT® systems are available in continuous or batch flow configurations. PACT® system customers also benefit from more than 30 years of process knowledge, pilot plant testing capabilities and project design expertise.



PACT® System Process (Single Stage, Aerobic)

System operation

In the PACT® system, powdered activated carbon is added to an aerobic or anaerobic biological treatment process. Physical adsorption and biological assimilation occur simultaneously. The carbon “buffers” the biological system against the effect of toxic organics in the wastewater.

In aerobic PACT® systems, influent flows to an aeration tank. Powdered carbon is added, making up a portion of the mixed liquor suspended solids. Following aeration, treated wastewater and the carbon-biomass slurry are allowed to settle.

In anaerobic PACT® systems, powdered carbon is added to wastewater before the anaerobic reactor. Again, the carbon and bio-system work together to achieve a high degree of treatment. As in conventional anaerobic systems, methane gas can be recovered and used for fuel, further enhancing energy efficiency.

Following treatment, a portion of the carbon and biomass slurry is wasted to solids handling. The choice of solids handling method will depend upon the amount of solids to be disposed of, disposal costs, and

carbon use. Waste solids can be wasted and disposed of as a slurry, dewatered to a compact stable cake, or pumped as slurry to a wet air oxidation unit where the carbon is regenerated and biological solids are destroyed. Wet air regeneration units can operate autothermally, recover carbon, and all but eliminate secondary sludge disposal.

Package Plants: Pre-engineered to save time and system design costs

For smaller municipal and industrial wastewater flows, we offer the economy and convenience of pre-engineered package PACT® systems. Both prefabricated and field erected models are available with design capacities from a few hundred gallons per day up to one MGD on an average flow basis.

Prefabricated package plant Models 25, 55 and 100 are factory assembled skid-mounted systems which include aeration, clarification, spent carbon slurry storage and auxiliary equipment such as pumps, aeration blowers, and motor control. Models 150 to 1000 are circular field-erected plants for larger flows and contain similar equipment. Pre-engineered PACT® package plants are available in both continuous flow and batch systems.



PACT® systems are effective in both aerobic and anaerobic systems.



Batch PACT® plants cut small flow treatment cost down to size

The economics of a PACT® system becomes even more significant when it's merged with the popular batch operation method of treatment referred to as a sequencing batch reactor or SBR. Within a treatment cycle that can be completed in less than five hours, wastewater is aerated, settled and decanted—all in the same tank. The costs of separate clarification and return sludge equipment are eliminated.

Batch PACT® plants are sized for small flow operations and priced accordingly; you don't have to buy more treatment capacity than you need. And, the self-contained single-unit design opens up a host of new wastewater management options.

Batch PACT® plants can also save installation and start-up costs. They arrive on site, ready to hook up and operate, and their above-ground design reduces site preparation costs and virtually eliminates excavation and construction costs.

Pick a unit ideal for your specific application and capacity requirements. Batch PACT® plants are prefabricated and shipped to you in various sizes designed to fit your treatment needs. The smallest unit (Model B12) measures 12' x 8.5' x 11.5' and has a maximum capacity of 12,000 gallons of wastewater per day. Another popular unit, Model B140 measures 12' x 12' x 55' and can handle flows up to 140,000 gallons per day.

PACT® systems have been applied to a variety of wastewaters:

- Municipal
- Joint municipal-industrial
- Industrial
- Hazardous
- Leachates from landfills
- Contaminated groundwater/surface runoff

Here is a representative sampling of typical applications and performance of the PACT® system:

Organic Chemicals Wastewaters – PACT® systems are in use at many organic chemicals, plastics, synthetic fibers, solvents, dye and pesticide manufacturing sites, both for pretreatment and direct discharge. At a Louisiana specialty chemical plant, a two-stage aerobic PACT® system meets the organic and effluent toxicity-based requirement for discharge to the Mississippi River.

Pesticide Wastewaters – A wastewater containing 19 pesticides in concentrations of more than 3,400 parts per million is treated with the PACT® system. The PACT® system achieves COD reductions of better than 99 percent, and total pesticide reduction of 99.8 percent.

Contaminated Groundwater – PACT® systems have effectively treated contaminated groundwater. Near Los Angeles, CA, a batch-operated PACT® system achieves COD and BOD removals of better than 99 percent from groundwater contaminated by a mobile home products and paint manufacturing plant.

Landfill Leachates – With landfill regulations tightening, PACT® systems are being applied to leachates from both municipal solid waste and hazardous waste landfills. At a combined hazardous and municipal landfill site near Los Angeles, CA, a PACT® system was installed in 1988 after it was evaluated lowest in cost and land usage and superior in treatment stability when compared with other systems.

Petroleum Refinery and Petrochemical Wastewaters – The PACT® system is being used to treat wastewaters from petroleum refining and petrochemical plants. At several refineries and petrochemical plants in the US and globally, the PACT® system is being used to meet a number of regulatory requirements, including bio-assay, organics and COD, or it is being used for water reuse purposes.



Pilot testing proves the effectiveness of PACT® system treatment for specific applications.

Pilot and treatability testing

In order to take full advantage of the flexibility of the PACT® system, we offer complete pilot testing and treatability studies. A testing program can be designed to suit your wastewater treatment needs.

Treatability testing equipment includes bench scale and frame-mounted pilot units which can be operated at our test facilities in Wisconsin or at your site. In addition, portable PACT® system pilot plants are available, with or without carbon regeneration. Testing can be done in all modes: aerobic, anaerobic, single-stage, or two-stage.

The pilot equipment is supported by our analytical laboratory—one of the best-equipped facilities in the United States for analysis of industrial, municipal, and hazardous wastewaters, waters, and sludges. Also, for handling and storage of waste samples, we operate a fully RCRA-permitted TSD facility.

We have years of experience conducting treatability studies on a complete range of wastewaters. Siemens Water Technologies can work with you on conceptual designs, screen your wastewater, and design a cost-effective system to bring your operation into compliance with environmental regulations. The company's experience assures reliable scaleup from laboratory and pilot plant data to sound working designs.

PACT is a trademark of Siemens, its subsidiaries or affiliates.

The information provided in this brochure contains merely general descriptions or characteristics of performance which in actual case of use do not always apply as described or which may change as a result of further development of the products. An obligation to provide the respective characteristics shall only exist if expressly agreed in the terms of the contract.

©2009 Siemens Water Technologies Corp.

ZP-PACT-BR-0409

Subject to change without prior notice.