

# Ocean Wastewater Discharge in the State of California Report and Inventory Prepared by Heal the Ocean

February 2010

<http://www.healtheocean.org/>

## Additional References, Summaries, and Sources

### Wastewater Treatment and Plant Operation

- i. Tertiary Wastewater Treatment Technology
- ii. On-site Wastewater Treatment Technology
- iii. Wastewater Treatment Plant Energy Consumption and Production

---

### Wastewater Treatment and Plant Operation

#### **Castelazo, Molly, Water Recycling and Reuse: Technologies and Materials, Report MST051A (2006) March (accessed October 2009)**

"BCC conducted this study specifically to look at this important industry and how it is growing and responding to water conservation efforts around the world. This important report offers a roadmap for new developments in the way we deal with one of our most precious natural resources. Only by analyzing the water recycling and reuse industry as it is today and by considering the factors that drive demand for recycling and reuse technologies tomorrow may we chart an informed path into the future."

<http://www.bccresearch.com/report/MST051A.html>

#### **Certified Biosolids Management Systems: A Compendium of Biosolids - EMS Success Stories. National Biosolids Partnership website (accessed December 2009).**

The National Biosolids Partnership (NBP) is an alliance of the National Association of Clean Water Agencies (NACWA) and Water Environment Federation (WEF), with advisory support from the U.S. Environmental Protection Agency (EPA). "The Partnership is committed to developing and advancing environmentally sound and sustainable biosolids management practices that go beyond regulatory compliance and promote public participation in order to enhance the credibility of local agency biosolids programs and improved communications that lead to public acceptance." // Environmental Management Systems (EMS).

<http://www.biosolids.org/docs/source/uses.pdf>

#### **Drinan, J.; Whiting, N., Water & Wastewater Treatment: a guide for the nonengineering professional. CRC Press (2001), Boca Raton.**

Problems facing WWTP management, urban water cycle, regulation, sources, treatment overview, advanced treatment, discharge, solids disposal.

<http://books.google.com/books?id=2z24NRadPMkC&printsec=frontcover#v=onepage&q=&f=false>

#### **Guidelines for Water Reuse, U.S. Environmental Protection Agency, Municipal Support Division, Office of Wastewater, 2004**

The 2004 Guidelines for Water Reuse examine opportunities for substituting reclaimed water for potable water supplies where potable water quality is not required.

<http://epa.gov/nrmrl/pubs/625r04108/625r04108.pdf>

#### **Nezlin, N., Wastewater discharge plumes in the Southern California Bight. Ocean Sciences Meeting, Feb 2010, SCWRRP website (accessed Jan 2010).**

This study analyses 10+ years of oceanographic observations in the vicinity of the offshore outfalls discharging treated effluent produced by the Publicly Owned Treatment Works (POTWs) plants located in the Southern California Bight, densely populated urbanized area. Oceanographic and water quality data were collected on quarterly basis by local agencies (Oxnard, Los Angeles, Orange County and San Diego) and analyzed in parallel with ocean color satellite imagery and oceanographic and meteorological data collected by National Data Buoy Center moorings.

[ftp://ftp.sccwrp.org/pub/download/DOCUMENTS/ConferencePresentations/Ocean2010\\_Nezlin\\_WastewaterDischarge.pdf](ftp://ftp.sccwrp.org/pub/download/DOCUMENTS/ConferencePresentations/Ocean2010_Nezlin_WastewaterDischarge.pdf)

**Primer for Municipal Wastewater Treatment Systems, United States Environmental Protection Agency, September 2004**

Primer for Municipal Wastewater Treatment Systems. The basic function of the wastewater treatment plant is to speed up the natural processes by which water purifies itself. In earlier years, the natural treatment process in streams and lakes was adequate to perform basic wastewater treatment. As our population and industry grew to their present size, increased levels of treatment prior to discharging domestic wastewater became necessary.

<http://www.epa.gov/npdes/pubs/primer.pdf>

**Recycled Water: Regulations and Guidance, California Department of Public Health website (accessed August 2009).**

Compilations of CDPH's recycled water regulations and related statutes are included in the Drinking Water Program's Law Book. The web page contains draft regulations and guidance documents for water recycling.

<http://www.cdph.ca.gov/certlic/drinkingwater/Documents/Recharge/DraftRechargeReg2008.pdf>

**Sewage treatment – Wikipedia summary**

Basic summary of sewage treatment, or domestic wastewater treatment.

[http://en.wikipedia.org/wiki/Sewage\\_treatment](http://en.wikipedia.org/wiki/Sewage_treatment)

**Technical Learning College, Water Treatment Continuing Education, Professional Development Course, 2006, online (accessed October 2009)**

Useful summaries and illustrations of wastewater treatment basics.

<http://www.scribd.com/doc/8065008/Water-Treatment>

**Tchobanoglous, G., et al, Wastewater Engineering: Treatment and Reuse, 4<sup>th</sup> Edition. Metcalf & Eddy (2003).**

Text book that gives a general overview on regulations, concerns, reclamation/reuse, biosolids, constituents, toxicity, VOC-Volatile organic compound removal, advanced treatment, disinfection, waste disposal, performance concerns.

<http://books.google.com/books?id=L1MAXTAKL-QC&printsec=frontcover#v=onepage&q=&f=false>

**Treatment Technology Report for Recycled Water, State of California Division of Drinking Water & Environmental Management, February 2009 (living document)**

"This document has been developed to serve as a reference source for those seeking information concerning technologies that have been recognized by the California State Department of Public Health (CDPH) as being acceptable for compliance with treatment requirements of the California Recycled Water Criteria. NOTE: The former California Department of Health Services became the CDPH effective July 1, 2007."

<http://www.cdph.ca.gov/certlic/drinkingwater/Documents/DWdocuments/RecycledWaterTechnologylisting2-09.pdf>

**University of Granada, New System of Wastewater Treatment Could Reduce the Size of Treatment Plants by Half. Science Daily (2007) Aug. 10.**

A group of researchers from the University of Granada has come up with a wastewater treatment system which has three clear advantages with respect to systems currently used: it is possible to obtain cheaper water of a higher quality, it considerably reduces the size of treatment plants (by more than half) and it minimizes the resulting mud production.

<http://www.sciencedaily.com/releases/2007/08/070809095155.htm#>

**Waterwebster – web portal for news and information about water. Wastewater web page**

<http://www.waterwebster.com/Wastewater.htm>

**World Health Organization Guidelines for the Safe Use of Wastewater, Excreta and Greywater.**

Use of greywater and treated water in agriculture. Health risks, policy, regulation, treated solids as fertilizer, minimum level standards.

[http://www.who.int/water\\_sanitation\\_health/wastewater/gsuww/en/index.html](http://www.who.int/water_sanitation_health/wastewater/gsuww/en/index.html)

---

*(See following pages for references on Tertiary Wastewater Treatment Technology, On-site Wastewater Treatment Technology, and Wastewater Treatment Plant Energy Consumption and Production.)*

## i. Tertiary Wastewater Treatment Technology

**Membrane Separation and Treatment. Clean Water Program, Nanyang Technological University, Stanford University, Singapore PUB webpage (accessed October 2009).**

Page from 2002-2005 research partnership website on aquifer storage & recovery and additional water recycling topics including analytics.

<http://www3.ntu.edu.sg/CWP/mst.htm>

**Ng Wun Jern, Innovative Water Reclamation Technology. Civil Engineering Newsletter (2001), National University of Singapore.**

A review of advanced technologies like membrane filtration, granular activated carbon adsorption, ultra-violet disinfection and advanced oxidation.

<http://www.eng.nus.edu.sg/civil/whatsnew/cenews/01jan.pdf>

**Loosdrecht, M.; Clement, J., eds., 2nd International Water Association Leading-Edge Conference on Water and Wastewater Treatment Technologies, IWA Publishing (2004), London.**

Scientific research and reports describing the future of Wasterwater treatment techniques. Highly detailed, very specific, very technical.

<http://books.google.com/books?id=AtIIBmlc018C&printsec=frontcover#v=onepage&q=&f=false>

**U.S. EPA EPA Capsule Report, Reverse Osmosis Process. Office of Research and Development, EPA/625/R-961009 (1996) September.**

In the reverse osmosis (RO) process, water passes through a membrane, leaving behind a solution with a smaller volume and a higher concentration of solutes. The solutes can be contaminants or useful chemicals or reagents, such as copper, nickel, and chromium compounds, which can be recycled for further use in metals plating or other metal finishing processes. The recovered water (permeate) can be recycled or treated downstream, depending on the quality of the water and the needs of the plant.

<http://www.epa.gov/nrmrl/pubs/625r96009/625r96009.pdf>

---

## ii. On-site Wastewater Treatment Technology

**Biolytixwater - "Australasia's most awarded sewage system." Commercial website (accessed October 2009).**

"Biolytix carefully researched the reasons for the problems and high operating and maintenance costs of mechanically aerated sewage treatment systems. And, rather than working to marginally improve on their inefficiency, we spent millions of dollars to develop a totally new way of treating wastewater. The result is the BioPod "ecosystem in a tank". From the outset, the BioPod was engineered to be robust and built to last. It avoids the mechanical complexity and problems of conventional systems, while significantly reducing the on-going costs. This has led to the BioPod becoming Australasia's most awarded on-site wastewater treatment system. Household systems, commercial and international projects."

<http://www.biolytix.com.au/residential/products/>

---

## iii. Wastewater Treatment Plant Energy Consumption and Production

**Energy Efficiency at Water and Wastewater Facilities, U.S. EPA Region 9 Sustainable Infrastructure and Climate Change Initiative.**

U.S. EPA Region 9 Water Division recently reorganized to establish the Infrastructure Office to focus on increasing the sustainability of our wastewater and drinking water facilities by helping them become more energy and water efficient. We offer technical and financial assistance to save energy and reduce water use, greenhouse gas emissions (GHG), and costs while improving wastewater effluent quality. We have developed a program to help keep wastewater and drinking water utility staff and management aware of all the resources available to make their facilities more energy and water efficient.

[http://www.waterboards.ca.gov/water\\_issues/programs/npdes/docs/energyflyer\\_epa.pdf](http://www.waterboards.ca.gov/water_issues/programs/npdes/docs/energyflyer_epa.pdf)  
[www.epa.gov/region09/waterinfrastructure](http://www.epa.gov/region09/waterinfrastructure)

**Logan, Bruce E., Energy Sustainability of the Water Infrastructure. Clarke Prize Lecture 2009, National Water Research Institute. Proprietary summary of cogeneration technologies.**

The challenge to the water community is how to achieve energy sustainability of our water infrastructure while relying only on methods of energy production that are carbon neutral. We can do this partly by exploiting an unused energy resource: the organic matter present in various domestic and industrial wastewaters.

<http://www.nwri-usa.org/pdfs/2009ClarkeLecture.pdf>

**Ventura Regional Sanitation District Launches New Biosolids Drying and Electric Generation Facility. Electric Energy Online (accessed November 2009).**

The Ventura Regional Sanitation District (VRSD) announces the start-up of its new Biosolids Drying and Electric Generation Facility. Powered by landfill gas, this unique system recycles 100 percent of its resources to provide a regional biosolids management solution and generate renewable energy for the local power grid. **Ventura, November 13, 2009** -

[http://www.electricenergyonline.com/?page=show\\_news&id=122559](http://www.electricenergyonline.com/?page=show_news&id=122559)

**Ventura Sanitation District goes green with biosolids project. Ventura County Reporter Online (accessed November 2009).**

Ventura Biosolids facility - opened Nov 19, 2009: \$19 million prototype facility, funded by the district, is composed of several trash hoppers, burners and generators that are designed to take wastewater and sewer plant solids, known as biosolids — a mostly aqueous, sludgy byproduct — and treat them for use as a fertilizer cover in the landfill so that existing trash can be better decomposed. Biosolids are formulated through wastewater treatment plants, then shipped into the landfill.

[www.vcreporter.com/cms/story/detail/sanitation\\_district\\_goes\\_green\\_with\\_biosolids\\_project/7151/](http://www.vcreporter.com/cms/story/detail/sanitation_district_goes_green_with_biosolids_project/7151/)

**Water & Energy Efficiency in Water and Wastewater Facilities. U.S. EPA Region 9 web page (accessed Jan 2010).**

Combined heat and power (CHP), also known as cogeneration, is an efficient, clean, and reliable approach to generating power and thermal energy from a single fuel source. Wastewater treatment facilities that have anaerobic digesters create methane gas as a by-product of digestion of biosolids. Currently, a number of these facilities release methane gas by flaring, converting methane to CO<sub>2</sub> and releasing it into the environment. Methane gas, however, is a good source of energy. By installing a CHP system designed to meet the thermal and electrical base loads of a facility, CHP can greatly increase the facility's operational efficiency and decrease energy costs. At the same time, CHP reduces the emission of greenhouse gases, which contribute to global climate change.

<http://www.epa.gov/region09/waterinfrastructure/technology.html>