Sewper Rx
From Beginning to End

by Mary Lynn Lytal

Manufacturing Process:

Sewper Rx is a mixture of bacterial species, grown under stressful conditions, that give them additional abilities not found in naturally occurring seed bacteria. Those abilities include anhydrobiosis (the ability to survive drying, allowing for easier delivery and longer shelf life), enhanced sludge and odor reduction, foam reduction and nitrogen and phosphorus removal, all without alterations to the plant or addition of chemicals, and using significantly less electricity. The bacteria undergo changes in their DNA allowing both the process and any resulting bacteria to be patented **(U.S. Patent 6884351).**

Sewper Rx within a Wastewater Plant:

1. **Aeration Basin:** (To achieve all of the benefits from **Sewper Rx,** plants should be operated with the least **D.O.** that will yield good results, added only at the beginning of the process and usually less than **4 ppm**.)
    a) **Odor Reduction or complete elimination** occurs within 24 to 72 hours. (Caused by **rapid breakdown of Ammonia and Sulfur compounds).**
    b) **Simultaneous Nitrification and Denitrification** achieves complete nitrogen cycle without additional steps in treatment process, resulting in **removal of most of the Nitrogen in effluent.**
    c) **Luxury Phosphorus Uptake** allows **Sewper Rx** bacteria to **remove and encapsulate excess phosphorus** from effluent and then follow the food source (solids), resulting in **very low levels of Phosphorus in effluent.**
    d) **Reduction of Pathogens:** (Lab tests prove **Sewper Rx** out competes **Coliform, Salmonella, Shigella** and other pathogens for food, reducing their numbers significantly, **even before disinfection.)**
    e) **Dramatic Solids Reduction:** As **Carbon** solids within the plant rapidly breakdown, they release **CO2,** which is **dissolvable in water,** producing **carbonates and bicarbonates** adding **alkalinity** to the water.

2. **Clarifier: Rapid and thorough settling** caused by higher **alkalinity** allows very high quality effluent to be discharged and virtually all solids to be directed for further treatment.
    a) **Effluent**: < 3 and <4 mg/L BOD and TSS and <1 mg/L **Phosphorus** and various forms of **Nitrogen** are typical results when **Sewper Rx** is firmly established (**3 to 4 weeks**) and other recommendations are followed (**low DO levels and a young sludge age**).
    b) Solids are directed to sludge holding tanks or digesters for further reduction, then, when available, on to a drying bed or belt press for **on-site storage in cake form. Carbon continues to reduce after solids are removed from plant.**
3. **Less Dissolved Oxygen** is needed for all processes within the system resulting in significant **electrical savings**. Once the excess solids have been reduced, **air to the digesters can be turned off.**

Reduction of Stored Solids and Recycling of Nutrients:

Approximately 70% or more reduction in total volume of solids occurs when stored on site for at least one month **after removal from plant**. Longer storage results in less volume of solids and higher concentration of nutrients.

Sludge cake from the Town of Lockport, LA was stored in onsite storage area. This picture was taken February 22, 2007. The operator of this plant prefers storing it outside of the plant and has space to do so.

This picture taken one month later on March 23, 2007, is of the same sludge pushed up against the far wall of the storage area. White patches are a mixture of minerals. This sludge contains almost all of the phosphorus that would have been in the effluent.

Alkalinity causes Crystalization and Precipitation of Phosphorus and other Minerals from the water into the solids, where **Phosphorus can be recycled**. **Excess Phosphorus** in our waterways and oceans is the main cause of **eutrification (Dead Zones)**. **Phosphorus mining is the most expensive and energy intensive of mining processes. Phosphorus** is a necessary but **very expensive nutrient for agriculture (price increased 800% in 2008 alone).**

Ideal conditions for precipitation of Phosphorus **(reduction or absence of Sulphur, Nitrogen, Carbon and Dissolved Oxygen)** occurred earlier in the process and are only possible because of the enhanced abilities of **Sewper Rx.**

Results of lab tests below illustrate the **further reduction of solids** and **concentration of minerals** after **sludge is removed from the plant** and **stored on site.**

CLIENT:	Sludge Solutions International	**Collection Date:**	11/22/2011 9:00:00 AM
Project:	SEWPER RX Test		
Lab ID:	11110917-002	**Matrix:**	SOIL
Client Sample ID	Lockport Sludge #1 White		

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
METALS IN SOIL OR SLUDGE BY ICP				**SW6010B**	**SW3050B**	Analyst: **STS**
Calcium	8,120	266		mg/Kg	10	12/1/2011 1:41:55 PM
Magnesium	917	26.6		mg/Kg	1	12/1/2011 1:37:50 PM
Manganese	3,630	53.2		mg/Kg	100	11/30/2011 2:26:11 PM
Potassium	375	266		mg/Kg	1	12/1/2011 1:37:50 PM
Sodium	361	266		mg/Kg	1	12/1/2011 1:37:50 PM
Total Phosphorus	12,100	2,660		mg/Kg	100	12/6/2011 4:10:49 PM

Lockport Sludge #1 was a sample of stored dried sludge which contained some of the white material. Notice that all of the minerals tested in #1 are in higher concentrations than Lockport Sludge #2 which were considered “mixed solids”.

Samples #1 and #2 were both taken on the same day from the same sludge and appeared to be completely dry. Yet a 100 g. sample set aside on a shelf weighed only 12 g. after one week of exposure to the air in our lab.

CLIENT:	Sludge Solutions International	**Collection Date:**	11/22/2011 9:00:00 AM
Project:	SEWPER RX Test		
Lab ID:	11110917-003	**Matrix:**	SOIL
Client Sample ID	Lockport Sludge #2		

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
MERCURY IN SOIL OR SLUDGE				**SW7471A**		Analyst: **MXB**
Mercury	0.37	0.10		mg/Kg	1	11/30/2011 4:07:00 PM
METALS IN SOIL OR SLUDGE BY ICP				**SW6010B**	**SW3050B**	Analyst: **STS**
Arsenic	9.72	0.55		mg/Kg	1	11/30/2011 2:10:14 PM
Barium	161	0.55		mg/Kg	1	11/30/2011 2:10:14 PM
Cadmium	0.57	0.28		mg/Kg	1	11/30/2011 2:10:14 PM
Calcium	2,450	27.7		mg/Kg	1	12/1/2011 1:39:54 PM
Chromium	2.34	0.55		mg/Kg	1	11/30/2011 2:10:14 PM
Copper	22.0	0.55		mg/Kg	1	11/30/2011 2:10:14 PM
Lead	3.62	0.55		mg/Kg	1	11/30/2011 2:10:14 PM
Magnesium	288	27.7		mg/Kg	1	12/1/2011 1:39:54 PM
Manganese	1,120	55.5		mg/Kg	100	11/30/2011 2:29:33 PM
Molybdenum	1.40	0.55		mg/Kg	1	11/30/2011 2:10:14 PM
Nickel	1.80	0.28		mg/Kg	1	11/30/2011 2:10:14 PM
Potassium	< 277	277		mg/Kg	1	12/1/2011 1:39:54 PM
Selenium	< 1.11	1.11		mg/Kg	1	11/30/2011 2:10:14 PM
Silver	< 0.28	0.28		mg/Kg	1	11/30/2011 2:10:14 PM
Sodium	< 277	277		mg/Kg	1	12/1/2011 1:39:54 PM
Total Phosphorus	3,550	277		mg/Kg	10	12/6/2011 4:13:45 PM
Zinc	208	0.55		mg/Kg	1	11/30/2011 2:10:14 PM
TOTAL KJELDAHL NITROGEN				**E351.2 #**		Analyst: **SXP**
Total Kjeldahl Nitrogen	865	50.0		mg/Kg	50	12/2/2011 2:10:00 PM

Since **Phosphorus is so valuable** and definitely **worth recycling**, we tested the phosphorus content of the **mixed solids** from the **same storage area** after two more months of processing. The **volume had continued to reduce** and concentration of **Phosphorus had increased by almost 800%.**

CLIENT:	Sludge Solutions International	**Collection Date:**	1/20/2012 3:00:00 PM
Project:	Non-Permit Testing		
Lab ID:	12020804-002	**Matrix:**	SOIL
Client Sample ID	Mixed Solids		

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
METALS IN SOIL OR SLUDGE BY ICP				**SW6010B**	**SW3050B**	Analyst: **STS**
Total Phosphorus	31,800	2,640		mg/Kg	100	3/6/2012 2:16:01 PM

Exceptional quality Class A sludge is possible when **Sewper Rx** is added at the beginning of treatment and solids can be stored until fully processed. There are no complaints of odor or pests from nearby residents.

Available technologies today, including **Enhanced Biological Nutrient Removal, all require additional equipment or processes**, the addition of other species of bacteria (which each perform only one specific function) at various stages of treatment or the **addition of chemicals to accomplish sludge settling** (but which also **produces additional sludge to handle**).

Conditions for Nitrogen and Phosphorus removal are often exact opposites. Trying to achieve these opposite conditions with other technologies is very costly and time consuming**, yet these conditions occur automatically with Sewper Rx.**

Sewper Rx accomplishes the above in the simplest of wastewater systems and actually **reduces operational costs** resulting in **substantial savings for the operators and potentially the consumers.**

Sewper Rx has proven to:

- Increase plant capacity by reducing the amount of solids throughout a wastewater treatment plant (often 70% or more).
- Reduce or eliminate odors.
- Improve settling while reducing or eliminating the need for polymers and chemicals used in the sludge thickening process.
- Reduce the volume of sludge that would otherwise have to be transported to a disposal site.
- Reduce electrical and other operating costs.

Applications:

- Privately owned and Municipal Waste Water Treatment Systems.
  (Lagoons and mechanical systems)
- Package plants and Marine Sanitation Devices for inshore and offshore oil operations
- Agricultural applications
  - Concentrated Animal Feeding Operations (CAFO's)
    - Poultry litter reduction and disease prevention
    - Animal wastes converted to top quality fertilizer
  - Composting Operations
  - Coffee production
- Lake and waterways restoration
- Aquaculture