ClearValue®

The Earth is mostly water.
Our bodies are mostly water.
ClearValue's Innovations improve
our water, our air, our health and our world.

Nutro™ - ClearValue's Bio-Solids Recycling Technology

On February 19, 1993, the National Sewage Sludge Use and Disposal Regulations (Chapter 40 Code of Federal Regulations Part 503 and commonly referred to as the 503 Regulations) were published in the Federal Register. The 503 regulations define treatment methods that transform bio-solids to Class "A" status; Class "A" bio-solids are free of pathogens and Vector attractions. In essence, the Regulation establishes several categories in terms of stabilization, pathogenic content, beneficial reuse and disposal practices for all land-applications. Since 1993, experience has taught that the most reliable methods are the temperature methods and/or chemical methods. The temperature methods include direct heating and thermophillic digestion. However, due to operating costs, direct heating and chemical methods are expensive. Chemical methods require a minimum pH of 12 utilizing an oxidizer, such as lime; this creates a very alkaline product, which is not good for land application. Temperature methods require heating to a minimum of 50 °C for a specified period of time, which is dependent on the amount of temperature above 50 °C. This is expensive.

The most economical method involves Thermophillic Digestion (TD). In comparison, TD is inexpensive. Energy cost is minimal due to the thermophillic process itself. In the case of Aerobic TD (ATAD), digestion occurs exothermically, maintaining temperature once initiated. In the case of Anaerobic TD (ATD), a hydrocarbon gas is produced in digestion, which is sent to fire a boiler to maintain the required temperature. However, while all bio-solids have odor, ATAD and ATD digested bio-solids tend to have significant issues in relation to odor. Further, the dewatering cost of TD Solids (TDS) is much more than that of Mesophillic Digested Solids due to the nature of thermophillic bacteria. This biological difference can make the dewatering cost of TDS expensive rendering ATAD or ATD uneconomical.

ClearValue surmounted the dewatering challenges in U.S. Patent Nos. 5,846,435 and 5,906,750. However, these patents do not incorporate a means of controlling odor. In a separate technological endeavor, ClearValue surmounted the technological challenges associated with sulfides and ammonia in U.S. Patents 5,705,072 and 6,136,193. Finally, in a technological endeavor to control protein degradation, ClearValue developed a stabilizer in U.S. Patent No. 6,066,349. All of these technologies have been combined into a new bio-solids management process, Nutro™, which can be viewed in WO 03/035554.

Nutro™ produces a Class "A" product by thermophillic digestion. The Nutro™ product has no sulfide or ammonia odor; the Nutro™ product looks and smells like soil. Further, being primarily a biological process, the Nutro™ is economical; Nutro™ competes very well with mesophillic systems, operating at much less cost than other attempts to produce a Class "A" product.

ClearValue's Nutro™ Technology/Business at a Typical WWT Plant

Chemical/Bio-Chemical	(R) Raw Material (BP) By-Product (P) Product	Costing	Estimated Contribution Margin	Volume of Use or of Manufacture	Annual Contribution/ EBIT ($M)
1° and 2° Solids	R	$0.000/lb.	N/A	Dependent upon WWT plant	N/A
Nat. Gas - Dry Product	R	$ 6.00/tcf	N/A	Dependant upon final product	N/A
Thiobacillus	P	$15.00/lb.	> $10.00/lb.	Dependent upon operation	≈ 0.010/0.005
Lime	P	$0.060/lb.	> $0.010/lb.	Dependant upon operation	N/A
Polyacrylamide(s)	P	$1.25/lb.	> $0.300/lb.	75% Product Dewatering	0.30/0.20
Liquid Fertilizer	P	$0.00/lb.	> $0.010/lb.	350k lb./D – 128M lb./Yr. @	**1.3 / 0.6**
Cake Fertilizer	P	$0.00/lb.	> $0.050/1b.	180k lb./D – 65 M lb./Yr. @	**3.3 / 1.6**
Dry Fertilizer	P	$0.00/lb.	> $0.200/lb.	11k lb./D - 4 M lb./Yr. @	**0.8 / 0.4**

@ Estimated for a 100 MGD WWTP having a 200 ppm BOD loading, 25% liquid, 50% cake and 25% dry products.

Sales of Nutro™ are to be through established industry distributors, wherein the accepted margin is 20%. Marketing is to be through the American Water Works Association and the local trade associations. In most instances, the municipality is expected to ask ClearValue to take over the bio-solids operations, thereby having a management contract.

ClearValue's Nutro™ Process is an efficacious and efficient means to mange bio-solids, eliminate pathogen transport, provide an economical/organic fertilizer, and recycle nutrients.

ClearValue's Nutro™ Process is a modification of Mother Nature's Process of nutrient management along with a natural, biological means, of pathogen and odor control.

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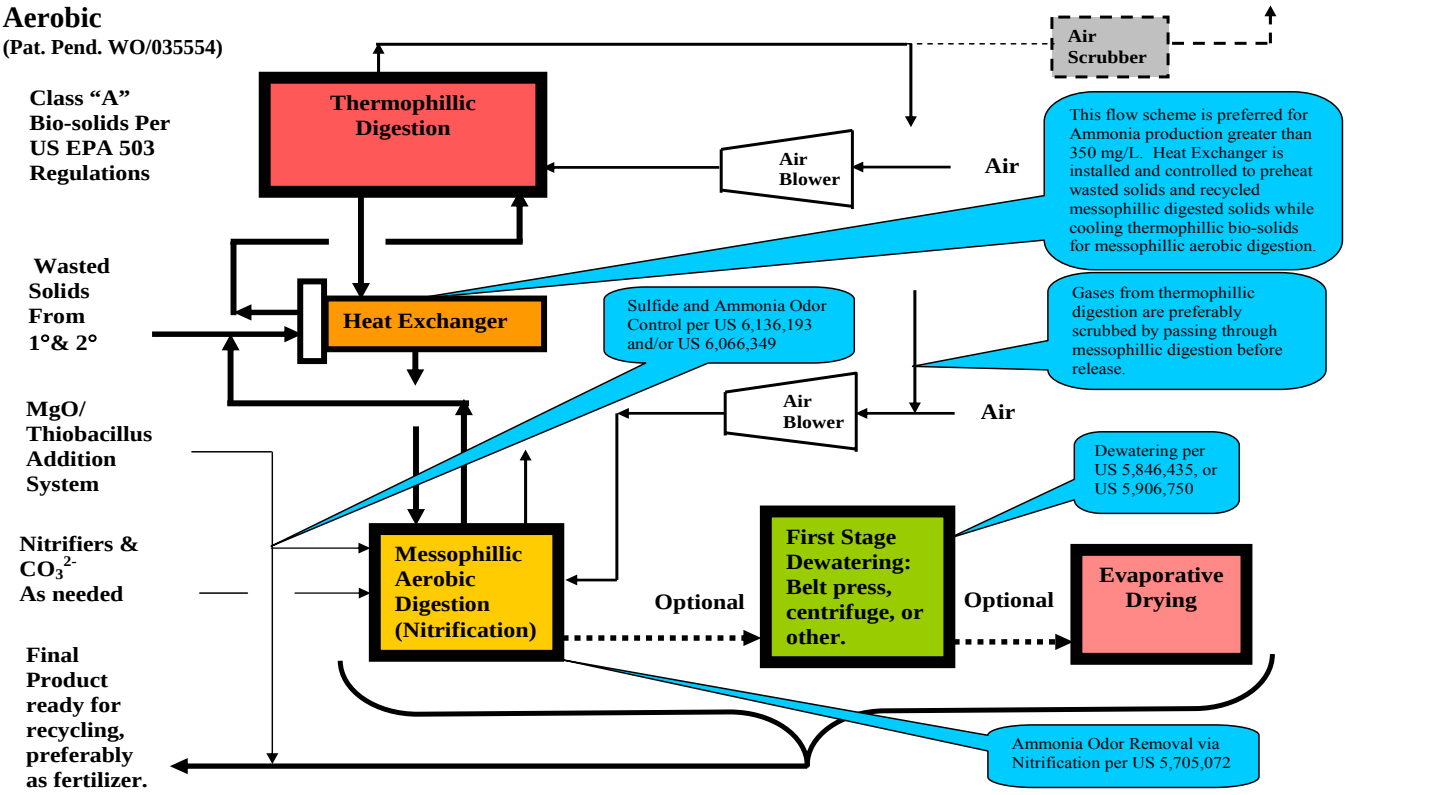
ClearValue ®

Aerobic
(Pat. Pend. WO/035554)



Anaerobic
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