Sludgeprints

One night I dreamed I was walking away from the digesters with the Lord. Many scenes from earlier in the day flashed across my mind.

In each scene I noticed sludgeprints on the concrete. Sometimes there were two sets of sludgeprints, other times there was only one.

This bothered me, because I noticed that during the periods of my life when I was in deep crap, I could only see one set of sludgeprints.

So I said to the Lord:

"Lord, you promised that if I followed you, you would walk with me always. But I have noticed that during the dirtiest, hairiest, stinkiest and trying periods of my life, there has only been one set of sludgeprints on the concrete. Why, when I needed you most, have you not been there for me?"

The Lord replied, "Those times when you have seen only one set of sludgeprints, my child, is when I carried you".

Thinking Outside the Tank

a.k.a – Biosolids Optimization;

Composting Makes Everything Better

Improving Biosolids Handling

Reducing Costs

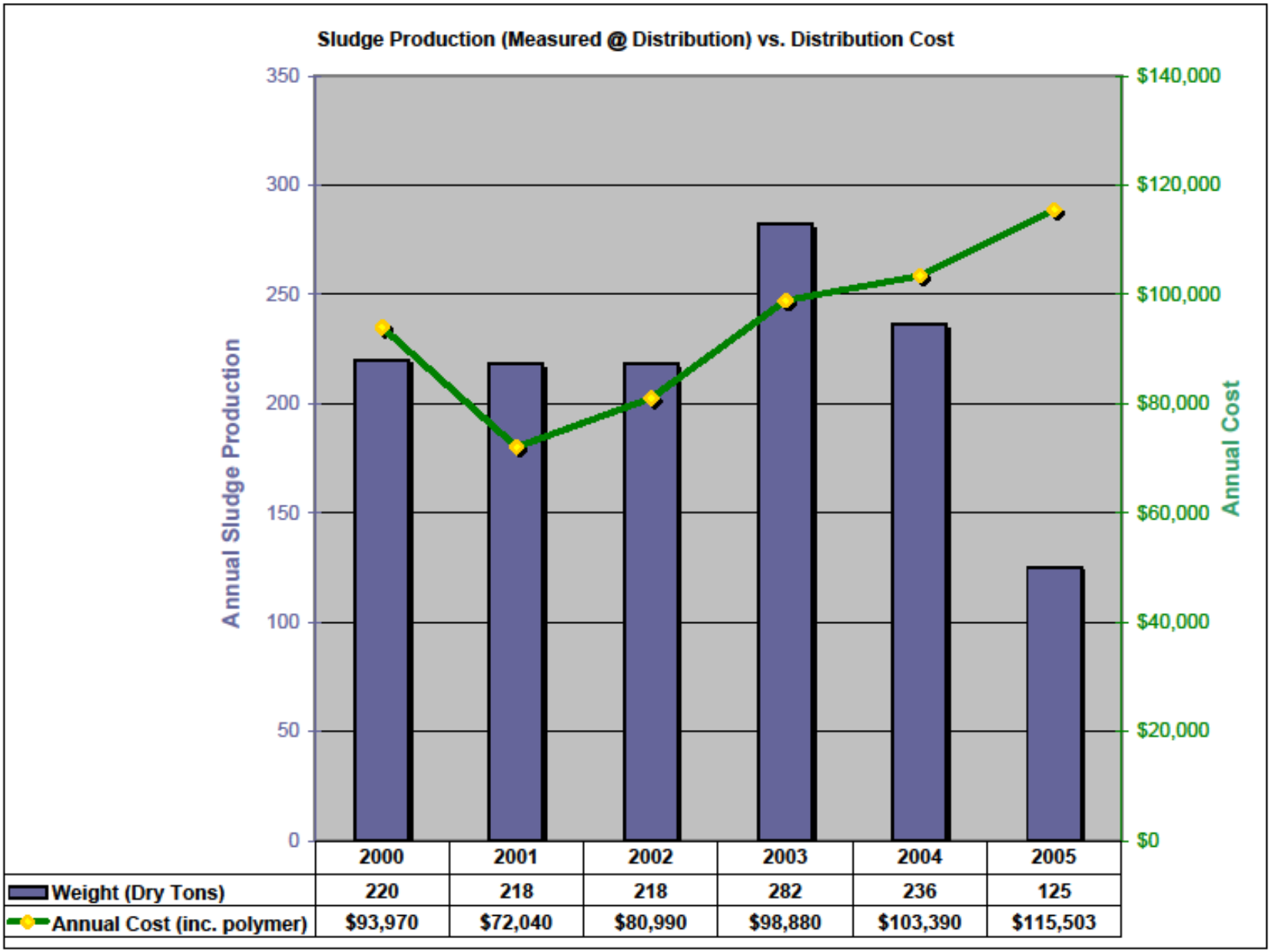
Providing a Valuable Resource

Angola Wastewater Treatment Plant

- Class 3 Facility
- 1.2 MGD Ave. Daily Flow, 1.7 MGD Rated Peak flow
- Partially Combined System
- Primary Clarification
- Activated Sludge
- Aerobic Digesters
- ~1 MG of Sludge Storage (includes digesters
- Industrial Pretreatment

Considerations for Land Application

- Permit
- Local sites for application
- Documentation (cumulative metals loading, nutrients, setbacks, etc)
- Vector Attraction Reduction
- Subsurface Injection
- Solids Inventory – Storage
- Cost
  - If you can't land apply, what are you going to do?



	2000	2001	2002	2003	2004	2005
Weight (Dry Tons)	220	218	218	282	236	125
Annual Cost (inc. polymer)	$93,970	$72,040	$80,990	$98,880	$103,390	$115,503

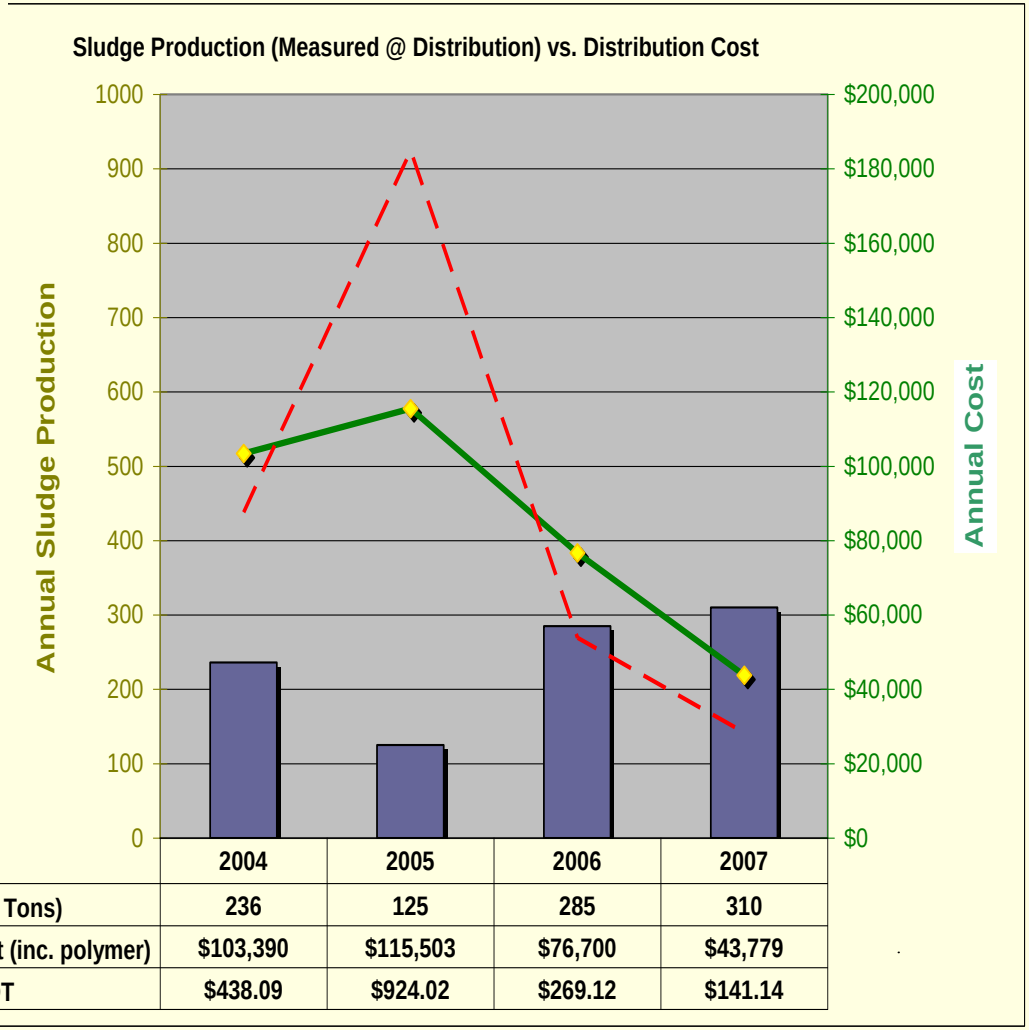
Capital Improvements, Belt Filter Press

Capital Improvements, Belt Filter Press

- Flexibility in Sludge Removal
- Cost Reductions (or at least Hold the Line)
  - Estimated Annual Savings: ~$19,000
  - Project Cost: $425,000
- Jones & Henry Engineers
  - Mason Engineering & Construction
  - Ashbrook 1-Meter Klampress
  - Praestol cationic polymer (BioChem, Inc)

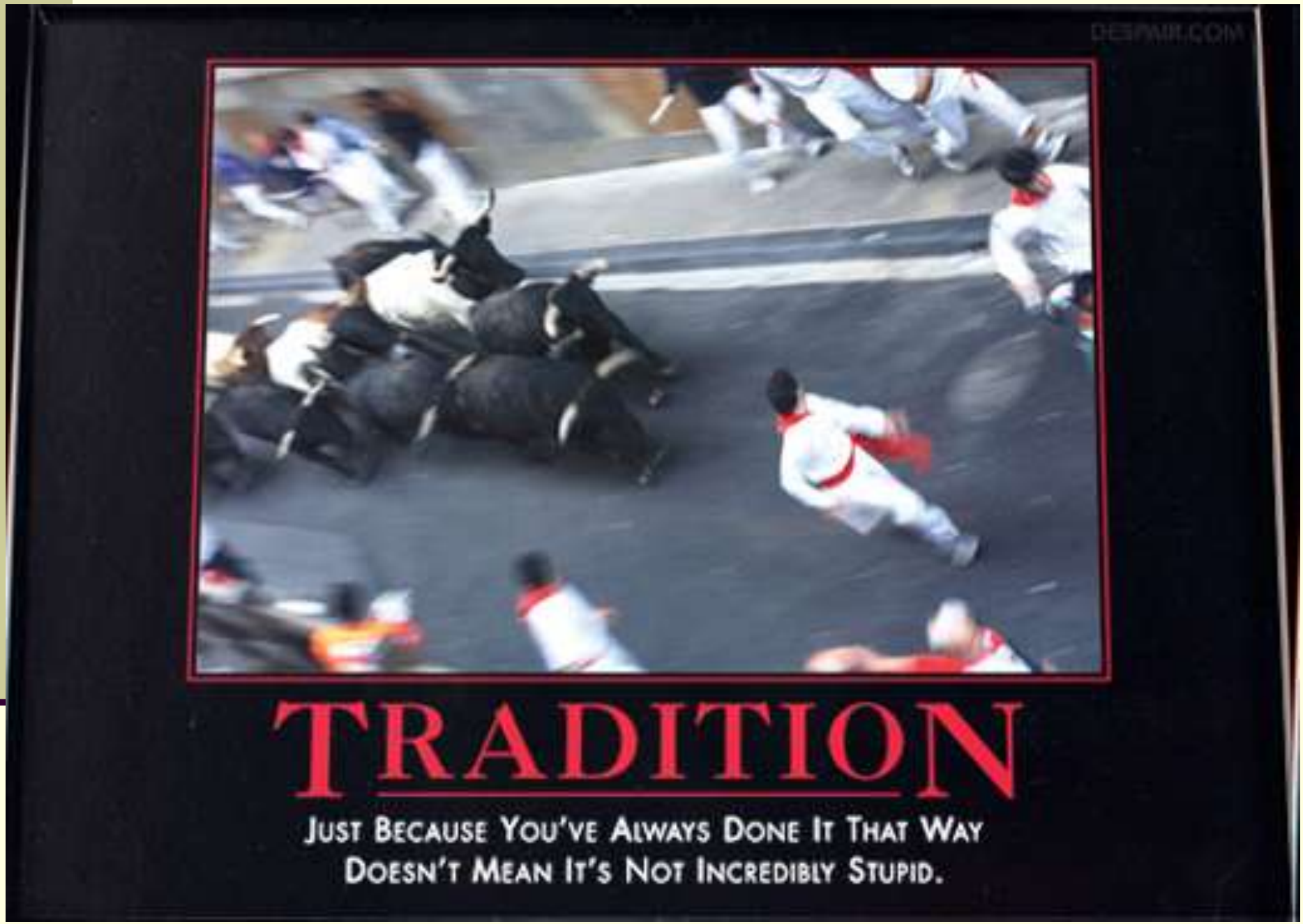
Belt Press Success!

- Actual savings ~$250/DT annually
  - Annual savings around $60,000!
  - Reduces Payback Period to ~7 years.



Pleased with outcome, but

- No more **local** “Beneficial Use”
- “Carbon footprint”
- Paying to send a valuable resource out of the county


TRADITION
JUST BECAUSE YOU'VE ALWAYS DONE IT THAT WAY
DOESN'T MEAN IT'S NOT INCREDIBLY STUPID.

Wait a Minute – We Have Yard Waste!

BROWN BEAR

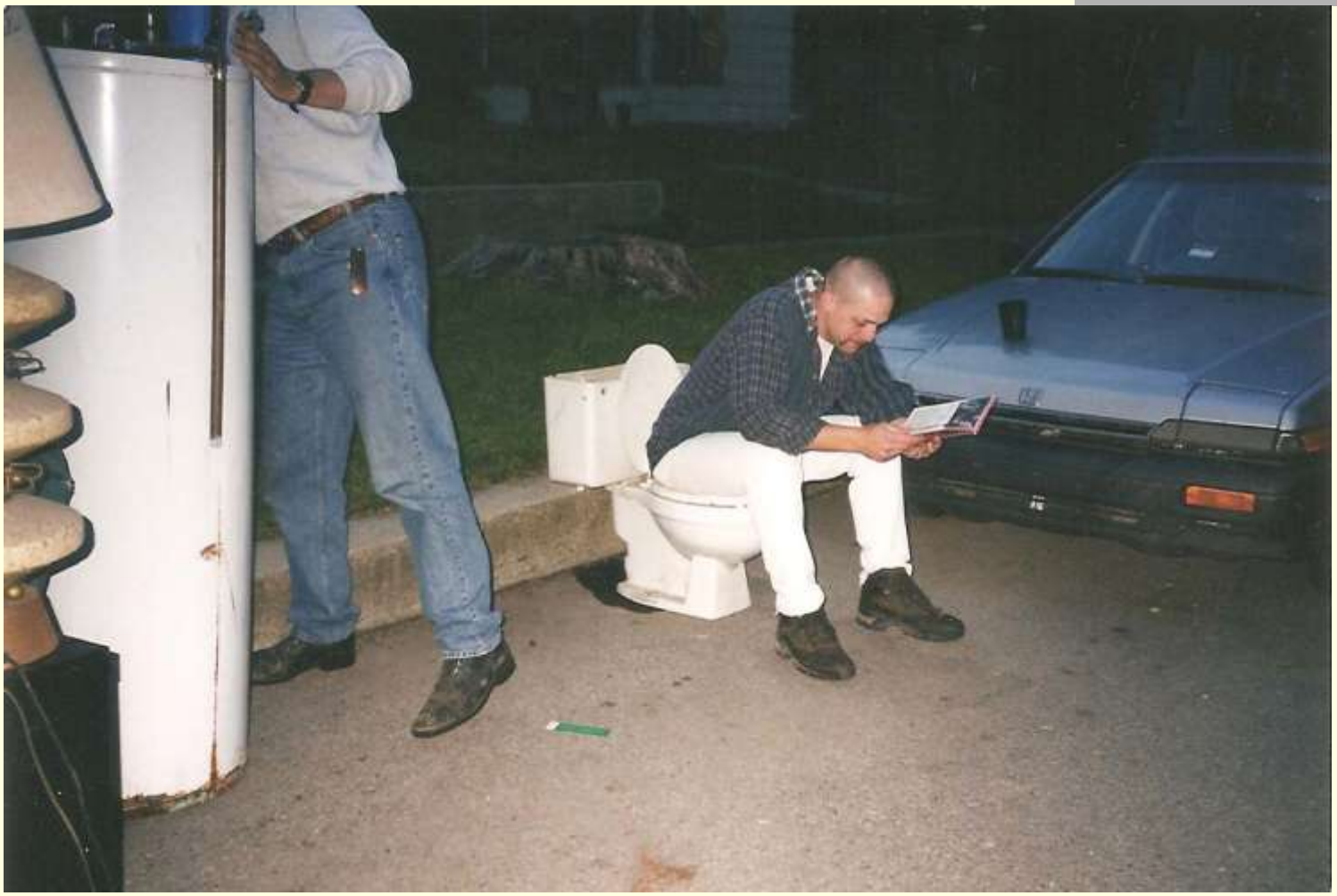
COLD-WEATHER COMMUNITY, BEATRICE, NE, PROVES PRACTICALITY OF YEAR-AROUND COMPOSTING

In 1991 when the City of Beatrice, Nebraska, put a Brown Bear auger tractor to work, their aim was to have a machine which could handle the composting of all the sewage sludge and all the yard wastes produced by the community's 12,994 people. It would be a difficult assignment. In addition to a demanding load, the Brown Bear would have to continue work through weather variations similar to other U.S. cities at Beatrice's 40° north latitude: places like Salt Lake City, Philadelphia, Champaign, IL and Columbus, OH. Twenty degrees below zero occurs in winter, over 100 degrees occurs in summer.

Contrary to thinking common at the time, Beatrice's Water Pollution Control Department had learned previously that

Biosolids come in from the treatment plant everyday, and are mixed with grass, leaves and woodchips.

Research & Development



US Composting Council

USCC Factsheet: Compost and Its Benefits[1]

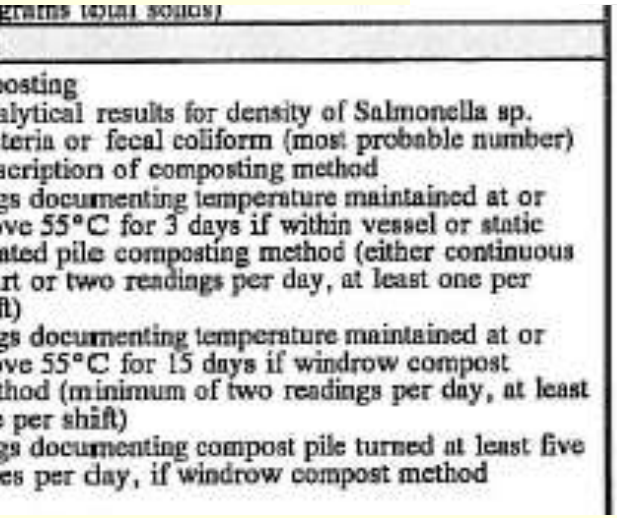
What is Compost?

Compost is the produ
decomposition of orga
through the generatio
it is beneficial to plan
resemblance to the ra

the unique ability to
improve the chemical

Preventing erosion with a compost blanket.

Figure 6. Applying a compost blanket in PA (photo credit: D. Caldwell)



Cooperative Extension Service ▫ The University of Georgia College of Agricultural and Environmental Sciences

Compost Utilization for Erosion Control

Oper

BIOSOLIDS COMPOST:

Information about GroCo

Process

METROGRO

A Product of

The Metro Wastewater Reclamation District

COMPOST

vanced
called

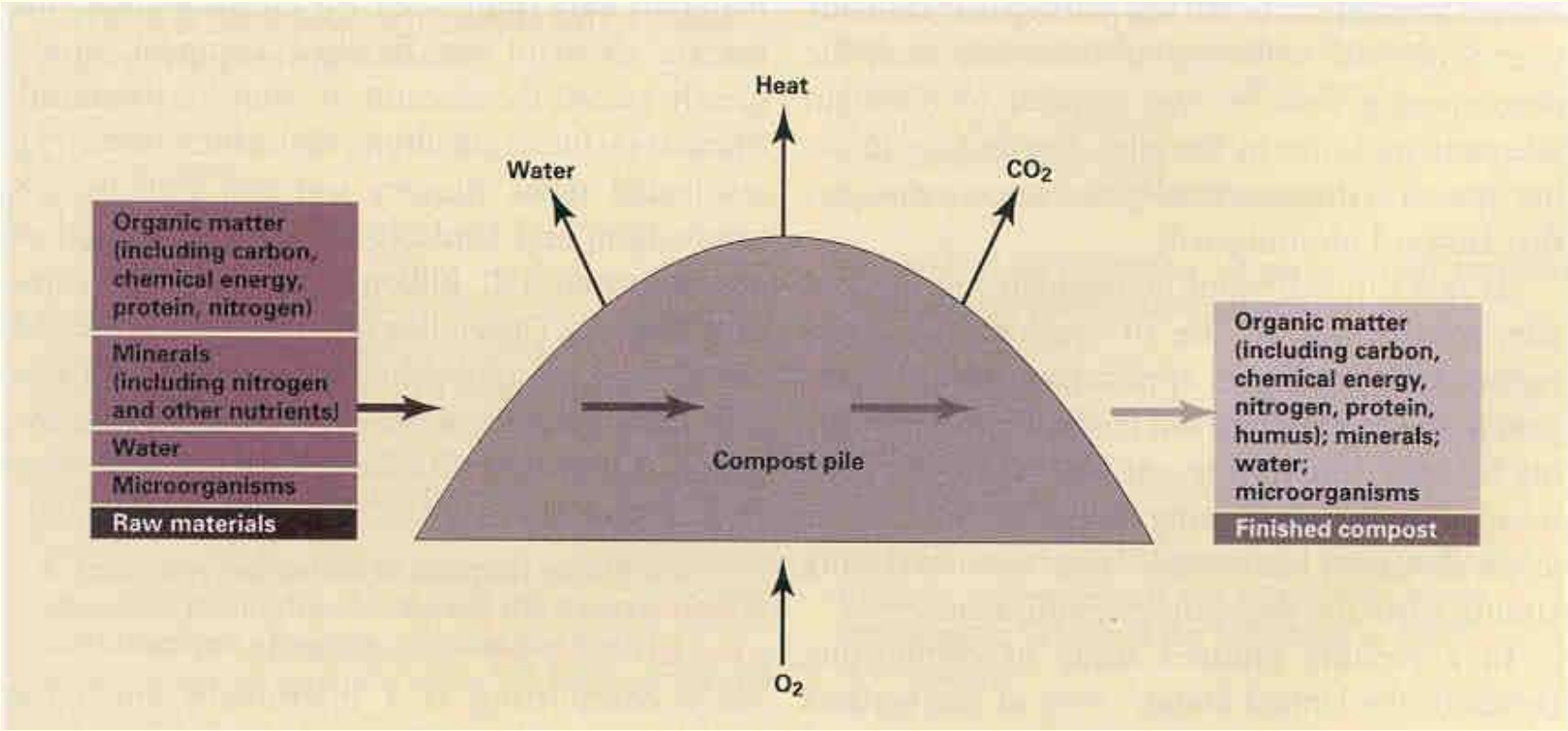
CORNELL WASTE MANAGEMEN INSTITUTE

ent

Rice Hall • Ithaca, NY 14853 • (607) 255

PECTS OF COMPOST QUALITY ASSURANCE

What is Composting?



Compost Pilot Program

- Street Department more than willing to provide leaves & yard waste!
- Tried 5 or 6 different “recipes”
- Overall, project successful
- Formal program would require much more space & hard surface for turning

- Values or ranges of values for operating parameters to indicate consistent pathogen reduction treatment

Alternative A4—Analysis Only

- Analytical results for density of Salmonella sp. bacteria or fecal coliform (most probable number)
- Analytical results for density of enteric viruses (plaque forming unit/4 grams total solids)
- Analytical results for density of viable helminth ova (number /4 grams total solids)

Alternative A5—Processes to Further Reduce Pathogens (PFRP)

- Heat Drying
  - Analytical results for density of Salmonella sp. bacteria or fecal coliform (most probable number)
  - Moisture content of dried sludge < 10 percent
  - Logs documenting temperature of sludge particles or wet bulb temperature of exit gas exceeding 80°C (either continuous chart or two readings per day, at least one per shift)
- Thermophilic Aerobic Digestion
  - Analytical results for density of Salmonella sp. bacteria or fecal coliform (most probable number)
  - Dissolved oxygen concentration in digester ≤ 1 mg/L
  - Logs documenting temperature maintained at 55-60°C for 10 days (either continuous chart or two readings per day, at least one per shift)
- Heat Treatment
  - Analytical results for density of Salmonella sp. bacteria or fecal coliform (most probable number)
  - Logs documenting sludge heated to temperatures greater than 180°C for 30 minutes (either continuous chart or three readings at 15 minute intervals)
- Pasteurization
  - Analytical results for density of Salmonella sp. bacteria or fecal coliform (most probable number)
  - Temperature maintained at or above 70°C for at least 30 minutes (either continuous chart or two readings per day, at least one per shift)
- Composting
  - Analytical results for density of Salmonella sp. bacteria or fecal coliform (most probable number)
  - Description of composting method
  - Logs documenting temperature maintained at or above 55°C for 3 days if within vessel or static aerated pile composting method (either continuous chart or two readings per day, at least one per shift)
  - Logs documenting temperature maintained at or above 55°C for 15 days if windrow compost method (minimum of two readings per day, at least one per shift)
  - Logs documenting compost pile turned at least five times per day, if windrow compost method
- Gamma Ray Irradiation
  - Analytical results for density of Salmonella sp. bacteria or fecal coliform (most probable number)
  - Gamma ray isotope used
  - Gamma ray dosage at least 1.0 megarad
  - Ambient room temperature log (either continuous chart or two readings per day, at least one per shift)
- Beta Ray Irradiation
  - Analytical results for density of Salmonella sp. bacteria or fecal coliform (most probable number)
  - Beta ray dosage at least 1.0 megarad
  - Ambient room temperature log (either continuous chart or two readings, at least one per shift)

Alternative A6—PFRP Equivalent

- Operating parameters or pathogen levels as necessary to demonstrate equivalency to the PFRP
- Analytical results for density of Salmonella sp. bacteria or fecal coliform (most probable number)

Table 8
Recordkeeping Requirements for Vector Attraction Reduction Sludge Processing Options

Option 1—Volatile Solids (VS) Reduction	Option 5—Aerobic Processing(Thermophilic Aerobic Digestion/Composting)
• Volatile solids concentration of raw and final sludge streams (mg/kg) • Calculations showing 38 percent reduction in volatile solids	• Sludge detention time in digester/composting • Temperature logs (at least two readings per day) showing average temperature above 45°C and minimum temperature above 40°C for 14 consecutive days
Options 2 and 3—Bench-Scale VS Reduction	**Options 6—Alkaline Treatment**
• One-time description of bench-scale digester • Time (days) that sample was further digested in bench-scale digester (30 days for aerobically and 40 days for anaerobically digested sludge) • Temperature logs (at least two readings per day) showing temperature maintained at 20°C for aerobically or between 30°C and 37°C for anaerobically digested sludge • Volatile solids concentration of sludge (mg/kg) before and after bench-scale digestion	• Logs demonstrating hours pH of sludge/alkaline mixture was maintained (12 for 2 hours and 11.5 for an additional 22 hours) • Amount of alkaline added to sludge (lbs or gals) • Amount of sludge treated
Option 4—Specific Oxygen Update Rate	**Options 7 and 8—Drying**
• Dissolved oxygen readings for sludge sample over 15-minute intervals (mg/L) • Temperature logs at beginning and end of DO readings showing test was conducted at 20°C • Total solids for sludge sample (g/L) • SOUR calculations (mg/g)	• Results of percent solids (dry weight) test • Presence of unstabilized solids generated during primary treatment

Pilot Project to Permitted Process

- Preparation of Permit Application documents
  - Application (check website for most current version)
  - Documentation of Vector Attraction Reduction Method
  - Management Plan/Operational Plan
    - Include QA/QC methods
  - Sample Product Information Sheet
  - Sample Forms to Document Method
  - Analytical Data

Construction of New Pads

- Street Department staff constructed pads
- 100’ x 150’ Yard/leaf waste storage pad
- 250’ x 150’ Composting pad
- Perimeter berm to hold & treat runoff

Let the Composting Begin!

- Layer Ingredients:
  - Leaves
  - Biosolids
  - Chipped Wood (when avail.)
- Turn with Loader
- Monitor Temperatures
  - 55° C (131° F)
  - 2x/day
  - 15 Consecutive Days > 55° C
- 5 Turnings During the 15 Day Period
- 50-60 Days in Active Composting Phase

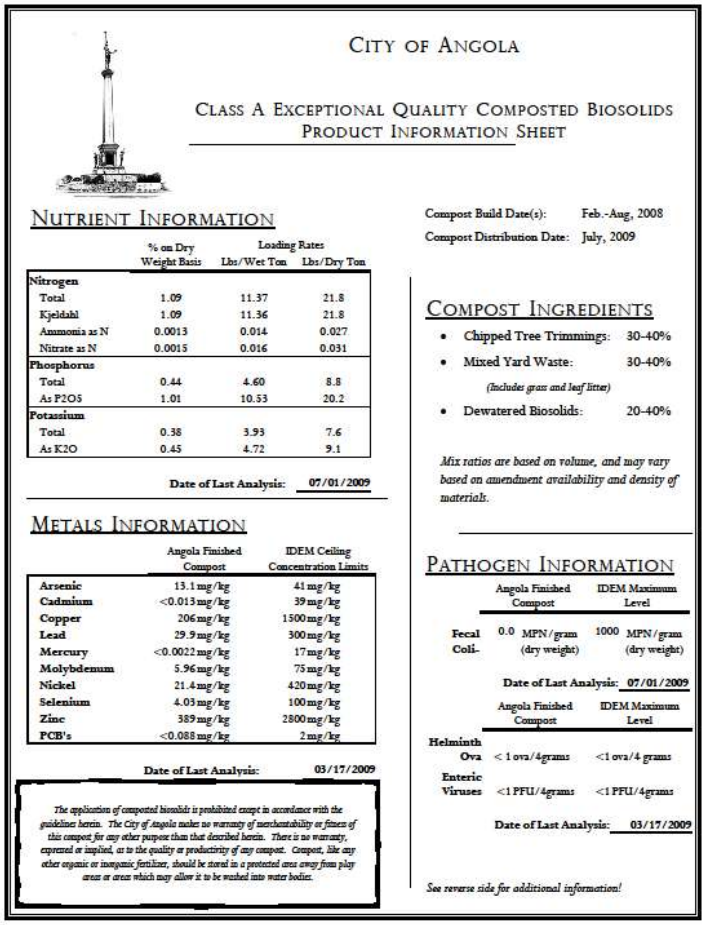
Curing/maturing

- Pile windrows in a well-drained area
- Additional 30-45 days, temperature dependent

Curing/maturing

- Pile windrows in a well-drained area
- Additional 30-45 days, temperature dependent
- Screen, if desired or needed
- Lab analysis & distribution

It All Comes Together…



CITY OF ANGOLA

CLASS A EXCEPTIONAL QUALITY COMPOSTED BIOSOLIDS
PRODUCT INFORMATION SHEET

NUTRIENT INFORMATION

Compost Build Date(s): Feb.-Aug, 2008
Compost Distribution Date: July, 2009

	% on Dry Weight Basis	Loading Rates Lbs/Wet Ton	Lbs/Dry Ton
Nitrogen			
Total	1.09	11.37	21.8
Kjeldahl	1.09	11.36	21.8
Ammonia as N	0.0013	0.014	0.027
Nitrate as N	0.0015	0.016	0.031
Phosphorus			
Total	0.44	4.60	8.8
As P2O5	1.01	10.53	20.2
Potassium			
Total	0.38	3.93	7.6
As K2O	0.45	4.72	9.1

Date of Last Analysis: 07/01/2009

COMPOST INGREDIENTS

- Chipped Tree Trimmings: 30-40%
- Mixed Yard Waste: 30-40%
  (Includes grass and leaf litter)
- Dewatered Biosolids: 20-40%

Mix ratios are based on volume, and may vary based on amendment availability and density of materials.

METALS INFORMATION

	Angola Finished Compost	IDEM Ceiling Concentration Limits
Arsenic	13.1 mg/kg	41 mg/kg
Cadmium	<0.013 mg/kg	39 mg/kg
Copper	206 mg/kg	1500 mg/kg
Lead	29.9 mg/kg	300 mg/kg
Mercury	<0.0022 mg/kg	17 mg/kg
Molybdenum	5.96 mg/kg	75 mg/kg
Nickel	21.4 mg/kg	420 mg/kg
Selenium	4.03 mg/kg	100 mg/kg
Zinc	389 mg/kg	2800 mg/kg
PCB's	<0.088 mg/kg	2 mg/kg

Date of Last Analysis: 03/17/2009

The application of composted biosolids is prohibited except in accordance with the guidelines herein. The City of Angola makes no warranty of merchantability or fitness of this compost for any other purpose than that described herein. There is no warranty, expressed or implied, as to the quality or productivity of any compost. Compost, like any other organic or inorganic fertilizer, should be stored in a protected area away from play areas or areas which may allow it to be washed into water bodies.

PATHOGEN INFORMATION

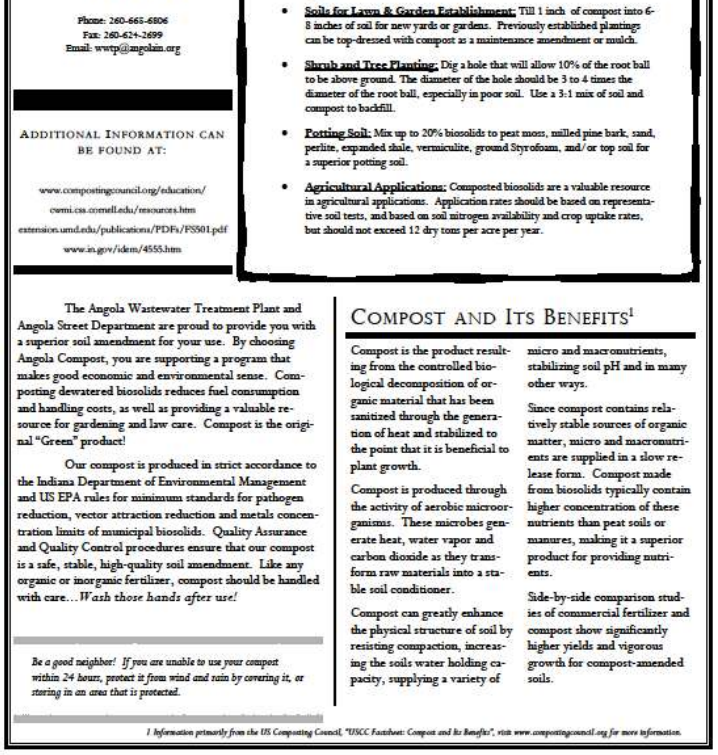
	Angola Finished Compost	IDEM Maximum Level
Fecal Coli-	0.0 MPN/gram (dry weight)	1000 MPN/gram (dry weight)

Date of Last Analysis: 07/01/2009

	Angola Finished Compost	IDEM Maximum Level
Helminth Ova	< 1 ova/4grams	<1 ova/4 grams
Enteric Viruses	<1 PFU/4grams	<1 PFU/4grams

Date of Last Analysis: 03/17/2009

See reverse side for additional information!



CITY OF ANGOLA

1098 Redding Road
(Mailing Address: 210 N. Public Sq)
Angola, Indiana 46703

Phone: 260-665-6806
Fax: 260-624-2699
Email: wwtp@angolain.org

ADDITIONAL INFORMATION CAN BE FOUND AT:

www.compostingcouncil.org/education/
cwmi.css.cornell.edu/resources.htm
extension.umd.edu/publications/PDFs/FS501.pdf
www.in.gov/idem/4555.htm

Uses & Application

As with any fertilizer, application rates should be determined based on soil tests. Compost should only be applied with a accepted practices, and always in a safe, nuisance-free manner. The following information provides a general guide for the use of this compost.

- **Lawn Maintenance:** Top dress approximately 0.5 cubic yard/1,000 square feet on established lawns and rake.
- **Soils for Lawn & Garden Establishment:** Till 1 inch of compost into 6-8 inches of soil for new yards or gardens. Previously established plantings can be top-dressed with compost as a maintenance amendment or mulch.
- **Shrub and Tree Planting:** Dig a hole that will allow 10% of the root ball to be above ground. The diameter of the hole should be 3 to 4 times the dimeter of the root ball, especially in poor soil. Use a 3:1 mix of soil and compost to backfill.
- **Potting Soil:** Mix up to 20% biosolids to peat moss, milled pine bark, sand, perlite, expanded shale, vermiculite, ground Styrofoam, and/or top soil for a superior potting soil.
- **Agricultural Applications:** Composted biosolids are a valuable resource in agricultural applications. Application rates should be based on representative soil tests, and based on soil nitrogen availability and crop uptake rates, but should not exceed 12 dry tons per acre per year.

The Angola Wastewater Treatment Plant and Angola Street Department are proud to provide you with a superior soil amendment for your use. By choosing Angola Compost, you are supporting a program that makes good economic and environmental sense. Composting dewatered biosolids reduces fuel consumption and handling costs, as well as providing a valuable resource for gardening and law care. Compost is the original "Green" product!

Our compost is produced in strict accordance to the Indiana Department of Environmental Management and US EPA rules for minimum standards for pathogen reduction, vector attraction reduction and metals concentration limits of municipal biosolids. Quality Assurance and Quality Control procedures ensure that our compost is a safe, stable, high-quality soil amendment. Like any organic or inorganic fertilizer, compost should be handled with care…*Wash those hands after use!*

Be a good neighbor! If you are unable to use your compost within 24 hours, protect it from wind and rain by covering it, or storing in an area that is protected.

COMPOST AND ITS BENEFITS[1]

Compost is the product resulting from the controlled biological decomposition of organic material that has been sanitized through the generation of heat and stabilized to the point that it is beneficial to plant growth.

Compost is produced through the activity of aerobic microorganisms. These microbes generate heat, water vapor and carbon dioxide as they transform raw materials into a stable soil conditioner.

Compost can greatly enhance the physical structure of soil by resisting compaction, increasing the soils water holding capacity, supplying a variety of micro and macronutrients, stabilizing soil pH and in many other ways.

Since compost contains relatively stable sources of organic matter, micro and macronutrients are supplied in a slow release form. Compost made from biosolids typically contain higher concentration of these nutrients than peat soils or manures, making it a superior product for providing nutrients.

Side-by-side comparison studies of commercial fertilizer and compost show significantly higher yields and vigorous growth for compost-amended soils.

1 Information primarily from the US Composting Council, "USCC Factsheet: Compost and Its Benefits", visit www.compostingcouncil.org for more information.

Third batch on the Pad

Spring 2010 Distribution

- Approximately 400 cubic yards (100 dry tons) of compost prepared for distribution.
- First “formal” distribution.
- Plan on screening 100 cubic yards for general public distribution.
- Remaining compost to be distributed unscreened for agricultural use.

Spring 2010 Distribution

- Screen Compost
  - Source of yard waste will dictate need to screen.
    - Wood chippings
    - Trash
    - Inorganics
    - Large clumps
  - “Overs” can be returned to new compost piles.

Spring 2010 Distribution

Spring 2010 Distribution

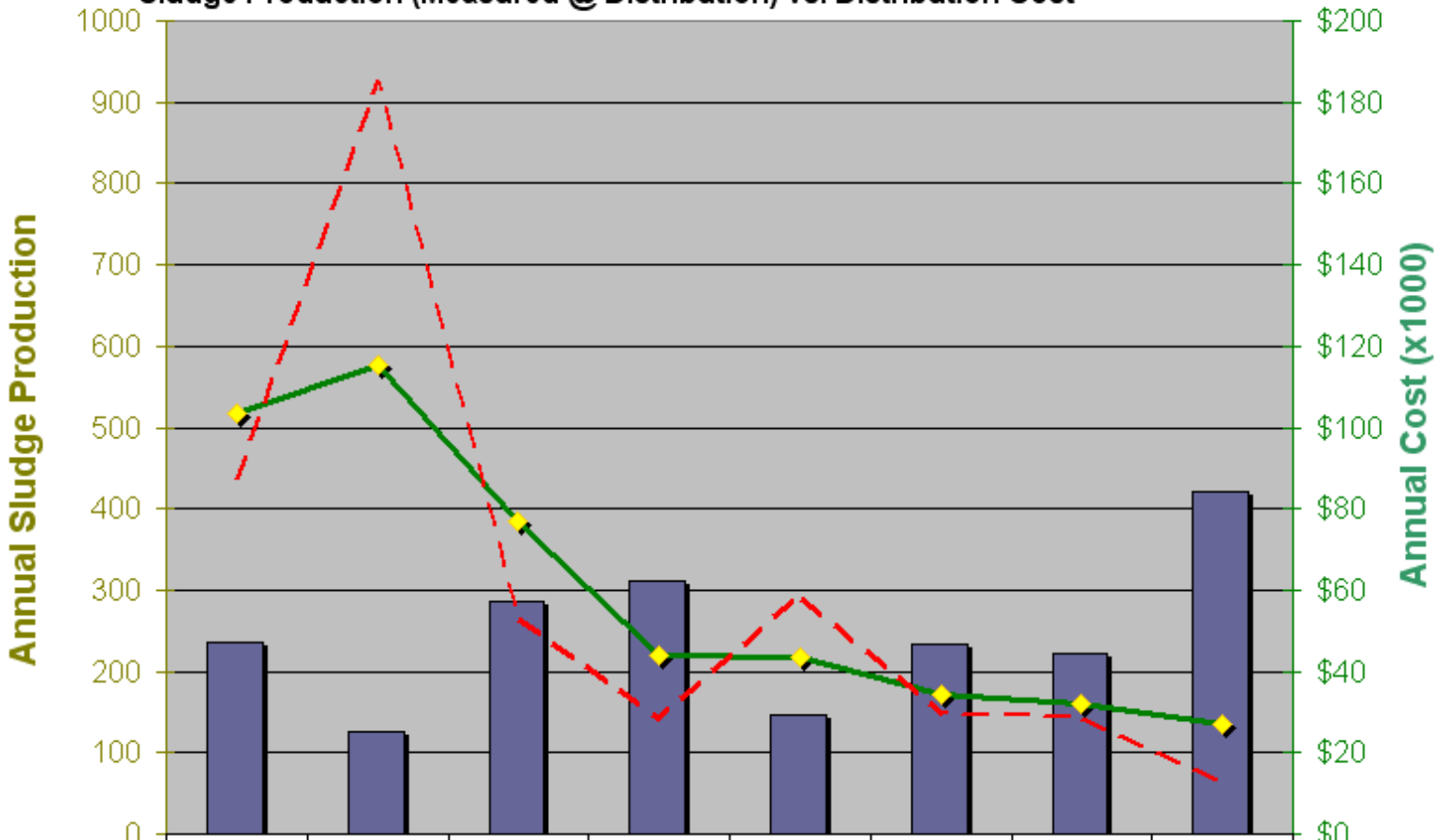
Free Compost Goes Fast At Angola WWTP

Monday, April 5, 2010

(ANGOLA) - It did not take long for people to take advantage of the Angola Waste Water Treatment plant giving away free compost on Monday morning. Waste Water Department Superintendent Craig Williams says nearly 130 cubic yards of compost was gone by 10:00am. Angola city officials say vehicles were lined up all the way down Redding Road to get the compost. They say new compost will not be ready until approximately September.

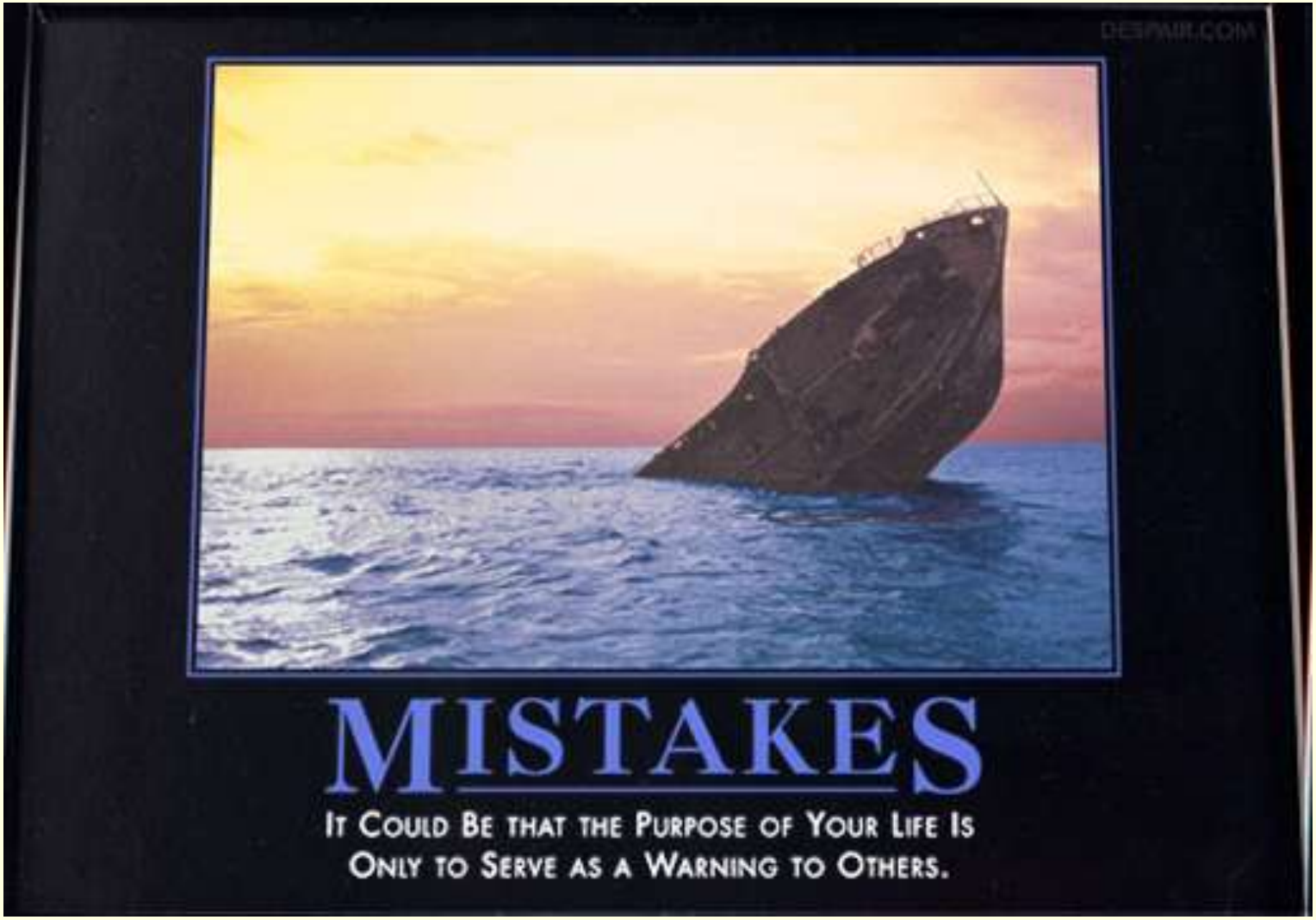
FM's Best!
WLKI
100.3

Sludge Production (Measured @ Distribution) vs. Distribution Cost



	2004	2005	2006	2007	2008	2009	2010	2010 (Ant.)
Weight (Dry Tons)	236	125	285	310	147	232	222	422
Annual Cost (x1000)	$103	$116	$77	$44	$43	$34	$32	$27
Average $/DT	$438	$924	$269	$141	$294	$148	$144	$64

Lessons Learned?



Lessons Learned?

- Don’t stockpile more biosolids than you can process
- Sampling plan needs to address temperature logs
- Get the permit right the first time
- Initial windrowing is time consuming
- Compliance turning & temperature data gathering is time consuming
- Start your PR early
- Don’t stockpile more biosolids than you can process

Where Are We Going From Here?

- Datalogger

Where Are We Going From Here?

- Datalogger
- Debris Forks for Loader

Where Are We Going From Here?

- Datalogger
- Debris Forks for Loader
- Truck & dump trailer
- Weather Station
- Tree buffer?
- Branding, bagging & sales?
- Asphalt surface?

Questions?

- References
  - Demotivational Posters by Despair.com
  - Brown Bear Company
  - US Composting Council www.compostingcouncil.org/
  - Cornell Waste Management Institute of Cornell Univerisity www.cwmi.css.cornell.edu/
  - Biosolids Compost – WEF Reference, Published, 1995
  - EPA's Guide to Preparing Sewage Sludge for Land Application, Published, August 1993