

Dairy Manager's Annual Report of Holsum Dairy's Ninth Year of Green Tier Qualification

2014 started with a bitterly cold week, the kind Wisconsinites are proud to survive. The winter led to animal, machine, structural and human stress, causing cancellations of some plans and changes of others.

Nevertheless, life went on; our employees are marvelous and inventive. They kept everything going throughout the winter's challenges.

Briess Industries, a local Green Tier member, is our largest off site by-product contributor. Irish Dairy accepted into its digesters **4,125,570 gallons** of 'waste' from area businesses. Elm Dairy accepted into its digesters **7,442,295 gallons** of 'waste' from area businesses.

	2010	2011	2012	2013	2014
Liquid 'waste' kept out of sewage treatment plants (gallons):	7,041,844	8,683,367	12,163,162	12,107,756	11,567,865
Solid waste kept out of landfills(tons):	178	3,170	3,417	4,041	-

This year we significantly reduced the use of iodine teat disinfectant while still improving our Grade A metrics. It took researching and adopting a novel sodium hypochlorite teat preparation that saves >12 gallons of iodine concentrate daily at each dairy.

In February, I presented "*Digester Economics*" to the 52nd Annual Rural Energy Conference & Agricultural Wiring Workshop in La Crosse. Interest in capturing methane and converting it to electrical energy continues in the state and in the country.

Also in February, our lead hoof trimmer reported that recent changes we made to the cattle handling area calmed the cows and facilitated their "pedicures".

Various groups toured throughout the year, including other dairymen interested in options for their building plans, students from Kenya, young dairy leaders from New York, executives of Great Giant Pineapple of Indonesia, members of the Irish Dairy Board, students from Fox Valley and Lakeshore Technical Colleges, the Sierra Club of Green Bay, a British Petroleum sustainable energy group, 88 eighth graders from Little Chute...a potpourri of personalities and unique questions. I always learn from them and enjoy adding to their understanding of our sustainable dairies.

Another way we stay in touch with the community is to provide free loads of digested manure solids for amending garden soils. We no longer advertise these well attended biannual 1st Saturday morning events (October and May). Many

repeat customers bring friends and neighbors to exchange this organic product for a donation to our **3** scholarships at local high schools. All in all, we collected about 200 of their names and home areas to get an idea of how far some came (several drove >20 miles!). Speaking to each, we also gave each participant a sheet with a few facts about the farms' effects on the community. A sample follows:

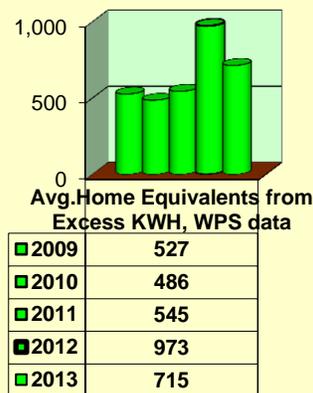


Thank you for participating in our Spring 2014 Community Manure Solids Day here at Holsum Irish Dairy

Your donation helps fund scholarships through our local high schools.

This garden soil enhancing, organic product is what's left after cow manure has gone through our anaerobic digesters. The digesters removed methane gas and converted it to electrical energy. Together with Elm Dairy, we produce enough electricity for all of our electrical needs AND those of several hundred typical Wisconsin homes:

Holsum's Green Electrical Energy Results



Respectfully,

Robert Nagel, DVM, MS; Manager, Holsum Dairies, Hilbert, Wisconsin 54129

Regulated topics:

Manure Metrics

Manure composition is of interest to us for our Nutrient Management Plan (NMP), as well as for minimizing our environmental footprint. After capturing the energy and fibrous material from cow “waste”, we have effluent with 82% less dry matter, 32% less nitrogen, 75% less phosphorous pentoxide (44% phosphorus), and 49% less potassium oxide (83% potassium) when compared to undigested manure values.

Weather Again Trumps All Plans!

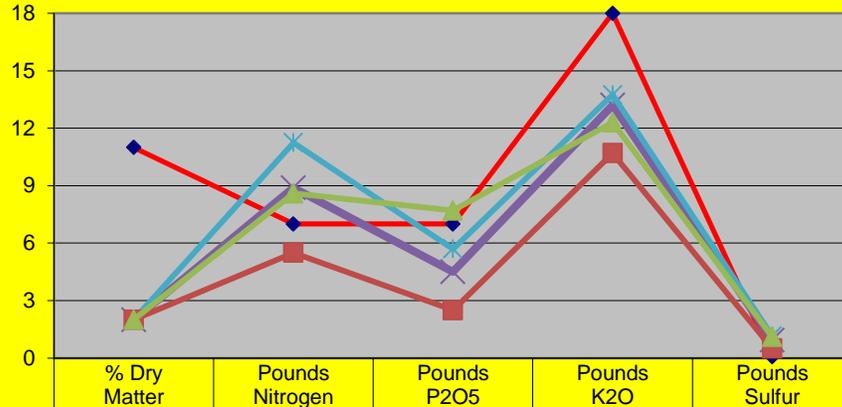
After years of success with the timing of our manure spreading, we ran up against a very wet autumn in 2013. The weather and county regulations necessitated our trucking some manure to another lagoon or to a pumping station for land application. 2014 was another wet fall, so we are once more reporting “Transfer” as one method of carefully returning manure nutrients to the land. “Transfer” means that lagoon contents are trucked to a pit or a holding tank near a field; they are then land applied via drag hose pulled by a tractor.

2010 gallons applied	105,712,397 (Irish and Elm Dairies and Calf Ranch young stock)
2011 gallons applied	115,666,654 (Irish and Elm Dairies and Calf Ranch young stock)
2012 gallons applied	124,471,833 (Irish and Elm Dairies and Calf Ranch young stock)
2013 gallons applied	130,322,433 (Irish and Elm Dairies and Calf Ranch young stock)
2014 gallons applied	120,554,066 (Irish and Elm Dairies and Calf Ranch young stock)

	Total gallons	Irish total gallons	% hosed	Elm total gallons	% hosed	Total hosed	Elm transfer	Irish transfer
2010	105,712,397	42,180,649	99.6%	63,531,748	63.4%	77.8%	-	-
2011	115,666,654	52,673,940	99.6%	62,992,714	85.0%	91.6%	-	-
2012	124,471,833	53,970,688	93.9%	70,501,145	63.7%	76.8%	-	-
2013	130,322,433	49,364,616	73%	80,957,817	35%	49.5%	32,986,767	7,910,114
2014	120,554,066	59,786,819	58%	60,767,247	27%	42%	30,845,262	23,159,046

Manure Analysis, Holsum Irish Dairy, 2 recent years

Pounds/Percent



	% Dry Matter	Pounds Nitrogen	Pounds P2O5	Pounds K2O	Pounds Sulfur
◆ Average Manure	11	7	7	18	0.06
■ Pond N, 2013, avg	2.0	8.90	4.50	13.22	0.94
✕ Pond S, 2013, avg	2.0	11.25	5.70	13.75	1.15
■ Pond N, 2014, avg	2.0	5.50	2.50	10.70	0.50
▲ Pond S, 2014, avg	2.0	8.60	7.70	12.30	1.10

Manure Analysis, Holsum Elm Dairy, recent 2 years

Pounds/Per cent



	% Dry Matter	Pounds Nitrogen	Pounds P2O5	Pounds K2O	Pounds Sulfur
◆ Unprocessed Manure	11	7	7	18	0.06
■ Pond 1, 2013, avg	2.0	11.65	6.10	14.20	1.29
✕ Pond 2 (E), 2013, avg	2.0	12.10	5.97	12.77	1.18
▲ Pond 3 (W), 2013, avg	2.0	7.15	0.83	11.39	0.40
■ Pond 1, 2014, avg	2.0	6.60	5.50	11.10	0.90
▲ Pond 2 (E), 2014, avg	2.0	5.6	2.9	10.0	0.5
■ Pond 3 (W), 2014, avg	2.0	4.10	1.10	9.00	0.30

The significance of the digested manure numbers in the previous graphs is:

- Less phosphorus builds up in the soil; it no longer is available to run into streams and contribute to algae bloom.
- We provide phosphorus, potassium (potash) and water to the alfalfa crop. By applying the effluent when the soil is relatively dry and the plant is actively growing, we reduce the likelihood of phosphorus leaching through the root zone. We reduce the purchase, transport and additional application of fertilizer.

Water usage

We are tracking our water usage from each well at each farm, as required by statute (Wisconsin Pollutant Discharge Elimination System, or WPDES). In addition, to allow for retrospective data mining and managing, we are comparing it to the numbers of cows (milking and dry) and the amount of milk shipped from the dairies. Increased water usage in hot months is for cow cooling primarily. **Water conservation measures have been emphasized since 2003.**

University of Wisconsin Extension reports an average of 40-45 gallons per day per cow for the average dairy farm, in the average year. This includes not only the water they drink, but all water used to wash facilities, milk storage tanks, milking machines, and water to cool the milk and the cows.

For **2014**, our **Irish Dairy averaged 43.1** intake of fresh gallons per cow per day; our newer, more precisely designed **Elm Dairy (down over a gallon from 2013) averaged 43.5** gallons/cow/day... which includes water used to care for an additional 3000 calves and heifers (the result of an exclusively artificial insemination breeding program).

Elm Dairy also incorporated higher capacity cow cooling in its design, so more water goes to cool the herd. We are evaluating ways to further improve cooling at each dairy. It is the right thing to do for the cows, and it will very likely pay off with more stable milk production in the heat.

What about people's households?

**All Things Considered,
National Public Radio,
5/13/15:**

The mayor of Santa Fe, New Mexico spoke about the results of the city's two tiered water fees. Prior to initiating the fees, Santa Fe averaged 162 gallons water per person per day. After the fees were in place, use dropped to 96 gallons per person per day.

EMS Internal Audit, September 2014

Auditors: Thomas Cully, DVM and Tom Myers, DVM

Summary: The auditors visited both Irish and Elm facilities, questioned employees, audited random protocols and procedures, and found some Opportunities for Improvement in these areas:

1-Identify a set of criteria for all Holsum documents, whether Green Tier, OSHA, or proprietary.

- It is unlikely that the future will bring fewer documents.
- Standardized filing and use of a Controlled Document Footer were recommended to avoid duplication and the use of outdated information.

2-Strengthen and ritualize training to ensure that it stays current

- Expect a certain rate of turnover and a changing workforce.
- Realizing that much of training takes place on the job and face to face, accept that much will not be documented.
- Continue to use Outlook for reminders, but tie as many trainings to promotions as possible. An example is training for Stockmanship each time Milkers are promoted to Pusher/Scraper.

To avoid duplicative recordkeeping, this document also serves as documentation of management's notice and acceptance.

Summation of Corrected Environmental Errors at Holsum Dairies, 2011-2014:

Liquid manure spills, chronological order	Severity	Brief Summary
June 6, 2011	3	Nighttime human error of monitoring
June 9, 2011	2	High winds exposed design flaw
July 7, 2011	1	Corrosion of 5 year old part
June 13, 2012	3	Dry, cracked ground allowed manure to flow directly to tiles
November 2, 2012	3	Nighttime; monitoring procedure incompletely implemented
February 13, 2013	2	Failed clamp in zero degree weather during snow event
November 5, 2014	3	Worker connected to wrong hose

Severity Codes: 0 == no impact on surface or ground water
 1==reached adjacent on-dairy dry containment ditch
 2==reached sediment retention ponds
 3== reached surface water (ditch, stream/pond/lake)
 4==impacted ground water

By comparison, the Milwaukee Journal Sentinel, November 30, 2006, reported that "since 1994, Milwaukee Metropolitan Sewage District has dumped an average of more than 1 billion gallons of untreated sewage per year into Lake Michigan."

This reference is included for perspective on the often sensationalized agricultural contribution to environmental pollution. Holsum Dairies, LLC remains committed to bettering its environmental performance. And we encourage all progress made by the Milwaukee Metropolitan Sewage District and other current Great Lakes polluters.

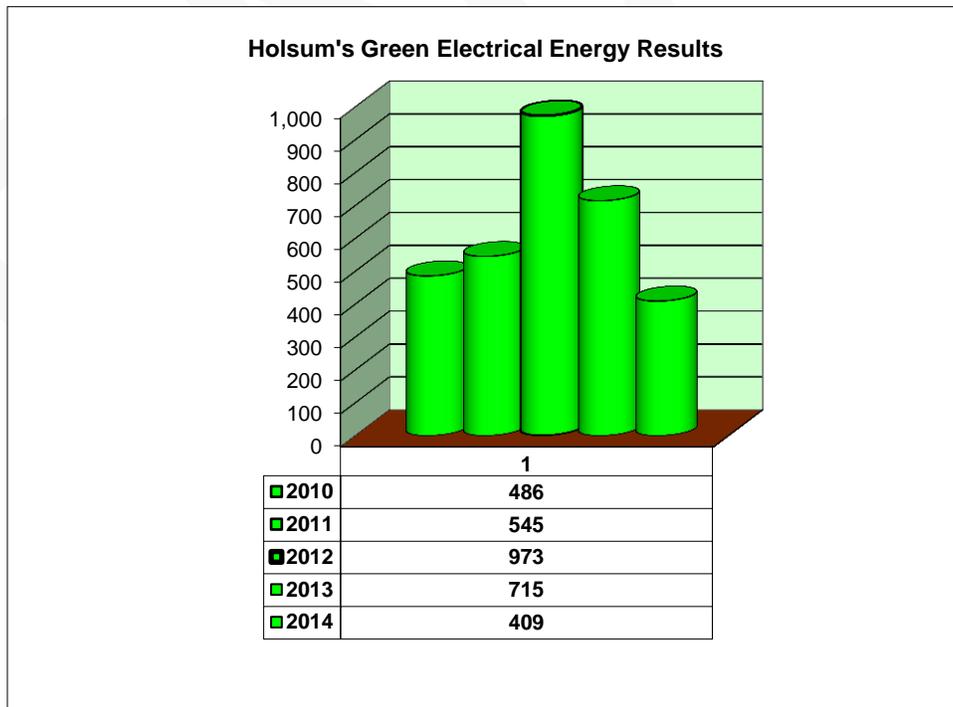
Unregulated topics:

1-Energy Producing Manure Digesters: Below is a record of our operations' electric use and our digesters' production, with a chart (of the most recent five years) showing the numbers of Wisconsin homes (average use) that our excess power can supply.

Kilowatt Hours "Excess" data: Note: a negative number or an unusually low number in an 'Excess' box indicates a period during which mechanical/electrical problems were significant.

Year	Irish Gen, kwh	Irish Use, kwh	Irish Excess, kwh	Elm Gen, kwh	Elm Use, kwh	Elm Excess, kwh	Combined Excess, kwh	Avg. Home Equivalents, WPS data
2010	3,727,200	2,394,862	1,332,339	5,501,195	3,159,443	2,341,751	3,674,090	486
2011	3,520,282	2,336,021	1,184,261	6,220,993	3,283,634	2,937,359	4,121,620	545
2012	5,746,992	2,616,331	3,130,661	7,790,214	3,563,801	4,226,413	7,357,074	973
2013	4,133,444	2,437,891	1,695,553	7,233,193	3,526,432	3,706,761	5,402,314	715
2014	3,968,949	2,536,867	1,432,082	5,281,854	3,618,133	1,663,721	3,095,803	409

Note: In 2010, the Elm digester was rebuilt. In 2011, we rebuilt the Irish digester. The investment, at an approximate cost of \$200,000, created higher generator reliability and a record amount of saleable kWh. As a result, in 2012 and 2013, the dairies far exceeded previous electrical generation from 'waste'.



2-Fuel Usage in gallons, most recent five years:

	2010	2011	2012	2013*	2014
Diesel, Irish	62,596	63,868	58,742	63,124	50,240
Diesel, Elm	102,243	95,643	93,145	117,785	170,616
Gasoline, Irish	3,409	4,437	3,435	3,573	4,203
Gasoline, Elm	4,793	4,871	5,830	7,673	6,965
Propane, Irish	19,452	21,750	17,453	11,296	25,613
Propane, Elm	30,979	32,319	19,702	25,588	38,313
Fuel Oil, Irish	11,228	9,811	17,453	27,332	29,200
Carbon dioxide equivalent, metric tons	2,138	2,099	1,919	2,417*	2990

*boiler failures, cold weather, manure transferring, meant larger footprint

Transportation and Vehicles

Transportation makes up a large part of an organization's overall environmental footprint. After it is cooled, our milk is deposited directly into insulated stainless steel tankers and picked up at the farm by a trucking business. Our primary fuel usage is to power pickup trucks and on-farm implements; secondarily, fossil fuels maintain the critical temperature for the anaerobic digesters when the methane powered engines shut down.

One common way to standardize energy use from different fuels is in terms of the carbon dioxide (CO₂) each produces.

Combined vehicle fuel usage equated to **2990** metric tons of CO₂ in 2014.

Calculation constants:

CO₂ produced by each gallon of:
 propane = 5.52 kg;
 unleaded gasoline = 8.87 kg;
 diesel = 10.15 kg;

3-Electricity Used (EPA: 6.91×10^{-4} metric tons CO₂ / kWh (each kWh = 3.608 kg CO₂))

Each kilowatt hour of electricity used (equivalent to about 3-4 hours of television operation) causes the release of 1.6 pounds of carbon dioxide into the air. A small house can easily consume 1,000 kilowatt hours of electricity per month, thus releasing 1,600 pounds (0.727 metric tons) of carbon dioxide in the process.

Irish Dairy's 2013 electrical usage equates to **1753** metric tons of carbon dioxide. Elm Dairy's 2013 electrical usage equates to **2500** (more cows and a calf raising endeavor).

2014 <u>electricity used</u> equals	4253 metric tons of CO ₂
2014 <u>vehicle fuel usage</u> equals	2990 " " "
Total fossil fuel use equals	6743 metric tons of CO ₂ (6729 in 2013)

4-Electricity Produced and Carbon Footprint Reduced

Combined excess electricity in 2014 = 3,095,803 kwh equates to: **2139.2** metric tons.

Since electricity produced by cow's methane earns a multiplier of **23**:

Total 2013 CO₂ credit = 49,201* metric tons

(85,859 metric tons credit last year)

*this calculated number is consistent with all our previous reporting, which is based on Wisconsin Public Service's reporting of kilowatt hours used and produced.

-*46,211 net calculated CO₂ credit, after vehicle fuel usage subtraction-

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