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

Dairy cows thrive on consistency. It has been said that "The more reliable and boring that we can make it, the more our cows will love it." Our greatest disappointments in 2013 revolved around roadblocks to providing such consistency.

1 – Agriculture always depends on the weather; so I am no stranger to the challenges that Nature often delivers. 2013 served up challenges in abundance! Spring's widespread hay field die off (>50%) affected an important cattle forage's availability, so we balanced to the herd's needs with other feedstuffs as best possible. The late and wet autumn kept our partner farmers' fields too wet for too long, curtailing our option of delivering manure nutrients most efficiently (via hoses) to them.

2 – Agriculture is also heavily dependent on technologies, from general use office electricity to specialized Anaerobic Digester components, some of which were not operable at Irish Dairy for 3 months in 2013. That loss, combined with the winter's record setting cold, interrupted the consistent electrical generation we had targeted for 2013 (it also will diminish the early months of 2014). A new $109,000 'Mix and Grit Pit' at Elm Dairy, added in 2013, will allow future cleaning of the digesters without shutting down operations. With that resulting efficiency, we plan to generate electricity at a high level for years.

3 – A strength of our sustainability effort is that we use post-digester 'manure solids' to bed our cattle herd. The re-use greatly reduces trucking of bedding each week. A weakness of our bedding choice is its fluctuating moisture content. Cow comfort and health can suffer. To improve consistency, we invested >$300,000 in a used bedding dryer later in the year. I anticipate its effects to show in 2014.

4 – New state standards dictated that each dairy upgrade its Feed Pad Leachate collection systems. The standard called for collecting the amount of runoff that would fall in the event of a 25 year rain event (~4.5" in 24 hours). We divert the water into our manure lagoons, decreasing their effective capacity and increasing annual expenses by $70,000 to empty the lagoons. We spent $99,000 at Irish to comply, and $97,000 at Elm, whose design outperforms regulation.

5 – We (with our partner-vendor, DVO (the installer and operator of our anaerobic digester), DATCP, and Calumet County) hosted the reigning Alice in Dairyland and her 4 hopeful successors in May. The group toured our installation; then the candidates prepared a promotional video for a wider audience.

6 - Perfect Environmental Performance, LLC performed our triennial, Green Tier mandated, External Audit in September (Results: page 6). The Andersons further educated us in our application of Green Tier principles and coached us on productive ways of interacting with WDNR staff.

7 - Community Solids Pickup Days (a long tradition): 55 participants answered our first survey of them, revealing that they came from 11 zip codes and 16 area townships to partake of our free, soil amending post digester manure solids.

8 - Irish Dairy accepted into its digesters **7,216,948 gallons** of waste from area businesses.
Elm Dairy accepted into its digesters **4,890,808 gallons** of waste from area businesses.

Liquid waste kept out of sewage treatment plants (gallons):	8,945,852	7,041,844	8,683,367	12,163,162	**12,107,756***
Solid waste kept out of landfills(tons):	--	178	3,170	3,417	**4,041***
	2009	2010	2011	2012	**2013**

*new record high

Respectfully,

Robert Nagel, 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 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. So this year, we necessarily add "Transfer" as a 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.

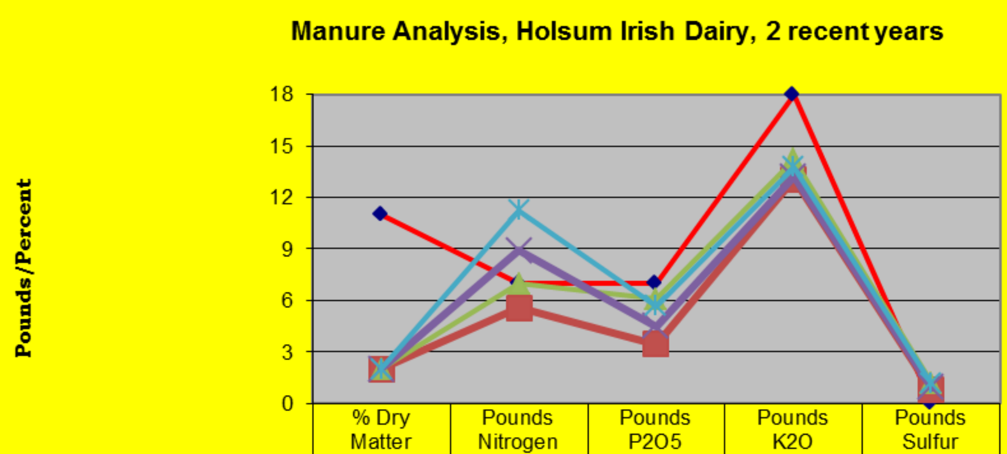
2009 gallons applied: 95,241,709 (Irish and Elm Dairies)
2010 gallons applied 105,712,397 (Irish and Elm Dairies and Calf Ranch young stock)
2011 gallons applied 115,666,654 (Irish and Elm Dairies and Calf Ranch young stock)
2012 gallons applied 124,471,833 (Irish and Elm Dairies and Calf Ranch young stock)
2013 gallons applied 130,322,433 (Irish and Elm Dairies and Calf Ranch young stock)

	Total gallons	**Irish** total gallons	% hosed	**Elm** total gallons	% hosed	Total hosed	Elm transfer	Irish transfer
2009	95,241,709	-	-	-	-	-	-	-
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

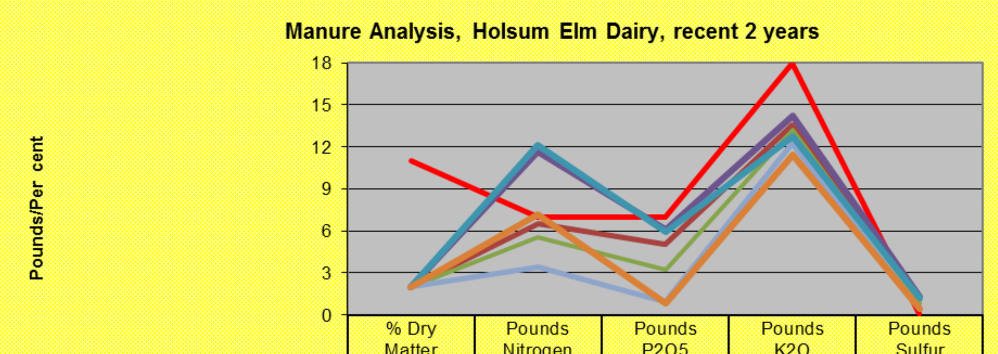
The significance of the digested manure numbers in the following graphs is:

-Less phosphorus builds up in the soil; it no longer is available to run into streams and contribute to algae bloom.

-We provide nitrogen and 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 nitrogen leaching through the root zone. We reduce the purchase, transport and additional application of fertilizer.



	% Dry Matter	Pounds Nitrogen	Pounds P2O5	Pounds K2O	Pounds Sulfur
Average Manure	11	7	7	18	0.06
Pond N, 2012, avg	2.0	5.56	3.45	13.06	0.79
Pond S, 2012, avg	2.0	6.97	6.07	14.20	1.18
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



	% Dry Matter	Pounds Nitrogen	Pounds P2O5	Pounds K2O	Pounds Sulfur
Unprocessed Manure	11	7	7	18	0.06
Pond 1, 2012, avg	2.0	6.54	5.04	13.57	1.06
Pond 2 (E), 2012, avg	2.0	5.52	3.19	13.17	0.79
Pond 3 (W), 2012, avg	2.0	3.45	0.96	12.28	0.47
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

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 **2013**, our **Irish Dairy averaged 43.1** gallons per cow per day**;** our newer, more precisely designed **Elm Dairy averaged 44.9** gallons/cow/day… which includes water used to care for an additional 3000 calves and heifers (the result of a 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?

By way of comparison, *Wisconsin D-N-R Bureau Chief Jill Jonas, on Wisconsin Public Radio, May 5, 09*, noted that the average Wisconsin human, weighing less than 200 pounds*, uses 63 gallons each day, about 18 gallons of which is toilet flushing. In arid states, she reported that per capita usage is over 100 gallons a day.

*the average milking cow exceeds 1,200 pounds and produces about 80 pounds of milk daily.

EMS External Audit, September 2013

Auditors: Perfect Environmental Performance, LLC, Tim Anderson, Karissa Anderson

Summary: The auditors visited both Irish and Elm facilities, spoke to employees, audited random protocols and procedures, and found a minor nonconformance, along with some Opportunities for Improvement.

Nonconformance 1 - Our documentation of evaluating Aspects and Impacts of the operation did not reflect the most common method that had evolved. We revised document E 4.3.1 HD Environmental Aspects Procedure and submitted the changes, which were approved.

The necessary corrective action from the External Audit was presented to management and reviewed, per ISO 14001. To avoid duplicative recordkeeping, this document also serves as documentation of management's notice and acceptance.

Summation of Corrected Environmental Errors at Holsum Dairies:

Liquid manure spills, chronological order	Severity	Brief Summary
August 2006	0	
September 2007	1	
December 2007	1	
June 2008	1	
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

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.

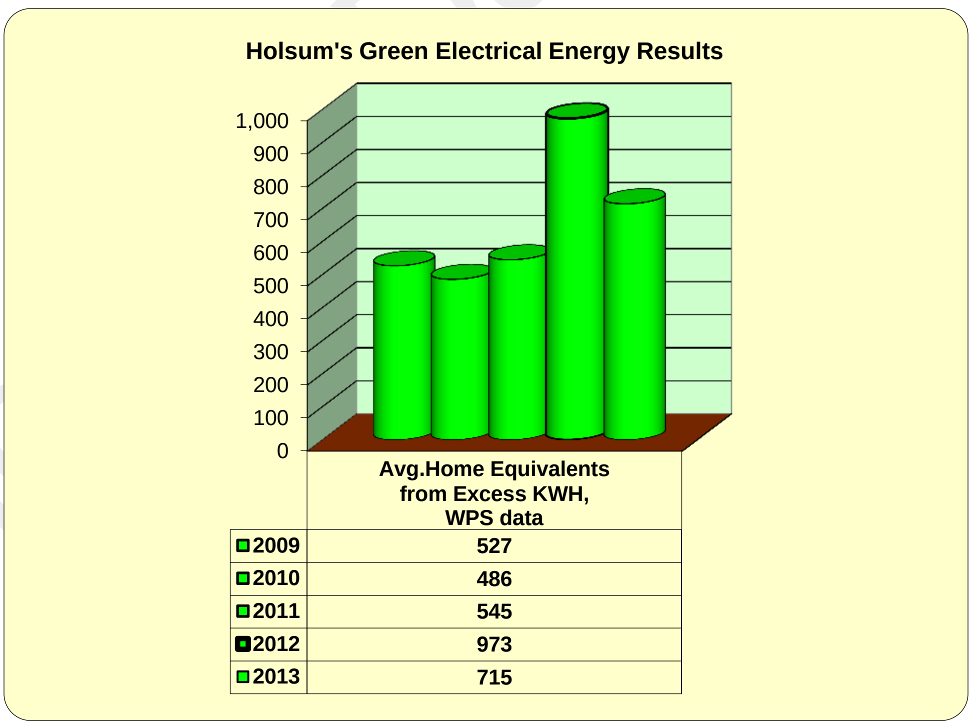
Unregulated topics:

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
2009	1,660,010	2,300,459	-640,449	7,458,045	2,833,209	4,624,836	3,984,388	527
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

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'.



WPSsummaryKWHdata.xls

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

	2009	2010	2011	2012	**2013***
Diesel, Irish	61,193	62,596	63,868	58,742	63,124
Diesel, Elm	74,669	102,243	95,643	93,145	117,785
Gasoline, Irish	2,874	3,409	4,437	3,435	3,573
Gasoline, Elm	3,883	4,793	4,871	5,830	7,673
Propane, Irish	27,319	19,452	21,750	17,453	11,296
Propane, Elm	21,109	30,979	32,319	19,702	25,588
Fuel Oil, Irish	30,598	11,228	9,811	17,453	27,332
Carbon dioxide equivalent, metric tons	2,017	2,138	2,099	1,919	2,417*

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

Transportation and Vehicles

Transportation can make 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 (CO_2) each produces.

Combined vehicle fuel usage equated to **2417** metric tons of CO_2 in 2013.

Calculation constants:

CO_2 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 CO_2 / 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 **1685** metric tons.
Elm Dairy's 2013 electrical usage equates to **2437** (more cows and a calf raising endeavor).

2013 electricity used equals	**4312** metric tons of CO_2
2013 vehicle fuel usage equals	**2417** " " "
Total fossil fuel use equals	**6729** metric tons of CO_2 (6190 in 2012)

4-Electricity Produced and Carbon Footprint Reduced

Combined excess electricity in 2013 = 5,402,314 kwh equates to: **3733** metric tons.

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

Total 2013 CO_2 credit = 85,859* metric tons

(**116,926** 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.

-*83,442 net calculated CO_2 credit, after vehicle fuel usage subtraction-

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