Derceto

GHG

Investigation into Green House Gas (CO2) Reductions

Background/Objective

Climate change is an issue of growing international concern. Many governments and organizations have recognized this and are now seeking ways to reduce their emissions of greenhouse gases (GHGs), in particular carbon dioxide (CO2). It is well-known that electricity production contributes to carbon dioxide emissions, so reducing energy use is one step that would have a positive affect. Derceto is already helping its US clients reduce their electricity usage (and cost) through its Aquadapt™ water pump schedule optimization software. The aim of this research was to quantify what reduction in emissions was actually being achieved at four of Derceto's cornerstone reference installations.

Approach

It was assumed that the primary influence Derceto Aquadapt software would have on CO2 emissions was through pump efficiency gains. That is, a reduction in the electric energy (kWh) required to pump water demand when compared with similar historical volumes. Hence, calculating CO2 emission reductions requires two actions, namely:

1. Working out the value of MWh that Aquadapt was saving on a monthly or yearly basis; and
2. Calculating the amount of CO2 emissions per MWh of electric energy used

Once these two values have been established, a simple multiplication was able to quantify the effective reduction in carbon dioxide that is being realized through the use of Derceto Aquadapt.

Energy Savings & CO2 Reductions

Energy use savings achieved by Derceto's Aquadapt software are calculated by comparing actual MWh use post installation compared to the historical MWh use pre installation of Aquadapt. This was a straightforward process for East Bay Municipal Utility District (EBMUD) in Oakland CA, where there existed over 2 years of complete information available from their customized 'energy cost baseline tool". For other Derceto installations an alternative method calculated expected MWh use by looking at the volume of water pumped through the distribution system. Relating average MWh consumption to the volume pumped in million gallons (MG) gives a unit measure of efficiency, which is used to calculate savings as follows:

- Expected MWh Use = Historical Average MWh/MG (monthly or yearly) x MG pumped after Derceto was installed (over the same months or a year)
- MWh Savings = Expected MWh use - Actual MWh Use (from electric bills/monitoring system)
- CO2 Emission Reductions = MWh savings x CO2/MWh

Sources of Information

For North American electricity suppliers, up-to-date information on a coefficient for CO2/MWh proved difficult to find. There is no one official source, and the information was not readily available on the supplier websites. As a result, estimates were made using the Energy Information Administration's (tri-agency data from EPA, EIA & FERC) eGRID 2004 database[1]. This had statistics on almost every power generation plant in the US in 2004, including annual figures for MWh production and CO2 emissions. Groups of power plants were selected from eGRID that were relevant to each supplier that were operated by them or in their power control area. An average annual coefficient for CO2/MWh could then be calculated by dividing the sum total emissions by sum total generation.

Customer System	Plant Operator Name	Selection Criteria in eGRID Database	CO2 Emissions (Tons/MWh)
East Bay Municipal Utility District, Oakland CA	Pacific Gas & Electric Co	non-utility service area	0.502
Eastern Municipal Water District, Perris CA	Southern California Edison	non-utility service area	0.515
Washington Suburban Sanitary Commission, Laurel MD	PJM Interconnection	power control area	0.547
Water District Number 1 of Johnson County (WaterOne), Kansas KS	Board of Public Utilities, Kansas City Power & Light Co	power control area	0.845

Table 1 – eGRID Carbon / Generation

Results

The following table lists calculated carbon emission reductions that have been achieved as a direct result of the installation and operation of Derceto's Aquadapt pump schedule optimization software:

Customer System	Average MWh per Year	Average Efficiency Gain under Derceto	EPA eGRID 2004 CO2 Emissions (Tons/MWh)	Extrapolated CO2 Reduction per Year (Tons)
EBMUD	26,000	6.1%	0. 502	800
EMWD[1]	7,000	8.4%	0. 515	300[2]
WSSC[2]	99,000	8.3%	0. 547	4,500
WaterOne[2]	94,000	6.0%	0. 845	4,800

Table 2 – Actual Results using EPA eGRID 2004

Assumptions Involved

The following assumptions were made for the analysis:

- The emission coefficients are for generated electricity only and losses through the transmission system are not included in the figures.
- Published 2004 data on CO2 emissions is sufficiently up-to-date for this analysis.
- For a nominated electricity supplier, the same fuel source mix supplies every customer.
- For each electricity supplier, the mix of fuel sources remains constant during the year.
- If two electricity suppliers were involved (as in the case of WaterOne, Kansas), a constant percentage of electricity was supplied by each.
- Calculated CO2 reductions over several months can be extrapolated to an entire year.

[1] Based on 3-6 months of available data
[2] Electric pumps only, gas pumps not analyzed