Four Seasons Health Care (FSHC) is an independent British provider of health and social care services. It owns The Huntercombe Group, a provider of inpatient mental healthcare and brain injury rehabilitation.

It has three divisions: brighterkind with 80 private pay-focused care homes; Four Seasons which has around 350 homes; and The Huntercombe Group with around 40 specialist mental health facilities. Total number of FSHC sites 440.

In September 2017 two Care Homes were installed with the 54mm commercial Tadpole deaerator to measure performance against the claims that it reduces heating fuel consumption by 15-20%.

It was understood that natural gas was delivered to site using Automated Meter Reading (AMR) this is a prerequisite as the performance of the Tadpole is measured by comparing consumption and billing data against the previous months and years using **degree day methodology.**

Heating energy consumption depends in part on external (weather-related) temperatures. Therefore we use heating degree days which are a measure of how much (in degrees), and for how long (in days), the outside air temperature was below 15.5°C to analyse the energy consumption pre and post tadpole installations. The base temperature of 15.5°C is used because at this temperature most UK buildings do not need supplementary heating.

DD Methodology

Step 1 - collection and processing of energy and degree day data. We plot the monthly gas consumption (kWh) against monthly degree days over a 3 years period before the Tadpole device was installed.

Step 2 - Obtaining a pre-installation performance line. The graph of space-heating energy consumption against degree days shows a relationship between the two.

We then generate a performance (trend) line and its equation which is an expression of how much energy the building can be expected to use for a given number of degree days.

Step 3 - Calculating post installation cumulative savings against the pre-installation performance line equation.

1	2	3	4	5	6
Month	Degree days (hWh)	Actual consumption (kWh)	Predicted consumption (kWh)	Difference (kWh)	CSUM
	From published or self-calculated values	From meter readings	Slope x Column 2 + intercept	Column 3 minus Column 4	Cumulative sum of figures from Column 5

Changes in supplier meant that AMR wasn't available at two sites and consumption was being estimated. This also meant that historical data was not available until the final bill had been created and we could then complete the analysis using billing data. As a result A further 2 homes were installed with Tadpole in January 2018.

Audited Results

The initial results after the settling in period of 3-4 weeks - using 3 months consumption data against historical data was **between 14.5% and 21.1% reduction.**

These results and all associated data was subsequently audited by FSHC Finance who initially challenged the findings. The team had identified similar reductions in a number of properties that did not have Tadpole devices installed. Further investigation found that all of these

properties had undergone some heating related improvement or investment that reduced gas consumption.

The business selected two additional homes from the profile group near to each of the test sites to determine what had changed and then analysed their individual gas consumption data to explain the gas reduction in a similar period.

The finding were that Control home 1 [1.] had replaced their boilers in Sep 2017 and Control home 2 had replaced a failed element[2.] in the DHW system in Dec 17.

Control home 3 replaced their boilers[3.] In Sep 2017 and Control home 4 had also replaced their boiler flue fan[4.] in Dec 17

All of these changes had significant cost implications and when analysed clarified the business case for installing tadpole across the FSHC estate.

FSHC Property	Duration of saving Months	Degree day analysis		ROI Year	Distance Miles
		Cost savings	% kWh savings		
Care Home in Sheffield x 2 Tadpole devices	9	-£3,419	**-18.9%**	1.02	0
CH1	11	-£1,375	-18.2%	[1.] **11.93**	12
CH2	6	-£987	-20.9%	0.97	7

1.) Tadpole is projected to extend the life of any boiler by between 3-7 years depending on age and condition. Removing Oxygen and entrained gases removes the product of corrosion thus improving performance and reducing annual maintenance and call out requirement.

FSHC Property	Duration of saving Months	Degree day analysis		ROI Year	Distance Miles
		Cost savings	% kWh savings		
Care Home London3.) 1 x Tadpole device	6	-£1,546	**-25.3%**	0.82	0
Care Home N London[3.] 1 x Tadpole device	5	-£1,268	-19.1%	0.83	7
CH3	8	-£2,562	-24.9%	[3.] **10.01**	20
CH4	8	-£1,129	-9.3%	4.85	10

3.) Tadpole, installed and commissioned = £2,525.00 inc VAT. Replacement boilers = £38,454.00

Summary

A second review was conducted using audited billing data up to July 2018 and showed a (net) reduction over the period of 14.5% and 15.5%, this translates into a combined annual savings of over £4,500 per annum for just these 2 homes which was superb.

FSHC has been monitoring the commercial Tadpole energy saving devices at 4 homes since September 2017.

The results over 12 months have been outstanding - we realised a **validated reduction in heating gas consumption of between 18% - 25%.** The data and calculations were re-audited by FSHC Finance and took into account weather (i.e. degree day analysis).

Based on the savings achieved the expected payback period for investment is approximately 1 year based upon the pro-rata methodology to calculate ROI.

To give perspective to the figures and projections

Tadpole has a 10 Year warranty and a 40 year expected lifespan. Therefore, based upon the lowest and highest calculated reductions in consumption and the corresponding savings, achieved, **FSHC could reasonably expect a saving per site of 18% to 22% and payback in less than 12 months.**

Larger sites and sites with more than 1 boiler room project payback between 12 -18 months and 28 specialised properties project payback at circa 2 years

Using the audited data and savings calculated at 18% from the [1.)]4 test sites, the actual savings per year equates to [2.)]£15,496.67 and a projected saving over 10 years of £154,966.66

Using a mean average saving of £3874.17[(2. / 1.)] It is reasonable to assume that the proposed staged rollout to install Tadpole at 205 homes would equate to savings each year of £794,204.17 and a staggering £7,942,042 over 10 years. At 22% the figures would be significantly higher.

“The payback period for investment is less than 1 year which is incredible, and I haven’t found anything that achieves these numbers that also continues to save each year whilst improving overall heating system performance.

Based on the results we are now installing an additional 12 homes this year to get the winter savings and then plan to roll this out to further sites in the UK and Northern Ireland during 2019.

By reducing our heating consumption we save money and reduce CO^2 which is good for FSHC, great for the environment and very timely with the Governments new SECR starting in April 2019.”

Kawun Williams | FSHC Sustainability Manager