EndoTherm®

Statement of Performance

EndoTherm Statement

The performance of EndoTherm as an energy saving technology has been tested in a lab environment by Enertek International[1], in a controlled domestic field trial by Atega Ltd[2] and replicated in over 30 case studies of various types. The performance of EndoTherm during these lab reports and pilot schemes has also been verified by the Energy Saving Trust under their product verification scheme[3].

WET HEATING SYSTEMS DOSED WITH 1% OF ENDOTHERM WILL EXPERIENCE AN IMPROVEMENT IN SYSTEM EFFICIENCY OF 8%. THIS CAN BE UP TO 15% IN SYSTEMS USING CONDENSING BOILERS.

EndoTherm Mechanism

Dosed at a 1% concentration, EndoTherm reduces the surface tension of water by 60%[4].

(Surface tension of water, γ=71.97Nm/m / surface tension of EndoTherm, ,γ=27.1Nm/m)

A liquid with a reduced surface tension has a lower contact angle and improves the thermal contact area or cross sectional area on the inside of radiators. The improvement in thermal contact area causes improvements in the overall heat transfer co-efficient which is:

$$Q = UA\Delta T$$

Where Q = Rate of Heat Transfer, U = Heat Transfer Coefficient, A = Cross Sectional Area and ΔT is Temperature differential.

Manifestation of Savings From EndoTherm

1. Nucleated boiling

The inclusion of a surfactant reduces the impact of steam bubbles restricting heat transfer in nucleated boiling sites thus allowing water to heat up quicker.

'Experimental results demonstrate that the heat transfer of the boiling process can be enhanced considerably by the addition of a small amount of surfactant' [5]

2. Systems Heat Up Quicker

The work done by Enertek International[1] shows the emitters and subsequently the rooms heat up and reach the thermostatically set temperature quicker. This is caused by an improvement in thermal effectiveness, thermal contact area and thus improvement in heat transfer efficiency. This reduces the boiler operation time for each cycle.

3. Longer slow down time

The work done by Enertek International[1] shows systems cooling down over a longer time period thus increasing the time between cycles and reducing the number of cycles over a given time period. The improvement in heat transfer continues when the boiler is off / low power. The heat continues to transfer into the room more efficiently thus maintaining the desired temperature band over a longer time period.

4. Increase in the ΔT or flow/return of the bulk water

The increase in heat loss from the system emitters reduces the temperature of the bulk water as it returns back to the boiler.

Work done by Enertek International[1] shows a lower return temperature thus creating a larger ΔT within the system. This cooler return allows modern boilers to condensate more and recover more latent heat from the water, reducing the workload of the boiler to heat the water back up.

Modern boilers will enter a condensing state with a return around 53/55°C but many systems in the UK are designed for a 80/60 flow/return and therefore do not fully allow the boiler to reach its full efficiency potential. The Enertek[1] report also identified a reduction in Boiler Flue Gas temperature to support this improvement.

Domestic Testing

The performance of EndoTherm was tested by Trivallis Housing Association by independent consultant Dean Partridge from Atega[2]. Atega are Carbon Trust Accredited and done work for the Energy Saving Trust.

The test followed the best practice protocols set out by the Energy Saving Trust. Sites were chosen within a Sheltered Accommodation Scheme and remote monitoring was installed taking 30 second readings on internal temperature, external temperature aswell as system flow/return temperatures. Gas consumption was also monitored.

All sites were powerflushed and control sites redosed without EndoTherm were compared with those where EndoTherm had been installed. Over 6 months, sites with EndoTherm saved, on average 21.34%. The control sites saved 7.35%. The subsequent savings caused by EndoTherm was 13.99%.

This also confirmed that the mechanism was different to that of a power flush.

References

1 Report E3363. (2014) EndoTherm Solution Assessment. Enertek International.

2 Partridge D. (2016) An Independent Test of EndoTherm Central Heating Additive at Fanhuelog Sheltered Accomodation. Atega Ltd.

3. Report 170125 (2017). Energy Saving Trust Report. Endo Enterprises--EndoTherm Central Heating Additive. Version 2.1

4 Anwar, J and Johnsone, W (2015) Surface Tension Measurements of a Heat Transfer Liquid at Different Dilutions. Report Number: L70. LPD Lab Services Limited.

5 Hestroni, G. (2013) Reports on Enhancement of Pool Boiling with Environmentally Acceptable Surfactants. Department of Mechanical Engineering, Technion--Israel Institute of Technology, Haifa 32000, Israel.