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**EXPERT OPINION ON THE SCALE-BEATER II AND  
SCALEWATCHER / SCALEWIZARD WATER TREATMENT  
PRODUCTS**

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Prepared for:

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# EXPERT OPINION ON THE SCALE-BEATER II AND SCALEWATCHER / SCALEWIZARD WATER TREATMENT PRODUCTS

## 1. Authority

I, Dr. Carl Jasper, the Author of this Report, have been working in the domestic plumbing and heating sector, testing and determining the operating mechanism and performance of water treatment devices, for more than 20 years. I have a doctorate in Physics and am a Chartered Engineer. For the last 4 years, I have been Director of Aquademic Limited, an engineering consultancy business providing advice on the selection and performance of water treatment products for domestic heating and hot water systems. I am Director (Water Treatment) of the Heating and Hot Water Information Council, and am Director and Chairman of the United Kingdom Water Treatment Association (UKWTA) – the leading Trade Association in the UK for companies involved in point-of-entry/point-of-use water treatment. For 15 years, from 1989, I worked in a Senior Management role at British Gas Research and Technology Division as head of the department responsible for testing water treatment devices and resolving technical issues with the performance of water heating systems which arose in British Gas Services customers' premises in the field. I have collaborated with other UK academics and experts in this area and have lectured extensively on water treatment technologies both in Europe and internationally. I have also acted as appointed expert witness providing expert opinion on a number of occasions in legal proceedings. I have provided expert opinion to Guy Parker, Directory of Investigations at the ASA on the operation and performance of water treatment devices on a previous occasion.

## 2. Instruction

I have been instructed by Messrs. Fast Systems Limited to provide a brief report on the following:

- i. the operating mechanisms of the MagnaFlow Scale-Beater II and Fast Systems Scalewatcher/Scalewizard (hereafter referred to as Scalewatcher) Water Treatment Devices.
- ii. evaluation of the relative performance of these particular products and comparison with that of similar devices based on test data gained in previous studies
- iii. comparison of the results I have obtained in tests on the Scalewatcher product with the results of test work reported by the University of Portsmouth (Report No. TRA9192472).
- iv. comment on the effect of the devices in inhibiting limescale precipitation when treated water is heated.

I have read the ASA correspondence to *Ideal Shopping Direct plc t/a Ideal Vitality* (Ref: A06-17929/SL) and Final Adjudication sent to *J.E.M Marketing Case Number A06-10076*.

I am in possession of a MagnaFlow Scale-Beater II unit with corresponding literature and packaging.

I was Manger of an extensive research programme involving assessment of the operation and performance of the Scalewatcher water treatment product in laboratory and field trials from 1989 to 1992 and have been involved in the testing of 5 different proprietary products similar in type to the Scalewatcher and 11 different products similar in type to the Scale-Beater II.

This report details my findings and observations, and provides my expert opinion as to the nature, operation and performance of the products being considered here.

### 3. Observations and Conclusions Based on the Evidence Found

I have inspected the two devices and conclude the following points regarding the types of product:

- i. The MagnaFlow Scale-Beater II is of the type commonly referred to as a *Clamp-on Permanent Magnet Device* whereby permanent magnets (usually weak field soft-iron core magnets) are clamped around the outside of the pipe carrying water.
- ii. The Scalewatcher is of the type commonly referred to as a *Wrap-Around Electronic Device* employing wires carrying an AC signal which are wrapped around the water-pipe - often erroneously (see point xvi below) referred to as a *Wrap-Around Electromagnetic Device*.

I am familiar with the results of extensive tests carried out on the Scalewatcher device by British Gas Research & Technology (published in a confidential internal report). I have considered the operating mechanism and performance of both types of device and conclude the following:

#### Clamp-on Permanent Magnet Water Treatment Devices

- iii. It is widely claimed by manufacturers of the *clamp-on permanent magnet devices* that their products inhibit limescale build-up on heat-exchange surfaces by encouraging the precipitation of needle-like aragonite limescale crystals, which find it harder to adhere to surfaces than the more normal calcite.
- iv. Some manufacturers additionally claim that the magnetic field induces polarisation of the dissolved transition metal ions ( $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$ ) responsible for limescale which influences the precipitation of aragonite in favour of calcite.
- v. Within the limits of experimental error, I have seen no evidence of the benefit of a reduction in limescale precipitation in any test on this type of device irrespective of water flow rate.
- vi. I have seen no evidence of the precipitation of aragonite in favour of calcite with this type of device irrespective of water hardness or flow rate.
- vii. In many of the experiments the magnetic field was found to be very weak between poles of the magnets inside the treated pipework as the field strength was attenuated by the pipe wall.
- viii. I have found that magnetic field strength needs to be several orders of magnitude greater than can be achieved with stand alone permanent magnets before any effect upon limescale precipitation can be achieved due to the application a magnetic field.

#### Wrap-around Electronic Water Treatment Devices

- ix. The Scalewatcher water treatment device is of the type generally claimed to work by producing an oscillating electric field which causes the ions of the dissolved hardness salts to *cluster* together to form nucleation sites (*seed crystals*) upon which further limescale precipitates when the water is heated. Limescale precipitated at these sites is washed through an appliance by the water flow.
- x. I confirm having found evidence of the mechanism of operation described in point ix (which is consistent with the Report from Portsmouth University) and the precipitation of a greater proportion of aragonite limescale crystals over calcite.
- xi. I confirm having found evidence of the efficacy of the Scalewatcher device over a wide range of water flows typical of that found in domestic premises in the UK.
- xii. I confirm having found evidence of the efficacy of the Scalewatcher device over a wide range of water hardness typical of the variation in water quality found across the UK.
- xiii. I confirm having found the ability of electronic devices to gradually remove existing limescale in domestic boilers during field trials (consistent with the Report from Portsmouth University).
- xiv. I confirm having found evidence that with the coil of wire wrapped around metal pipework, the signal conveyed through other connected metal components in the system.
- xv. I confirm that these results were consistent with tests on other wrap-around devices from different manufacturers.
- xvi. Although often referred to as *Electromagnet Devices* the magnetic field associated with the electric current flowing in the wire which is wrapped around the pipework is negligible

compared to a permanent magnet and I have found no evidence for its influence upon any limescale inhibition benefits found.

### Product Testing

xvii. I sit on a number of European Standards Committees involved in the development of test methods to evaluate the performance of water treatment products and am familiar with much of the test data published by leading experts. Having been involved in extensive test programmes carried out by British Gas Research & Technology I am of the opinion that field trial testing has proven to be the most effective means of establishing product performance. This approach has demonstrated good repeatability. I would not expect further repeated field trial testing of previously evaluated products to generate contradictory results.

## 4. Effect of Limescale on Energy Efficiency

Through Aquademic Limited, I was instrumental in demonstrating the reduction in energy efficiency due to limescale build-up in water heating applications. As representative of the UKWTA Trade Association I presented this information to the Office of the Deputy Prime Minister in November 2005. This has resulted in amendment to Part L of the Building Regulations (published April 2006) now requiring treatment of supply water in heating applications to prevent limescale precipitation in hard water areas for compliance. A submission to brand limescale inhibitor devices *Energy Saving Devices* is currently being considered by the Energy Savings Trust.

## 5. Overall Summary and Conclusions

1. *Clamp-on Permanent Magnet* and *Wrap-Around Electronic* Water Treatment Devices such as the MagnaFlow Scale-Beater II and Scalewatcher are not the same type of product and should not be considered the same. They employ very different physical principles as the basis of their operating mechanisms.
2. I have found no evidence of the efficacy or benefit of any *clamp-on permanent magnet device* in inhibiting hard water limescale precipitation.
3. I have found significant evidence of the efficacy and benefit of the Scalewatcher *wrap-around electronic* water treatment device in inhibiting hard water limescale precipitation in tests at various flow-rates and with waters of varying quality.
4. I have generally found that *wrap-around electronic* water treatment devices gradually remove existing limescale in plumbed-in boilers and water heaters in field trial tests.
5. The results from laboratory and field trial tests on the Scalewatcher water treatment device and findings in relation to the operating mechanism are consistent with results obtained in tests on similar proprietary wrap-around electronic products.

## 6. Declaration

This report consists of 3 pages plus the front cover and has been prepared by me. I declare that:

- a. I understand my duty in providing this report is to act as independent expert witness to help the parties concerned establish the facts and that this duty overrides any obligation I have to the parties who have engaged my services
- b. I have complied with this duty
- c. I have taken reasonable care to consider all of the relevant facts which have a bearing upon this case
- d. I believe the facts and findings that I have stated in this report to be true and that the opinions expressed herein are my own and are correct

Signed: 

Date: 23<sup>rd</sup> August 2007