March 1992



BEST PRACTICE PROGRAMME

# General Information Leaflet

# CONDENSING BOILERS IN NON-DOMESTIC BUILDINGS

## The success of Condensing Boilers in Non - Domestic Buildings — A User Study

### Key Findings

Of users questioned:

- 93% found installation "Average" to "Very Easy"
- 92% found commissioning "Average" to "Very Easy"
- 85% found maintenance "Average" to "Very Good"
- 80% found reliability "Good" to "Very Good"
- 88% said they would specify them again

### Introduction

The condensing boiler is one of the most energy efficient heat generators available for space and domestic hot water production. By making use of the latent heat of vaporisation contained within the flue products, condensing boilers can operate, at full load, at efficiencies better than 95%. Typical seasonal efficiencies of between 85 and 90% give these boilers efficiencies between 20 and 25% higher than modern conventional boilers.

The Energy Efficiency Office has been actively promoting the use of condensing boilers in both domestic and non-domestic buildings for several years under the Energy Efficiency Office (EEO) Best Practice programme and its predecessor the Energy Efficiency Demonstration Scheme. Promotion has been through Demonstration Projects and Case Studies disseminated via EEO publications and seminars.

An essential aspect of the acceptance of any new technology is how well it performs in practice and how users of that new technology perceive its value. Sufficient installations of condensing boilers now exist in non-domestic buildings to permit a reasonable assessment of user satisfaction.

This publication reports on an assessment of various aspects of the achieved performance of condensing boilers as perceived by users, including installation, reliability, economic and technical performances.

The results of this assessment indicate that there is a high degree of user satisfaction in all aspects of condensing boiler performance. In this survey a user covers those responsible for the specification, management and operation of condensing boiler plant. Table 2 gives a breakdown of decision makers included in the sample.

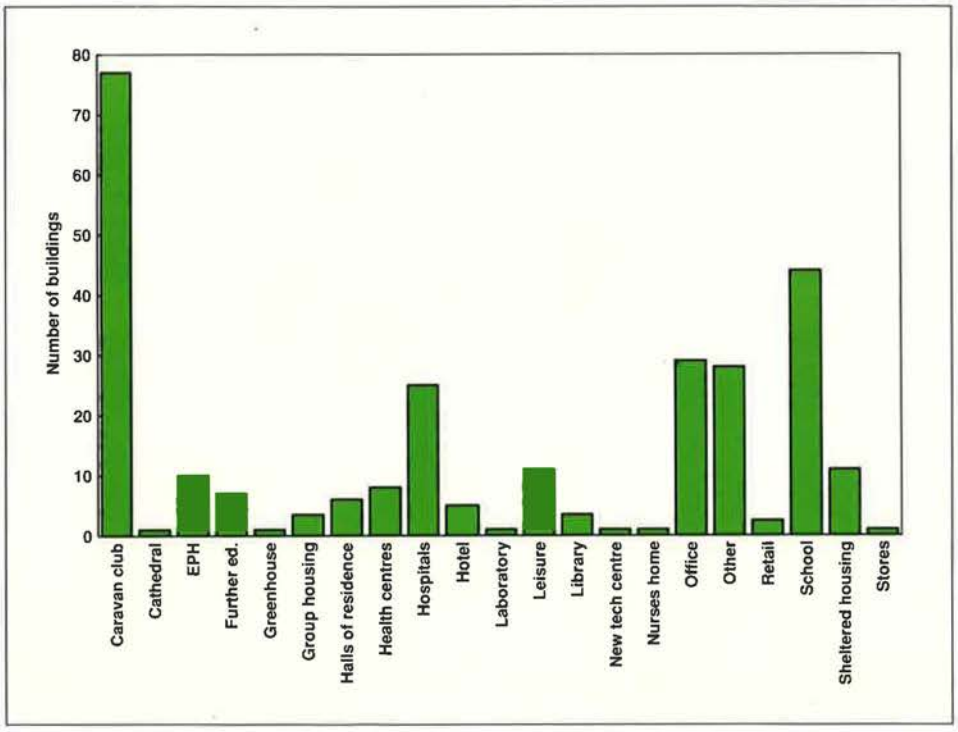


*Figure 1. Populations of Building Types in the Survey*

Energy Efficiency Office
DEPARTMENT OF THE ENVIRONMENT

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## THE SURVEY AND INSTALLATION ISSUES

### Outline of Work

Data from the operators of 279 installations were obtained accounting for 492 condensing boilers. Fourteen boiler manufacturers were represented in the sample. The range of building types within this sample was extensive. The major building sectors, covering 52% of the sample population, are shown in Table 1 below.

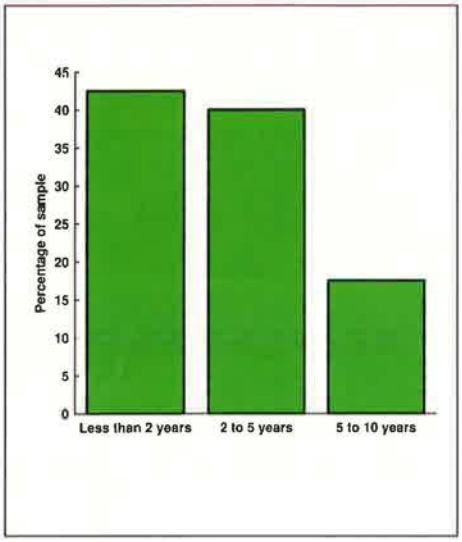


*Figure 2. Ages of Boilers*

Figure 1 shows the total range of building types and installations in the sample.

Seventy one percent of all installations were condensing boilers only (single and multiple) with 28% being mixed boiler systems (condensing and conventional).

Boilers in the sample covered an age range of up to 10 years. Figure 2 shows the distribution of boiler ages in the sample, 28% of those in the sample did not respond.

**Table 1. Major Sectors in Sample**

| Sector | Number of Installations | Percentage of Sample |
|---|---|---|
| Education | 51 | 18 |
| Offices | 29 | 10 |
| Hospitals/Health Care | 33 | 12 |
| Residential | 32 | 12 |
| Sub Total | 145 | 52 |

***Note*** A further 77 installations (28%) were from Caravan Club site installations providing communal space and water heating facilities.

Respondents to the survey represent a range of decision makers, Table 2 outlines these. The sample clearly gives a good spread of both types of applications and functions of respondents and as such is a good indicator of the achieved success of condensing boilers.

### Results of Study

The major results are presented in Figures 3 to 11. Each figure corresponds to a particular question which appears as a heading to the figure. Where appropriate qualitative questions sought responses on a 5 point scale.

### Installation Issues

In this part of the survey information was sought concerning the reasons for selecting condensing boilers, as well as, on ease of installation and commissioning. The responses are shown in Figures 3,4, and 5.

Figure 3 clearly shows that 66% of those questioned selected condensing boilers due to savings either in fuel or fuel cost, most of the further 27% who cited a combination of reasons included fuel and fuel cost savings. Clearly then the message that condensing boilers yield significant savings is a key motivating factor amongst decision takers.

Figures 4 and 5 show that both boiler installation and commissioning is generally regarded as average to very easy. Of those responding, 93% said that condensing boilers were average to very easy to install and 92% said that condensing boilers were average to very easy to commission.

This information demonstrates that condensing boiler installation and commissioning are relatively simple and should therefore pose no barrier for those considering investing in them.

**Table 2. Decision Makers in Sample**

| Job Function | Percentage in Sample |
|---|---|
| Energy Management | 27 |
| Maintenance | 7 |
| General Management | 23 |
| Services Engineering | 43 |
| Total | 100 |

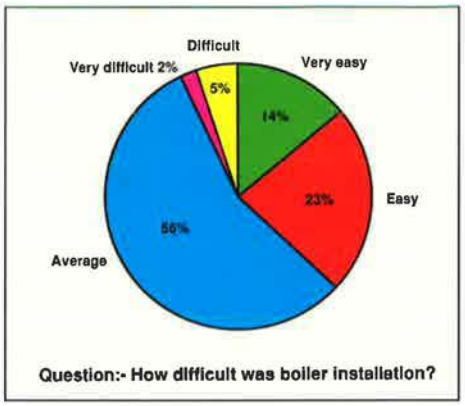


*Figure 4. Boiler installation*

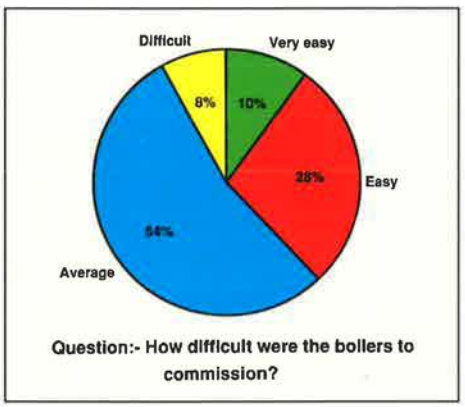


*Figure 5. Commissioning of the boilers*

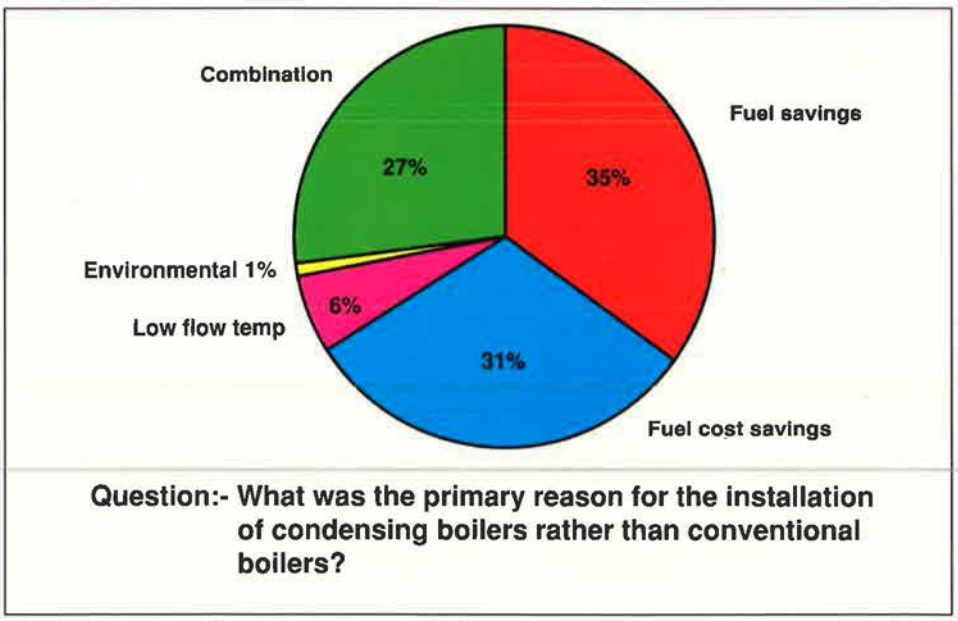


*Figure 3. Reasons for installing condensing boilers*

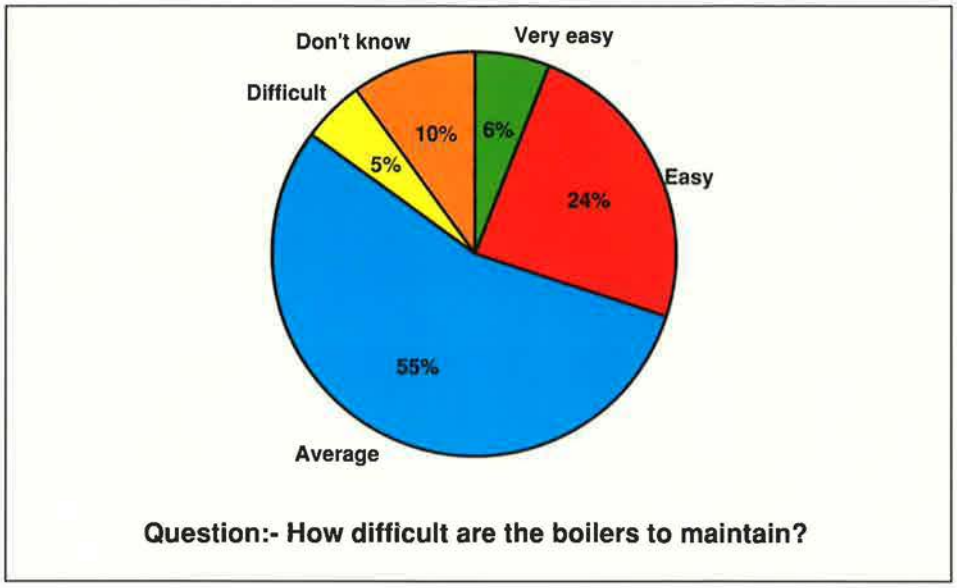


*Figure 6. Boiler maintenance*

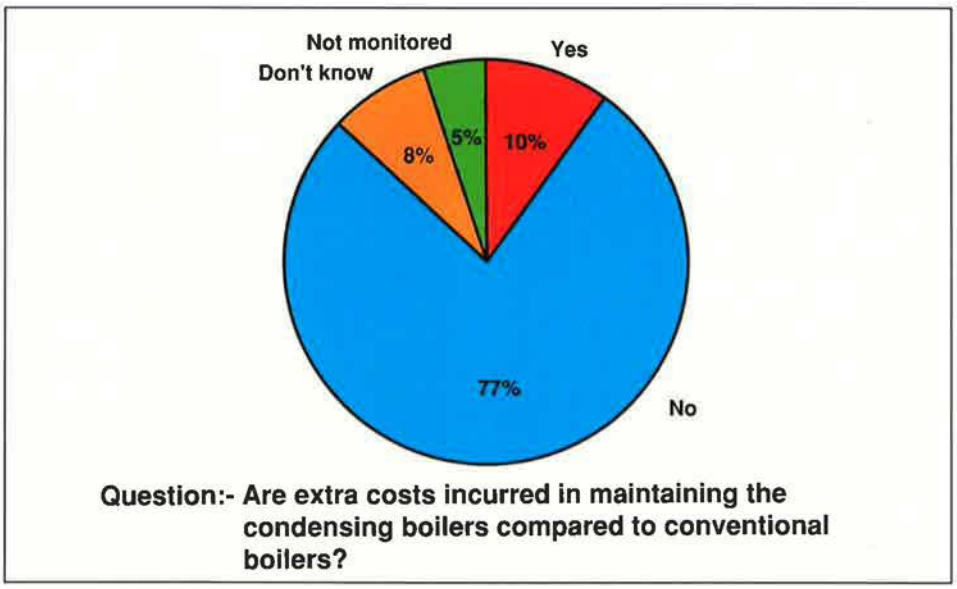


*Figure 7. Maintenance costs*

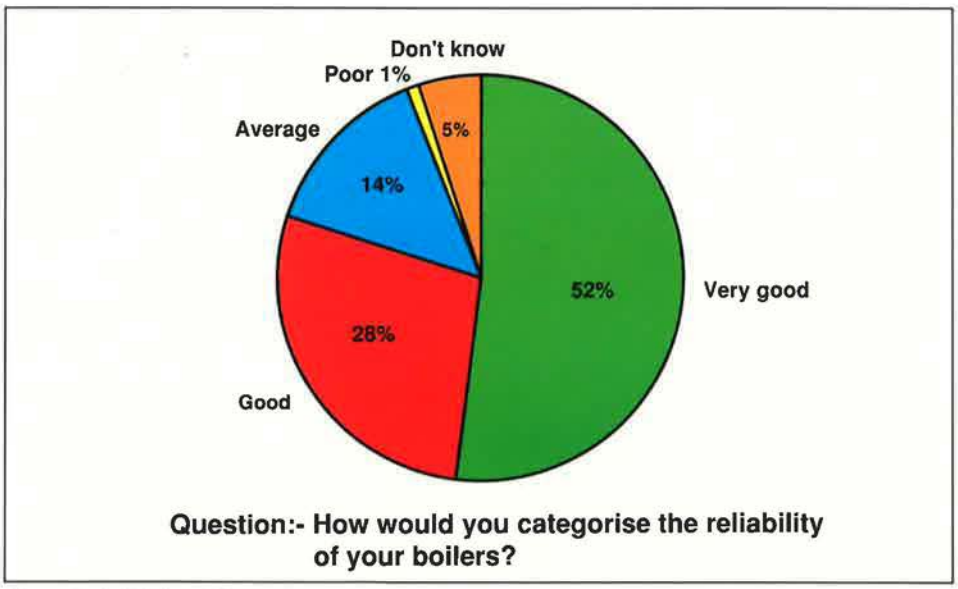


*Figure 8. Reliability of the boilers*

### Maintenance and Reliability

The survey addressed one of the areas of major concern in the past regarding condensing boilers: reliability and maintenance. Responses to these issues are shown in Figures 6, 7, and 8.

Figure 6 shows that maintenance is generally average to very easy, with 85% of respondents taking this view. When the issue of maintenance cost was raised, 77% of respondents noted that there were no extra costs in maintaining condensing boilers (Figure 7). Thirteen percent of respondents did not know if extra costs were being incurred.

Figure 8 shows that when reliability was assessed, 80% of those who replied said, that boiler reliability was good or very good.

It is important to note that the sample of boilers included appliances of up to 10 years of age with a substantial proportion (17%) of those over 5 years old (see Figure 2). The reported views in this survey therefore do include those with up to 10 years experience of condensing boilers.

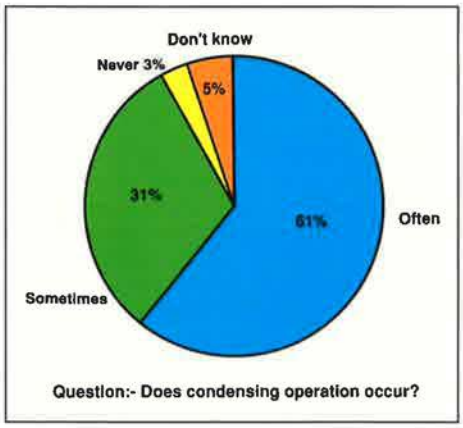


*Figure 9. Occurrence of condensing operation*

### Technical Performance

The final section of the study dealt with how well the boiler was perceived to be performing in both technical and economic terms. An overall indication of the satisfaction of users was assessed by asking whether they would specify condensing boilers again. (Figure 11).

The technical performance was simply assessed by asking whether condensation was known to occur. Figure 9 shows that condensation occurred often in 61% of installations, only in 3% was condensation known to never occur. This indicates that system design was generally of a high quality within the sample.

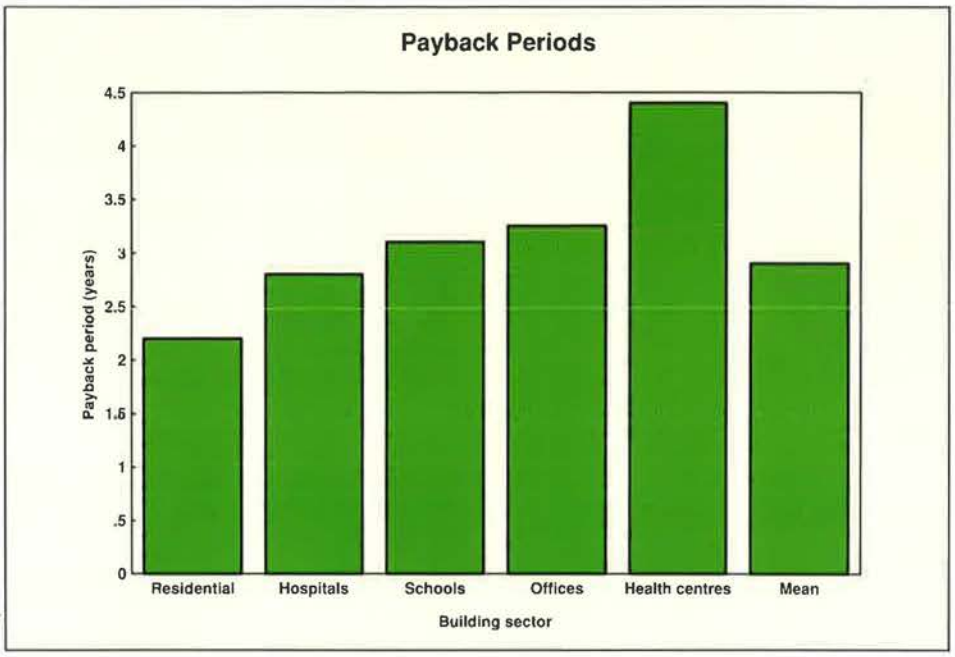


*Figure 10. Payback periods for the 5 largest groups in the sample*

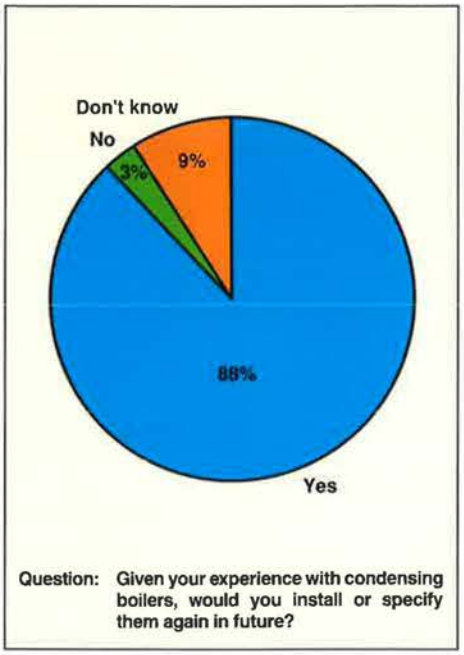


*Figure 11. Future installation*

### Economic Performance

The economic performance was assessed by determining payback periods for the various installations. Only 32% of respondents were able to provide information of sufficient detail to answer this question. As many installations were relatively new and were still in the process of paying back, 50% of respondents based extrapolated current economic performance to achieve a likely payback time. The average payback figure for the whole sample was 3.2 years.

Further analysis examined the payback periods for the five largest groups in the sample. Figure 10 shows the result. The figure shows a range of mean payback periods from 2.2 years in residential applications (sheltered accommodation, old peoples homes) to 4.4 years in health centres. The mean of this part of the sample was 2.9 years.

This range can be accounted for by considering typical hours of use in the categories considered. The CIBSE Applications Manual AM3: Condensing Boilers explains that applications with high hours of use (2500-3500hrs/yr) such as sheltered housing and hospitals will offer better payback performance than those applications with lower hours of use (<1500hrs/yr) such as offices and schools. Nevertheless, paybacks of about 4 years for applications such as offices and schools and a mean payback of 3.2 years for the whole sample indicates that, generally, paybacks were short.

Finally, the participants in the survey were asked whether, following their experiences with condensing boilers, would they specify them again. Figure 11 shows that 88% of respondents said they would. This is a clear indication of a high level of overall satisfaction with their condensing boiler installations. Of those who did not respond positively the majority had new installations and were in the process of appraising their success.

## CONCLUSIONS

This user survey has shown a number of key outcomes for those considering investing in condensing boilers:

- they are simple to install and commission.
- in operation they have proven reliable and easy to maintain with no maintenance overcost when compared with conventional boilers.
- a high proportion of boilers have been operating within condensing mode indicating very high efficiencies.
- average payback (based on the overcost of a condensing boiler) for the sample was 3.2 years. When optimum installation types were considered (such as hospitals and sheltered accommodation) paybacks were between 2.2 and 2.8 years.
- almost 90% of those who specified condensing boilers would specify and install them again.

**This survey clearly shows that non-domestic condensing boilers have proven to be most successful in this random sample of installations.**


### Further Information

This General Information Leaflet (GIL) was prepared by BRECSU for the EEO as part of the EEO's Best Practice programme. A series of Good Practice Case Studies on the use of Condensing Boilers in a variety of buildings is being prepared (see below). **Good Practice Guide 16** provides practical information on installing condensing boilers in large buildings.

The Chartered Institution of Building Services Engineers (CIBSE) **Applications Manual AM3: Condensing Boilers** gives detailed guidance on all aspects of the subject. This covers appliance selection, new application yardsticks, system design and economic evaluation.

For further details on Best Practice publications contact BRECSU, Building Research Establishment, Garston, Watford, Herts, WD2 7JR. Tel: 0923 664258.

For further details on CIBSE publication contact the Chartered Institution of Building Services Engineers, Delta House, 222 Balham High Road, London SW12 9BS.





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