Radon Sump System Performance Measurement: Pilot study

Introduction

For decades Radon sump systems have been fitted to domestic and commercial properties in the UK.

Once fitted no measurements are taken to determine if the sump system is performing well. The only recommended check made is a 3 month passive radon detector check.

If the results from the radon detectors show a poor reduction in radon levels, then time is wasted in determining if the geology, building structure, or the radon system are the reason for poor radon reduction.

Aim

This document aims to determine if there are a set of tests and tools that are useful to assure installers and customers that a radon system is performing to a reasonable standard, or whether another parameter is the cause of poor radon reduction post-system fitment.

The Principles

The aim of the testing is to measure three important parameters of an 'active' radon sump system (where a fan is fitted in the system):

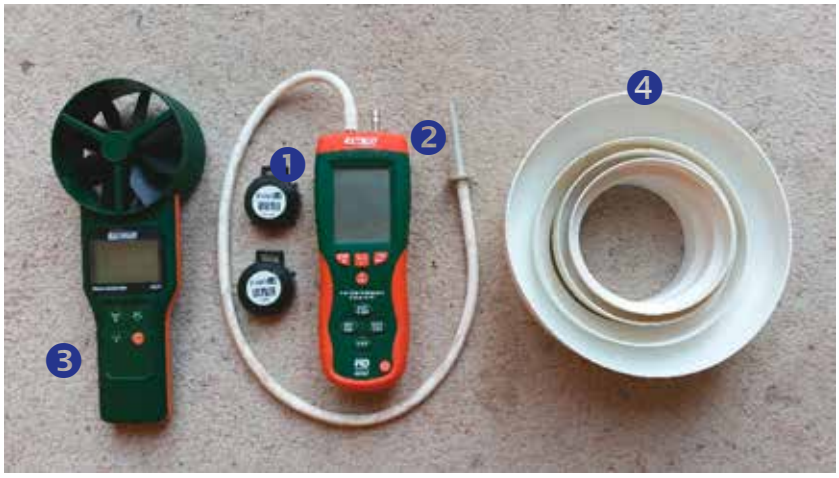
1. The pressure drop or rise on the sump side of a radon sump system
2. The airflow through a radon sump system or radon ventilation/extraction system
3. The post-fitment reduction in radon levels in the building being remediated by the radon system

The Tools

Figure 1 shows the tools required for checking the performance of a radon sump system:

1. Passive detectors
2. A pitot tube anemometer
3. An anemometer
4. Reducers to fit different fan outlets

Figure 1



The Method

The Pitot tube anemometer is used on the sump side of the fan on a sump system. It measures the drop in pressure at the sump side of the fan. A 6mm hole is drilled on the sump outlet pipe to the fan and a pitot tube is placed in the hole. The pressure drop/rise in Pascals is measured.

The anemometer is used to check the airflow from the outlet of the fan. The appropriate reducer is fitted to the outlet side of the fan and the anemometer is placed over the end to get an airflow measurement in metres/second.

The passive detector(s) measure the radon levels over a 3 month period, using the UK standard method of measurement and applying a seasonal correction. The result from the pre-fitment test is recorded. A second set of detectors are placed within two weeks of the sump system being fitted. The percentage reduction in radon levels is recorded and used in comparison against airflow and pressure drop.

Results

Figure 2 shows that there is a relationship between air flow and pressure drop, which varies with different types of fan.

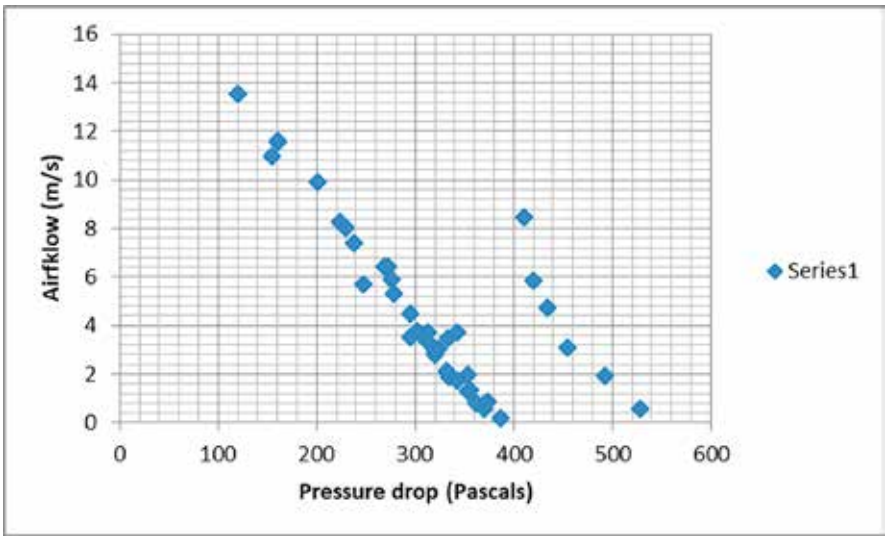


Figure 2 *Comparison of airflow and pressure drop.*

Figure 4 shows that even lower airflows can produce good percentage drops in radon, although could have less impact than higher airflows.

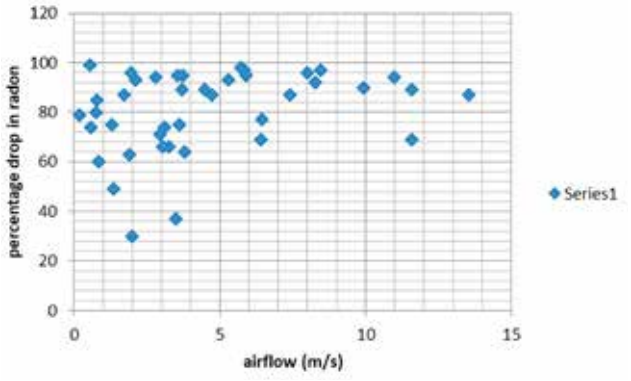


Figure 4 *Comparison of airflow & % radon reduction.*

Figure 3 shows that most systems measured have been successful at reducing radon by large margins in many cases. However, it does not show a lower or upper threshold of fan impact on radon.

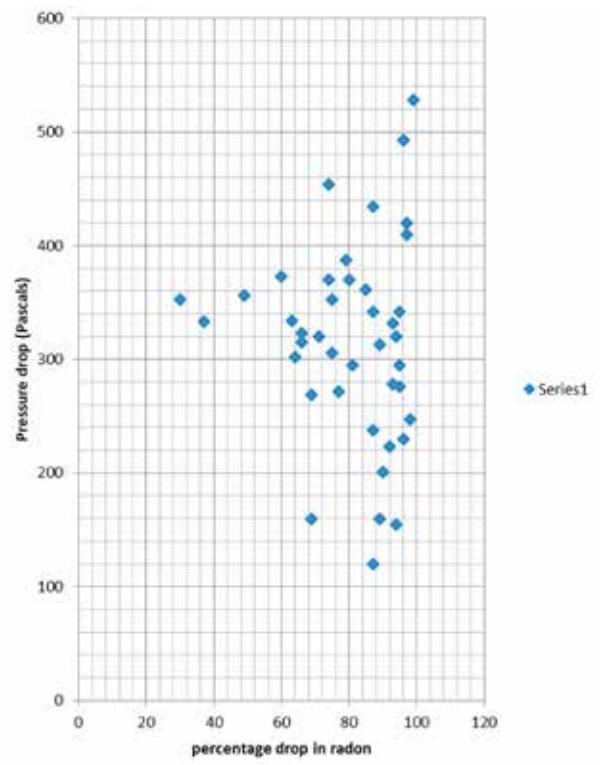


Figure 3 *Comparison of pressure drop & % drop in radon.*

Conclusion

The results show that generally well fitted sump systems have a dramatic effect on reducing radon levels in properties.

The test equipment can determine if a fan is operating correctly, and can identify the performance of different types of fan. This would allow comparison of different types of fan under test conditions, and identify if a fan is not performing to standard. Once more data is collected on different types of fan, it would allow installers to quickly identify if a fan needs replacing when servicing.

At present the pilot study requires more rigorous academic appraisal in order to extract more robust results. The author is open to academic input as to how this study can be refined and improved.

The results of the pilot study show that much more data needs to be collected to begin to determine if there are pressure/airflow thresholds that should not be exceeded either at the lower or upper limits of these parameters. Should a sump system depressurise a sump by at least 150 Pascals? If an airflow is less than 0.3 m/s with a pressure drop of greater than 360 Pascals; could this be a sign that the sump is in the wrong location (i.e. the ground is to dense)? More data is required to answer these questions. The author is happy to work with installers to collect more data for this study, with the aim of improving our service to customers.

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