Research & Development Highlights

95-205 Technical Series

Duct Cleaning

Introduction

Professional duct cleaning companies maintain that routine duct cleaning is desirable. They claim that duct cleaning improves air flow, reduces dust and mould in the house, saves energy and generally makes the home more comfortable. However, little research exists to verify these claims.

In response to numerous public inquiries about this subject, CMIHC initiated research projects to assess the effectiveness of duct cleaning in homes heated by forced warm air systems, and to examine biocide[1] 1 use by duct cleaning companies. The projects were undertaken in 1993 and 1994.

Research Program

CMHC contracted with a research team to conduct the duct cleaning study. The research team was required to review the existing literature on the subject, and then to study certain conditions in a number of houses before and after duct cleaning.

For the literature review, the researchers examined studies on duct cleaning that had previously been conducted in North America and elsewhere. They also reviewed the standardized duct cleaning procedures developed in the United States by the National Air Duct Cleaners Association (NADCA). (Similar standards do not exist in Canada.)

The field research was conducted in and around Montreal. The research team first identified homeowners who were planning to have their ducts cleaned. From these, thirty-three were selected for the study. The houses varied by age (ranging from new to **45** years old), size, number of occupants, smoking habits of occupants, type of heating and ventilating equipment, and type of energy used for heating (electricity, oil or natural gas).

The range of houses selected allowed the various duct cleaning techniques used by different companies to be assessed. The techniques included:

- Cleaning with a portable industrial vacuum and brushes
- Cleaning with a portable industrial vacuum and compressed air spray
- Cleaning with a truck-mounted vacuum system
- Cleaning with a truck-mounted vacuum system and metal balls that stir up the air to be sucked in by the vacuum unit in the truck.

Researchers took before- and after-duct cleaning measurements of air flow in the supply (“hot”) and return (“cold”) air ducts, the amount of electricity used by the furnace fan, dust concentrations in the air, and levels

[1] Biocides are products used to kill moulds, bacteria and yeast.

of mould and bacteria (micro-organisms) in the house. The researchers were not present during the cleaning, and the duct cleaning companies were not aware that they were part of a study.

Duct cleaning companies sometimes clean the house's furnace fan when they clean the ducts. To see if a clean furnace fan improves air flow or saves energy, the fans in a number of houses were cleaned and the air flows measured before the duct cleaners arrived. The duct cleaners were not told that the fans had been cleaned. Upon completion of the field work, the measurements were analyzed to determine how duct cleaning affected the air flows, energy use, dust levels, and levels of micro-organisms in the houses studied.

Because the research team was unaware that many duct cleaners routinely spray the cleaned ducts with biocides, biocide use was not assessed in the first project. A second contractor was commissioned to examine biocide use by duct cleaners across Canada. The biocide use study included a telephone survey of over twenty duct cleaners to find out what biocide products they use, under what conditions, and how the biocides are applied. Field testing was conducted on five houses where ducts had been cleaned and biocides used. The testing measured the amount of biocides applied, and the concentration of biocides remaining on the duct surfaces and in the house air after the duct cleaning service.

Findings

The findings for the projects are summarized below.

1. ***The Literature Search***

area had been done on duct cleaning in commercial buildings, where the ducting systems are different from those found in houses. One commercial building study reported that the amount of dust found in ducts was typically too small to affect air flow measurements.

-Study results tended to be inconclusive due to small sample size or uncontrolled experimental situations.

-Studies which assessed the impacts of duct cleaning on micro-organisms found that the impacts varied due to differences in the biocides used to eliminate the micro-organisms. Furthermore, the biocides themselves could reduce the quality of the air in the homes where they were used.

-Industry-funded research showed positive results from duct cleaning.

2. ***Field Research***

Air Flow and Related Measurements

-Duct cleaning did not significantly reduce the amount of energy used by the furnace fan.
- Duct cleaning did not significantly increase supply or return air flow rates.

Dust Measurements

- Many ducts were not cleaner after the cleaning exercise.
-In most cases, the duct cleaning resulted in significant reductions in the amount of dust on the surface of the return ("cold") air ducts.
-The concentrations of dust were very low in the supply ("hot") air ducts, both before and after the cleaning.

. Most previous research in the subject

- The largest reductions in duct dust concentrations occurred in those return air vents where the ducts were dirtier to start with.
- Measurements of the dust in house air showed that there was no significant reduction after duct cleaning. Some houses showed a temporary ***increase*** in dust levels for several hours after the duct cleaning. This was probably due to dust loosened up by the cleaning process.

Measurements of Micro-Organisms (Bacteria, Yeast and Mould)

- The observed concentrations of micro-organisms in house air were below recommended levels, both before and after the ducts were cleaned.
- Concentrations of micro-organisms in house air were lower after duct cleaning.
- Duct cleaning did not significantly reduce the concentrations of microorganisms on duct surfaces.

Summary

The following statistically significant improvements were noted after duct cleaning:

- Reduced concentrations of surface dust in return air ducts
- Reduced concentrations of airborne micro-organisms.

Conclusions

Since electricity use by the furnace fan, airflow and airborne dust concentrations were similar before and after cleaning for the overall sample, industry claims of energy savings, increased airflow, and dust
reduction cannot be verified using the results from this project.

It is not clear that duct cleaning is responsible for the minor reduction in microorganisms in house air, since this could have been due to the biocides used during cleaning, or to the timing of the testing.

Study Limitations

The following study limitations were identified in the study report:

- The number of houses studied was small, making it more difficult to detect significant effects and draw conclusions.
- Manipulation of duct dampers and grates by the cleaning crew may have affected flow results.
- The test procedures used do not require surface dust measurements to be taken at out-of-reach duct locations, where dust conditions may be very different.
- In measuring the duct airflow, only representative supply and return ducts were assessed not all the ducts in the household.
- Due to small sample size, it was not possible to assess the relative effectiveness of the different cleaning techniques.

3. ***The Biocide Use Study***

The research found that biocide use by duct cleaners varies greatly: some duct cleaners never use biocides; others use biocides at each duct cleaning service. The measured concentrations of biocides in the house air after the duct cleaning were found to be relatively low. The impacts of biocides used during residential duct cleaning have not been assessed. Consequently, the potential health effects of even small quantities of

Most previous research in the subject

biocides in the house air are currently unknown.

Implications for the Housing Industry

Keeping in mind the limitations of this research, the results of this research project indicate the following:

- Homeowners should not necessarily expect significant improvements in their home's indoor air quality, nor reductions in their heating bills, as a result of having their house ducts cleaned.

- Cleaning only the return air ducts and the furnace fan may be the most effective and efficient approach to improving air circulation with an existing system.

- Until the efficiency of biocides are proven and their potential effects established, householders should refrain from having biocides applied. According to federal authorities, no products are currently approved by the Pest Control Products Act for use in residential duct cleaning.

Project Manager: Don Fugler
(613) 748-2658
Research Report: The Efficiency of Residential Duct Cleaning (1994)
Research Consultant: Auger, Donnini & Nguyen Inc.

A full report on this research project is available from the Canadian Housing Information Centre at the address below.

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