CONDENSATION PROBLEMS – A NEW LOW COST SOLUTION

By I.P. ASHWORTH

Throughout the year, housing managers and maintenance staff have to combat the problem of dampness in local authority houses.
It is estimated that over 3 000 000 households in the UK suffer from this blight.
Oxford Practical Technologies, with the co-operation of South Oxfordshire District Council have devoted two years of development engineering into solving this ongoing problem. The results of this is believed to be the first and only air drying heating system on the market.

Our climate, coupled with the effects of household activities such as cooking, showering, plant collections and increasingly (amongst young parents) unvented tumble dryers, has led to higher levels of humidity trapped in the modern home. Dampness is compounded by double-glazing and superior insulation.

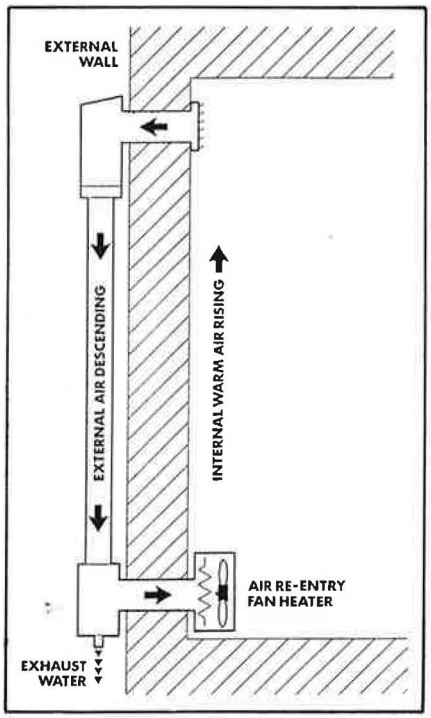

Figure 1: The 'Good Health' air drying heating system.

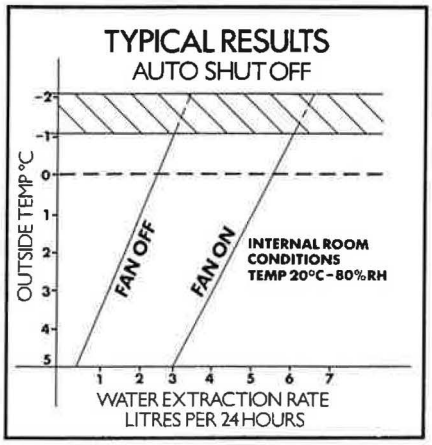

Figure 2: Some typical results achieved by the 'Good Health' air drying system.

The 'Good Health' air drying heating system was developed from the simple observation that windows in houses steam up on cold or cool nights. This is due to the humidity condensing on the cooler window panes – *i.e.*, the warm air at the top of the room, laden with water, cools and immediately descends upon the window, depositing the moisture. Additionally, as the air cools, it falls rapidly pulling more warm and wet air into contact with the window, thereby increasing water capture. The condensation rate increases at the ratio of inside to outside temperature differential.

From these observations it appeared possible to remove the upper layer of hot, wet air from the top of the room, condense it, and return it to the room in a dry state.

This was achieved by inserting two holes through an outside wall, one at the highest level below the ceiling and one directly beneath it at ground level. A heavy gauge metal heat exchanger was developed to mount onto the outside wall, opposite the highest point inside the room. A 70 mm diameter pipe was passed through the wall to collect the damp, warm air. The heat exchanger absorbed over cool periods as much low temperature as possible and thereby enabled it to perform its condensing

Figure 3: A typical 'Good Health' system on a house.

task, not only throughout the cold night hours, but also for one to three hours into the day – even when the outside temperature had climbed to 5°C. Directly below the heat exchanger, a smaller heavy gauge metal box was mounted. This in turn, was connected to the room at floor level *via* a 70mm pipe. The function of this lower box was to direct the now dry air, received from the upper heat exchanger, back into the room and releasing the condensed water into the garden or other suitable waste outlet. This is shown diagrammatically in Figure 1.

Air Drying Heating System

In order to move the air through the system more effectively, a wall-mounted fan heater was fitted on the inside wall, which reheats the returning dry air. With the fan running for twenty-four hours and the inside room conditions at 20°C/80% RH, the water extraction reached 5.5 litres per day. However, with average household conditions (containing a family of four) an extraction rate of one to two litres can be anticipated using this system over operating periods of two hours in the morning and two hours in the evening. Even with the fan heaters switched off, the air movement occurs through the thermal gravitation effect and extraction rates of 0.5 litres to 0.75 litres per day have been attained.

An important observation should be at this point. If the householder follows the simple operating instructions, the walls, plasterwork, and general household atmosphere will have dried out considerably in the first week. The water extraction rate falls and mould cease multiplying; it is now that the mould stains should be removed with a weak bleach solution and light scrubbing, then wiped with clean water and dried.

When the climate stays below −2°C for longer than a day, the 'Good Health' air drying heating system has an automatic shut-off mechanism built into the heat exchanger. This has the effect of stopping all the air movement within the system, while allowing the householder to continue to use the fan heater. There are three reasons for this action:

(1): The water would freeze up on the inside surface of the system, depositing a large amount of frozen liquid. When the warmer temperatures take effect, the bottom water release valve will not have cleared to allow the water to escape. Water would then enter the room *via* the air re-entry pipe at floor level.

(2): The returning air becomes progressively colder and the occupants would become more aware of these changed conditions.

(3): The general humidity levels drop to 30-40% RH in long, cold periods, thereby eliminating the need for dehumidification.

With reference to Figure 2, it should be noted that the system is effective at extracting water from the atmosphere, even at higher temperature levels of 4-5°C, making the system viable throughout most of the the UK summer months. The results shown were achieved in the ideal test conditions of a sealed chamber (representing the living room) and a refrigeration unit (for the external environment). The test results repeated consistently. When the fan was not operated, the air from the test chamber laden with water, cooled rapidly and descended the down-pipe pulling more warm wet air into contact with the heat exchanger. The atmosphere inside the heat exchanger is one of a heavy white mist, similar to a winter's mist. The sytem in this mode has returned results on actual homes of 0.5 – 0.75 litres per night.

Figure 4: This installation on flats illustrate the unobtrusive character of the 'Good Health' system.

System Benefits

Three examples will serve to illustrate the effectiveness of this system.

A recent installation for a local authority has eradicated mould from the bathroom wall, and after three months, no trace of mould had returned. The woman of the house is very pleased with the effect, as she has faced years of the black (often slimy) wall mould. In addition, the bedroom above was also contaminated with excessive moisture retention in the wall plaster. The bedroom was cold and uninviting for the three boys who slept in it. (In fact two of the boys would regularly bed-wet.) The system was fitted in this room and was switched on for only an hour before bedtime. It has resulted in providing a good atmosphere for all the boys to settle to an uninterrupted night's sleep. The residents confirm that the living conditions have improved, converting often warm wet conditions to a fresher dryer environment.

Mr Field of Berinsfield, South Oxfordshire, comments: 'It has completely changed the atmosphere for the better.'

Mrs Alison Ifile, who occupies a privately owned Victorian house in Oxford was also pleased with the results – 'We now eat in the dining room; previously it was too cold and damp.'

The 'Good Health' air drying heating system has now been ordered by twelve local authorities for a wide range of house types. These have varied from blocks of flats through modern estate houses to a converted fire station, now being used as a halfway house. The system is proving to be an inexpensive solution to their damp problems.

Costs

The only moving part of the whole system is the fan heater, this has been de-rated to operate on fan only; minimum 250 watts and maximum heat 500 watts. Used for one to two hours per morning and evening, the running costs are only 2½p-5p per day. The cost of the whole system varies depending upon quantities ordered. For quantity orders, this can be as low as £99.00.

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