farm energy centre

11 Technical Note

Electric Underfloor Heating for the Dairy Parlour

Introduction

One of the most practical and safe ways of providing heating for a dairy parlour is to use electric heating cables embedded in the floor of the pit.

Users of these systems are invariably enthusiastic about their ability to provide a good working temperature and particularly to stop 'cold feet' problems. Frost protection is also a great advantage, especially for parlours with low level jars.

Underfloor heating can be used in both new and existing parlours - a quick setting screed laid over an existing floor can incorporate heating cables.

Underfloor heating cables

The cables used for site cast underfloor heating fall into two main catagories:

1 those operating at mains voltage

2 those operated at low voltage through a voltage reduction transformer.

Of the mains voltage types of cable, there are two which are most commonly used. The first is a single core cross-linked polyethylene sheathed and insulated cable. This is light to handle and inexpensive, but can be susceptible to damage if laid carelessly.

The second is a more robust cable with a plastic covered copper sheath. This cable is less susceptible to damage on installation,but is more expensive especially for smaller heated areas.

Both cables come with what is termed 'cold tails'. These are ready jointed to the ends of the heating cable and used to connect it to the electricity supply as heat from a directly connected heating cable would damage most electrical terminations.

Low voltage cables are operated from a transformer which reduces the mains voltage. This secondary voltage is too low to cause a shock, so the cables need have little or no electrical insulation. A low voltage system tends to be more expensive because of the need for a transformer. Although mains and low voltage cables differ in price, installed correctly they are both equally effective as a heating source and will give years of reliable service.

Cables

Underfloor heating cables are normally thermostatically controlled to ensure that correct temperatures and low running costs are maintained. This is done by inserting the probe from the thermostat into a pipe which has been cast into the screed above the cables. This will provide accurate floor temperature control.

A timeswitch should be used to bring on the floor heating sometime before milking so an acceptable working temperature can be quickly acheived.

An additional thermostat which senses the air temperature in the parlour should be used to override the time switch so that frost protection can be achieved at all times.

Loading of heating cables

The normal rating of the cables required for parlour floors is 200W per m^2 of floor area.

Floor construction

Correct floor construction is very important if the cables are to work effectively. Construction using conventional concrete mixes are only suitable for new parlours. Existing parlours have been unable to afford the time needed to allow for the laying and curing of a new concrete floor.

However, it is now possible to use underfloor heating in existing parlours using a quick setting cement over the existing floor. Care should be taken in the selection of a cement product as some makes are unsuitable for this application.

Existing floors

In this instance the cables are positioned on the old floor and 32 mm of quick setting concrete is laid and hardened in the time between morning and afternoon milking.

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New floors

The two main factors affecting the make-up of the floor are:

1 the type of insulation that is to be used

2 whether all the concrete can be laid within a two hour period; if this cannot be done then slightly thicker screeds have to be used to maintain the strength of the floor.

Notes on construction

1. The sub-base should have the relevant falls and be well compacted. If hardcore is used it should be blinded with sharp sand.

2. Expanded polystyrene insulation cannot withstand high temperatures and must not be used. Extruded polyurethane (purlboard) or extruded polystyrene (styrofoam, polyfoam) insulation is recommended.

3. The screed in which the cables are buried is laid in two layers. The bottom layer (1:3 cement, sharp sand) is laid first and the cables are then positioned on this screed, held firm with proprietory cable anchoring clips. This is followed by the final screed (1:2:2 cement, sharp sand, 10mm aggregate). The concrete mix should be fairly dry. It should retain its form after being compressed by hand, but should crumble easily when disturbed.

4. The cold tails of the cable are brought back to a convenient position where they come out of the concrete protected by a piece of pipe. This should be sealed on completion of the job with waterproof compound.

5. The top layer of concrete should be trowelled onto the cables, taking care that the cables are not damaged or moved together. If the cables become pushed together this could cause a hot spot in the screed which could lead to their failure. Thorough compaction of the concrete is necessary so that air pockets in the screed, which could lead to over-heating are eliminated. A wooden float should be used to flatten the surface of the concrete, followed by the light application of a steel trowel to give a suitable finish.

6. Where it is not practical to lay the cables and the top screed within an hour of laying the first screed, then it should be covered with polythene and allowed to cure for 24 hours before the cables are positioned and the final screed laid.

7. A qualified electrician should be in attendance throughout the laying procedure to check the cable for continuity and insulation resistance. The testing is to ensure that the cable has not been damaged during the laying process; it is a lot easier to take up a damaged cable at this stage than after the concrete has set.

8. The completed floor should be covered with polythene for one week or sprayed with a sealing resin to prevent it drying out too quickly. Ideally it should be left to dry for five to six weeks before the cables are switched on. Then the heating should be turned on at a low themostat setting for a few hours each day, progressively increasing the number of hours until full input is achieved after four or five days. This will ensure that the screed has dried out thoroughly.

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March 2000
p:/newtnotes/tn11.pm65

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