LIMPET CONCRETE CURING SYSTEMS

The Challenge

The Limpet Heating Company (‘LHC’) makes a wide range of process heating products and systems that are focused mainly on process industry applications.

However, their patented technology also lends itself very well to concrete curing applications, especially where accelerated initial curing is required. The most important applications are pre-stressed units, such as lintels, T-beams, slabs, hollow-core panels and railway sleepers. In cold weather, these can take several days to reach the required strength for de-moulding, so heat is applied to provide a 24-hour production cycle.

However, the heating systems can also be used to accelerate curing of other concrete moulds, using bespoke heating and insulation panels.

Traditional heating methods include steam and kerosene burners. However, these techniques are extremely energy inefficient and are not environmentally friendly or safe. In addition, they are difficult to control and may result in lower long-term strength or micro-cracking of the concrete units.

The LHC concrete curing system overcomes these issues in a number of ways, most notably using a fraction of the energy.

The Limpet Accelerated Concrete Curing System

There are three elements to the accelerated concrete curing systems offered by LHC:

- The patented MegaLimpet which is a modular, intelligent, device that is incorporated into a control panel that supplies power to the concrete moulds. It incorporates some sophisticated software that has two main features for concrete curing:
  - The temperature ramp rate is controlled, so that heat is not applied too quickly or early, thereby reducing the risk of cracking. The typical settings are between 6°C per hour to 12°C per hour, depending upon the mould configuration.
  - Once the desired curing temperature has been reached (say 50°C), the control is accurate to within 1°C and the system only applies heat when the temperature sensors incorporated in the mould tell the Limpet to turn on the heat. This typically results in very low energy consumption. For example, a 15m mould with two 140mm square cross-section units (i.e., around 0.5m³ of concrete in the entire mould) can be heated using less than 50kWh of electricity (i.e., a cost of £5 at £0.10/kWh).

- Limpet heating panels. These are aluminium plates with electrical heaters attached to them that are mounted onto the outside surfaces of the concrete mould. All the electrical components are potted, so that they are completely waterproof, at least to IP67 rating. The contact surfaces of the panels are coated with heat conductive paste and are normally secured underneath the mould. They are held in place by a rigid mechanical system to ensure excellent contact between the heating panel and the mould. The heaters used by LHC are extremely reliable and are sized to suit each application. In a typical mould there may be more than one ‘control loop’ (typically controlling a ‘zone’ or channel in the mould), each of which incorporates a very accurate temperature sensor that feeds back the temperature information to the MegaLimpet, which then turns the heating on and off, depending upon the ramp rate or the set temperature.

- Insulation. Each heating panel is covered with PIR insulation (Celotex or Kingspan) and waterproof polypropylene cladding. The unheated surfaces are also covered with the same insulation. To ensure best performance and energy efficiency, LHC strongly recommends that the top surface of the mould is covered with a strong plastic sheet (such as Visqueen); this significantly reduces heat losses, thereby reducing the temperature gradient within the concrete unit (and hence the risk of microcracks), as well as reducing energy costs and aiding hydration.
Other Similar Applications

The same system can be used for heating sand and gravel silos. The challenge with these is that in very cold weather, the sand or gravel can freeze into large lumps, making it difficult or impossible to discharge the material from the silo onto a conveyor or into a vehicle. The heating panels are custom-designed to fit around the outside of a silo and controlled in a similar way to the concrete mould system but without the ramp control. Air sensors will detect when cold weather is imminent and will automatically turn on the heating. Manual over-ride is also possible.

Photographs of Recent Installations

Typical prestressed concrete mould heating system with control panel

Control panel interior with Limpet MegaLimpet control unit (bottom right)

Bonding insulation panels to the side of a mould

A heating panel installed underneath a mould and secured by Unistrut supports locked into the ends of the mould section