

# NEXTGEN TELECOM SITES



## Phase-change material and outside air

### Vodafone the Netherlands

VodafoneZiggo is a leading Dutch company providing fixed, mobile and integrated communication and entertainment services to consumers and businesses. As of January 1, 2017, we have over 5 million mobile, nearly 4 million TV, over 3 million fixed broadband internet and 2.5 million fixed telephony connections. Our combined annual turnover in 2016 was over € 4 billion.

### Challenge

Energy costs of traditional air-conditioners are high and some are and of life. Together with the managed service company we looked for solutions which were more sustainable, had a smaller carbon footprint and took care of the temperature from the UPS batteries.



### Solution

The power consumption from the telecom equipment is different. The locations are very different but most of all small. Together with the managed service company we created a small airhandlingunit. Phase change materials are only used to shave off the high outside temperatures. The design is based on 3-5 kW site load and very easy to install and to maintain. The idea is that everybody can do the maintenance. Each component is easy replaceable, in minutes, without affecting the operation. The airhandlingunit is developed together with supplier Tizzon and Energy Cool. The footprint from the unit is based on a 19" rack and fits in the most shelters.

### Phase-change material

Phase-change material is a substance with a high heat of fusion which, melting and solidifying at a certain temperature, is capable of storing and releasing large amounts of energy. Heat is absorbed or released when the material changes from solid to liquid and vice versa.

Phase-change materials work on a natural principles and is as simple as it is revolutionary. The Phase-change material used within the mobile sites consists of encapsulated salt hydrates and is a residual product from the Dutch salt mines. Depending on the desired temperature within the mobile sites and the climatic conditions, the most ideal phase-change material with sufficient capacity are compounded. The heat in the mobile sites is stored during the day in the phase-change material, and this heat is discharged at night by means of the cold outside air. As a result, the mobile sites are at constant temperature. By the use of phase-change material, no refrigerants are necessary.



## How does phase-change material work in the Vodafone telecom sites

First of all we use the displacement theory for the telecom sites. We press out the hot air and try to keep the  $\Delta T$  as low as possible. With this you always have cold air on floor height where the batteries are positioned.

During outside air temperatures up to 26°C, cooling is normally provided by outside air only. The fanspeed controller will increase the fanspeed when the room temperature increases.

With temperatures above 26°C the fan speed decreases and phase-change material will melt as soon as the outside air temperature rises above the melting temperature. This absorbs the energy and cools down the system air within the ASHRAE range. When more air is needed the fan speed will increase. The PCM makes sure that the temperature on the floor is always low.

Once the outside temperature is lower than the PCM, the process is reversed.

The phase-change material solidifies overnight because the temperature of the outside air drops below the solidification temperature. The absorbed energy is once again released into the system air.

## Tizzin

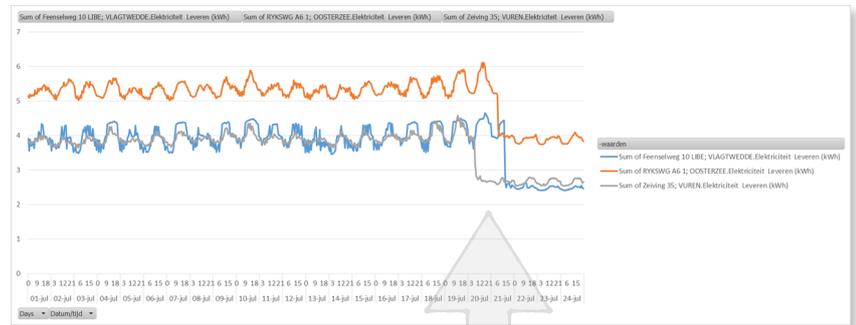
In recent years we specialised in cooling products for small and medium-sized Energy storage- and equipment rooms. Based on Thermal Energy storage (Phase Change Materials and Free-Air).



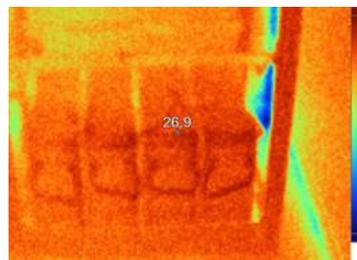
Michel Bosman  
[michel.bosman@Tizzin.com](mailto:michel.bosman@Tizzin.com)  
[www.Tizzin.com](http://www.Tizzin.com)

## Results

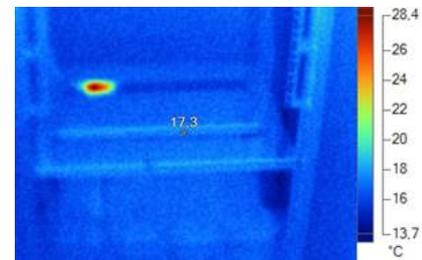
The airhandling units are monitored and placed all over the Netherlands and other European countries. Not only at Vodafone. The temperatures are within the limits according to the ASHRAE. The Phase Change materials are working as a peak control.



Power usage after installation of the airhandling units



Battery temperature before installation of the airhandling units



Battery temperature after installation of the airhandling units

The Vodafone telecom sites based on phase-change material and outside air provide:

- Lower battery temperature
- 93% reduction on energy (1,5 kW to 110W)
- No refrigerant used
- Smaller foot print
- No noise



“In the Netherlands, we have a number of Vodafone pilot sites with PCM-cooling for nearly 2 years. A solution that is almost maintenance free and does not contain any refrigerants. During this period the sites performed according to the agreed specifications. No problems have occurred during this period, even in the warm summer last year. The complete power consumption has decreased significantly, including a significant reduction of battery temperatures compared to sites with a traditional A/C unit. In several ways, I’m very positive about PCM-cooling” Wiel Ackermans Domain architect at Vodafone