

# Dairy drives energy use down and milk production up with LED lighting

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The progressive family-owned Donker farm in North Holland is home to 170 cows producing over 1.3 million litres of milk annually. When it came to building a new state-of-the-art environment for their herd, the Donkers took the advice of specialist dairy supplier Animat Netherlands and installed bovine waterbeds in the new 1900m<sup>2</sup> facility. For good reason they were also looking for a more energy efficient lighting solution.

## The challenge

In 2003 a report was published by the Research Institute for Animal Husbandry which showed farmers that improving the lighting inside their milking barn would encourage the cows to produce more milk.

While that may certainly have been true, adding more light at the time of the report would have been very expensive, as electricity costs continued to rise. On top of that there was the added maintenance cost of the typical high pressure sodium fittings being used.

## The solution

Animat proposed Dialight LED high bays for the new facility, each LED fitting carrying a five year warranty and drawing just 150W compared

to 480W including ballast loss for the HPS fittings. Unlike the yellowish glow of the HPS, the LED luminaires deliver exceptional visibility that mimics daylight and their specially designed optics ensure that light is directed only where it is needed, avoiding light spill which is a sensitive issue in Holland.

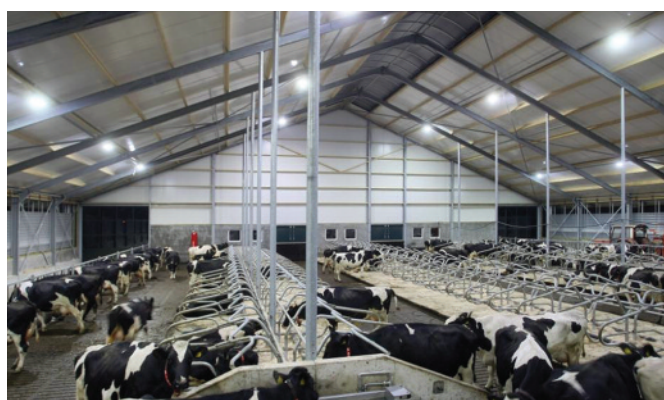
With instant-on ability, the LED high bays can also be turned off and on as needed, avoiding the problematic warm-up period common with other light sources, and they can be dimmed to just 30W to supplement natural light while using very little power.

## The result

With an average of 150 lux on the ground, visibility is now better and energy costs and CO<sub>2</sub> emissions are down by as much as 90% when using dimming, 70% at other times. Barn workers are now better able to see colours properly, identifying animals more easily by their ear tags and spotting injuries or other animal welfare issues.

Being smaller and running at a low temperature compared to other lights, the LED high bays collect much less dust and dirt, helping to keep the barn clean, while emitting no UV they also attract fewer insects.

Milk production is already up by 5% per cow and the Donkers anticipate that, with the combination of LED lighting and the waterbeds, their annual output will increase by 15%. Overall the farm has dramati-



**Research has shown that 16 hours daily at 120-200 lux followed by eight hours darkness has a positive effect on milk production, growth and fertility.**

cally reduced operational expenses and improved production with innovative technologies that make for happy, healthy and very productive dairy cows.

## Summary of findings

There has been no consensus in the Dutch dairy sector about which light regime ensures productive and healthy animals. The need for clarity on this has become more urgent now that more use is being made of milking robots during the night.

The report by G. Biewenga and A. Winkel 'Shedding more light on light: the effects of light on the performance and behaviour of dairy cattle' gives recommendations for the desired light regime for dairy cattle. The standards for the illumination of cattle barns found in Dutch publications appear to be based on achieving good working conditions for the stockman. These standards provide criteria that components of the light regime must meet.

The light regime is the way in which dairy farmers expose their animals in terms of the colour, duration and intensity of the light. It is clear that exposure to light influences the cow's hormonal balance.

When daylight is long, the melatonin concentration in the blood falls and there is an accompanying rise in the concentration of the insulin-like growth factor-1 (IGF-1) in the blood

serum. This hormonal stimulus seems to be responsible for certain changes in animal performance. Heifers exposed to a light regime of 16 hours light and eight hours darkness can be made to grow faster, so that when they attain puberty they are younger and weigh less.

What is important is that this is not achieved by feeding them a high energy diet that causes fat to be deposited in the udder and depresses milk yield.

Exposing dairy cows to a longer period of light after calving brings on oestrus earlier. And prolonging the light period to 16 hours boosts milk production by 6-15%. This causal relationship is clear, because the higher milk yield is followed by an increase in food intake, rather than vice versa. For dry cows it seems that prolonging the dark period boosts milk production.

To ensure that there is a visual stimulus to utilise the feed, it seems to be important to illuminate the feed alley properly. Together with the increased need for nutrients, this ensures more feed is eaten.

Animals exposed to long periods of light spend more time lying, less time standing, move about less and appear to show far fewer draught-induced symptoms.

On the basis of this study it is recommended that cattle are exposed to 14-16 hours of 120-200 lux per day. The period of darkness per day must last at least six hours. ■

**LED high bays dimmed to 30W on left and at full 150W on right.**

