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# Lighting of cowhouse and milking area

*Work has to continue smoothly and reliably on farms even when there is not enough daylight. Correct lighting and illumination in the milking area and cowhouse improves work efficacy, safety, hygiene and efficiency and cow performance can also be increased.*



Fig. 1: Example of a well lit milking parlour

American investigations over the last 20 years show that milk cows managed with 16 to 18 hours of light per day can produce 5 to 16% more milk (average around 8%) compared with cows kept with 13.5 or less hours of light daily and there are up to 15% less fertility problems in well-lit cowhouses compared with very dark housing.

The longer lighting periods lead to a change in hormone activity which is the main reason for the increased milking performance – which readjusts after about two to four weeks. To achieve sustainable increases 200, or better, 300 lux should be available, although more milk can only be achieved through the combination of sufficient light intensity and longer light periods (200 lux for 16 to 18 hours).

### Fundamentals of lighting

Sight comprises many elementary complementary functions (e.g. contrast judgement, sight sharpness, recognition speed) which are greatly improved by good lighting, according to observation requirements and individual optical capacity and influenced also by the state of health of the person involved.

### Example of cowhouse lighting for four-row cubicle layout, open-front design

For a 33.5 • 21 m cowhouse with desired 200 lux lighting, 150000 lumen current would be required. Using 400 W sodium vapour high-pressure lighting, six lights need to be installed to achieve an average lighting strength of 200 lux. For even illumination, the distance between the lights should be 1.5 to 1.8 times their height. This first simple calculation does not consider lighting efficiency < 100 % nor the presence of dirt on the lights. A more precise result is offered by a lighting-planning programme.

Natural climate open housing with sufficient daylight ingress usually need additional lighting mornings and evenings and this can be controlled in association with time of year by a time switch so that around 200 lux is always achieved. Such adjustment can, e.g., take place via a light sensor connected to a dimmer. To work efficiently, the sensor should be situated under the roof overhang in the northwest corner of the cowhouse so that it is not influenced by direct sunshine and

lighting. Adjustments should then take place through measurement of the light strength. The advantage of the type of light mentioned above is the high illumination achieved per watt. However, the building must have sufficient interior height with at least 5 m in the area of the lights. A broad illumination characteristic is very important to illuminate a large area evenly and, through this, keep the number of lights as low as possible whilst achieving the required strength of lighting. Additionally, a fluorescent light which is kept on through the night can be placed at 2.5 to 3 m height over each water trough. The feed table should be similarly lit with a row of fluorescent lights at 2.5 to 3 m height above the feeding fence.

For the above building area, evaluation with a lighting calculation programme gives the following requirements: eight sodium vapour high pressure lights for the lying area, 10 fluorescent lights over the feed table and two fluorescent lights over the parlour crush. In this way it is ensured that 200 lux illumination is achieved everywhere in the house. Total cost for lighting and installation should be around € 3250 with annual electricity cost ~ € 2400 with 16 hours daily lighting. With sufficiently-lit housing the lighting can be switched off during the day so that over the year only an average eight hours additional lighting per day is required.

For low-roofed byres and renovated old buildings with low ceilings fluorescent lights at 2.5 to 3 m height should be planned, and here too a level of at least 200 lux is required.

Table 1: Recommended illumination levels for dairy farms

Working area/ Task	Illumination level (Lux)
<i>Parlour</i>	
General lighting	200
Milking pit (udder level)	400 - 500
<i>Bulk tank and other working rooms</i>	
General lighting	200
Rinsing and washing area	500
<i>Treatment area/ calving pens</i>	
General lighting	200
Treatment crate	1000
<i>Office</i>	
Feeding area, lying area	500 - 750
Parlour crush	200 - 300

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### Keywords

Dairy cow production, lighting, work safety

## Light configuration in a parlour

Workplaces in the parlour are often badly lit compared with those in industry with, e.g., 200 lux illumination advised in the past for the milking pit. However, this level is definitely too low for the production of high quality food because it allows insufficient illumination for the observation of disease-related changes in cow or milk. For this reason a lighting strength of 400 to 500 lux is recommended at the udder area. All aspects of the udder would not be illuminated at 200 lux even with the placement of light rows over the milking pit at 2.5 to 3 m height, not to mention enough light for a precise pre-milking control. Also, the udder is in the shadow of the milker.

## Proper illumination of important areas

In such cases only proper distribution of the lighting into general illumination and working illumination over the milking pit helps. As general lighting a total of four lights should be positioned under the ceiling and over the cow stances (i. e. two per side) with the aim of giving 200 lux over the whole area – this being a fictive area at working height within the parlour. In the pit this fictive area is at udder level around 1.3 to 1.4 m above the milking floor. Over the milking pit two rows each of five lights should be positioned around 40 cm from the mid-axis at about 2.2 to 2.5 m height above the pit floor to give around 500 lux illumination (fig. 3). As far as possible, the lights over the pit should have a broad illumination characteristic. (An electrician should be consulted in this respect for calculations regarding the lighting).

Around 630-watt power is required for illumination of the parlour. At 1.5 hours total time per milking this means an electricity consumption of around 1.9 kW. Material costs and fitting for the lights total ~ € 850.

Through the positioning of the two mid-axis lines of lights, projection of the milker's shadow on the udders is avoided. The general lighting at the ceiling creates a better contrast which definitely improves sight in the parlour.

Because of their high light production and the relatively low ceiling height, fluorescent lamps are generally used within the milking facilities. Despite their higher price, lights with electronic pre-starters should be chosen as these help prevent flickering of the lights, consume up to 20% less energy and also help to increase light working life by up to 50%.

In choosing lights attention must definitely be paid to selecting wet area lights in the protection class IP 65. These are protected against water spray and dust ingress and are

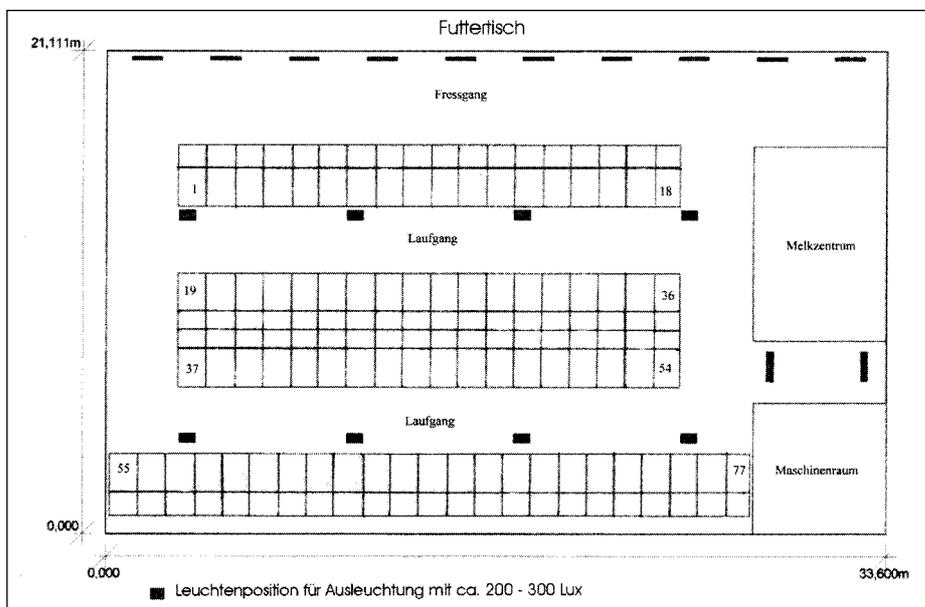


Fig. 2: Lamp positioning in a cubicle barn

available as wet room lights from nearly all light manufacturers.

## Adjoining areas

### Bulk tank and machinery room

Sufficient lighting should also be planned for rooms adjoining the parlour. Bulk tank and machinery rooms should have a general lighting of 200 lux and for cleaning the milking equipment 500 lux should be aimed for.

### The dairy office and other working areas

In many farms the office is a multi-purpose room for paperwork, computer-assisted herd management tasks and often the storage of veterinary medicaments. Here one should be guided by the amount of light needed for the work most carried out. DIN 5035 estimates 500 lux for office areas

## Does application of additional lighting pay?

In the USA one assumes that variable costs through increased feed consumption, energy use and the fixed costs of fitting the lights are repaid within a year through increase in cow performance. Where additional quota costs have to be considered as in Germany then the repayment time would be up to three years, depending of herd size.

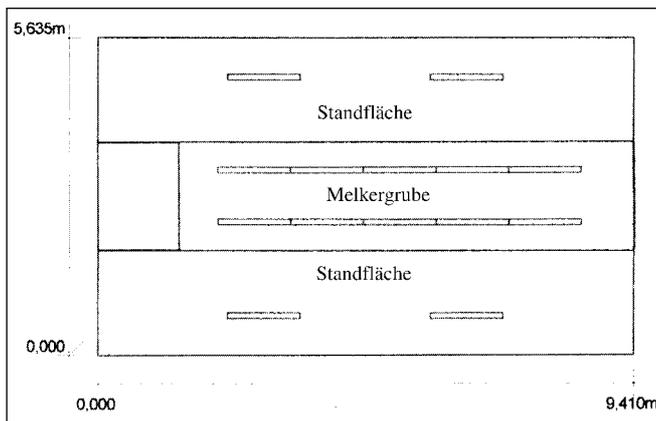


Fig. 3: Lamp positioning for excellent lighting of the udder area

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