



Dairy lighting

1. Introduction

The dairy, like any other workplace, needs to have good lighting for safe, efficient operation. In this Quick Note we discuss the lighting requirements and examine the various choices for dairy lighting.

2. Interpretation and relevance to Australian conditions

Many older dairies have solid walls and low roofs, requiring artificial lighting to operate even during daylight hours. Although newer dairies have avoided many of these design problems, Australian farms typically start milking before dawn and the evening milking extends to well after dark – especially in the winter months. Good lighting is an essential element and a variety of choices are available for this purpose.

3. Relationship to CowTime goals

Good lighting can make milking easier and more productive. Good lighting will improve cow flow and reduce the risk of injuries to cows and the workers. Good natural lighting, combined with energy efficient lights, can reduce operating costs.

4. Common dairy lighting issues

Dairy entrance

Sharp changes in light levels affect cow flow, particularly when the cows have other obstacles to consider like at the entry to the milking platform. Cows moving from a sunny, outside holding yard may hesitate at moving into an entrance that has a much lower level of light. Sharp, dark shadows across the concrete can also be interpreted by cows as a barrier, causing them to pause before crossing. Translucent polycarbonate roofing and or walls can even out light levels reducing these problems. At night, make sure cows do not have to look into bright lights as they approach the dairy entrance.

Inside the dairy

It is preferable to make use of as much natural lighting as possible. Higher roofs and open sides make a big difference to the amount of natural light in the milking area. Materials such as polycarbonates can be used for skylights and clear walls but clear skylights can let in too much heat if the roof is low and orientated towards the sun.

Adequate artificial lighting must also be available. Mount lights above the line of sight and consider a matte finish for reflective surfaces to reduce glare for both cows and milkers. Even light distribution is important throughout the dairy but the milking platform and pit need to be especially well lit. As a general rule, illumination must be sufficient to allow milkers to assess the cleanliness of cows' teats and the colour and quality of milk strippings. White light makes this task easier. The recommended illumination in the milking area is given in Table 1. Consider installing motion detector lights and automatic timers in passageways.

Table 1: Suggested illumination levels for dairies.

Area of milking facility	Illumination level - lux	Comparative lighting levels
Cow traffic areas (indoor)	100	Building corridors, storage and stairwells
General lighting	200 - 220	General home lighting
Milking pit	500 - 550	Well-lit office

Source: CowTime Guidelines for Milk Harvesting

Colour / uniformity of light

When trying to check milk for blood or clots in the pit it is helpful to have light that shows the true colour of different objects. Incandescent and halogen lamps show the true colours of objects the best of all common lighting sources. However, high-quality fluorescent or metal halide lamps (with a colour rendition index of 80 or more) are a good compromise and are adequate for most dairies.

The uniformity of light is affected by the height and spacing of the lights. A high level of uniformity is required in an intense work area such as a milking pit, office and milk room washing area. This level can be achieved by using a

fixture spacing to mounting height ratio of one. For example, mount the lights 3 meters apart if they are mounted 3 meters above the ground.

Types of lighting

Incandescent lights

Traditional light bulbs have the advantage of being cheap, easy to replace and instantaneous. They are useful for situations that only require illumination for short periods at a time.

Halogen lamps

Halogen (flood) lights or spot lamps are useful where high intensity light needs to be directed for a specific purpose, for example in walkways or to inspect the inside of bulk vats etc. They are inexpensive and often come with roof / wall mountings. Bear in mind that flood lamps and spot lamps can cause sharper shadows and increased glare.

Fluorescent lighting

Fluorescent lighting provides the most cost-effective general lighting for dairies. A mounting height of less than 3.5 meters (and a large number of tubes) is desirable to give adequate lighting for the pit. Tubes should be cleaned annually (and replaced every 4-5 years) as their output is greatly affected by dust. Recommendations for US dairies (fully enclosed) are detailed in Table 2.

Table 2: Area (m²) illuminated by florescent lamps of various sizes mounted at various heights (US data).

Area of milking facility	Mounted height (m)	2 x 1.2m 32W lamps	4 x 2.4m 32W lamps	2 x 2.4m 50W lamps	2 x 2.4m 86W lamps
General lighting (200 Lux)	2.4	8	16	13.5	23
	3.6	5.5	10.5	9	15
Milking pit lighting (500 Lux)	2.4	3	6.5	5.5	9
	3.6	2	4	3.5	6

Source: converted from tables in Chastain & Nicholai (1996)

Mercury vapour

Many newer dairies have installed mercury vapour lamps. These lights have high outputs making them suitable for general lighting in larger areas with high roofs. Only a small number of single 400W globes are required, reducing installation and maintenance costs. Mercury vapour lamps are fairly inexpensive and have a long life (22,000 hours) but throw a slightly pinky-blue-white light. They take several minutes to reach full brightness after being switched on.

Metal Halide

Metal halide lamps have similar uses and operation to mercury vapour lamps but have a shorter life (12,000+ hours) and are 3-4 times more expensive. However, they throw a very white light and are about twice as energy efficient.

High pressure sodium

High pressure sodium lights are extremely energy efficient and have a long life (25,000 hours). They are used extensively in very cold climates or in areas requiring continuous lighting.

Energy efficient lighting

Energy-efficient lights tend to have a longer life and will reduce electricity costs. The most efficient lamps to use are fluorescent, high-pressure sodium or metal halide. Fluorescent lamps, including compact fluorescent tubes (CFLs) use only one quarter to one fifth as much energy as incandescent bulbs to provide the same level of light. Replacing 38 mm fluorescent light tubes with 26mm triphosphor light tubes uses up to 8% less energy and gives out at least 50% more light. You may only need 1 tube where previously you used 2.

5. Potential issues with implementation

Consider future maintenance safety issues, particularly working at heights, when installing dairy lighting.

6. Robustness of this information

This information is based on practical tips from local dairy builders and extension materials from the US.

7. References and further reading

- Chastain, J., and Nicholai, R. (1996) Dairy Lighting System For Free Stall Barns and Milking Centers AEU-12, Biosystems and Agricultural engineering, University of Minnesota, Extension Services. <http://www.bae.umn.edu/extens/aeu/aeu12.html>
- Ciolkosz, D. and Gooch, C., (2001) Lighting Systems and Design for Milking Centers. Proceedings from the Milking Systems and Parlors: Planning and managing for Quality Milk and Profitability Conference. NRAES-131. Agriculture and Engineering Service, Ithaca, New York
- Klindworth, D., Greenall, R. & Campbell, J. (2002) CowTime Guidelines for Milk Harvesting, Dairy Research and Development Corporation (now Dairy Australia), Melbourne.
- Reduce your electricity bill – use compact fluorescent lamps. Australian Greenhouse Office.
www.greenhouse.gov.au/local/publications/lighting.html
- Steps to reducing energy costs on your dairy farm. Genesis Automation. www.genesisauto.com.au/html/dairy.htm
- Glatz, Phil, Coverdale, Tom, Eichner, Corey and Simpson, John. Triphosphor lighting for broilers and layers.
<http://www.sardi.sa.gov.au/pages/livestock/poultry/husbandry/triphosphor.htm:sectID=592&tempID=141>
- Sustainability Victoria website advice
<http://www.sustainable-energy.vic.gov.au/seinfo/your-home/lighting/index.asp>

Disclaimer: The options, advice and information contained in this publication have not been provided at the request of any person but are offered by Dairy Australia solely to provide information. While the information contained in this publication has been formulated with all due care and in good faith, the contents do not take into account all the factors which need to be considered before putting that information into practice. Accordingly, no person should rely on anything contained herein as a substitute for specific advice.