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Trends in Constructing and Equipping Dairy Cow Stables

Although the positive trend in milk price development could not be maintained, construction investments postponed for a long time are needed on many dairy farms. In the advisory service, there is a high demand for structural alteration solutions for existing dairy cow stables and also for new housing concepts. What are the current state-of-the-art solutions for improving milk production? In the following, up-to-date recommendations for designing important functional areas in dairy cow stables are made.

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In the new construction of dairy cow stables, clear axes for feeding, driving, and milking, as well as clear division and structuring of the groups play a decisive role with regard to work load and hygiene. Lying box loose houses on growing farms should have 2 x 3 rows and a separate milking house. In addition, they should be able to be divided into four groups at the centre of the stable by means of a central feeding table and a central driving aisle. Such a division allows efficient herd management to be realized and the stable to be used optimally with regard to the requirements of production technology and animal physiology.

When automatic one-box milking systems are used, shorter ways and smaller groups should be provided. For this reason, a modern dairy cow stable could be built by planning a six-row stable with two outer feeding tables and a central robot street as a connective element between the feeding tables.

Water Supply

Cows must have free access to water at any time. For a group consisting of 60 dairy cows, the installation of at least three simple one-place drinkers or trough drinkers with a trough 100 cm in length in addition to a large trough drinker with a trough 200 cm in length is recommended. The drinkers should be freely accessible from several directions.

Feeding Table and Feeding Place Design

Over the years, the feeding table measurements to be considered have changed due to the higher mechanization degree. If the feeding table is used on one side, it should have a width of at least 5 m. For feeding tables used on two sides, a usable width of at least 6 m should be planned. For better feed intake, the level of the feeding table should be 20 cm above the level of the walking surfaces. In order to protect the surface of the feeding table and to maintain hygiene in the long run, concrete feeding tables must be protected against acid corrosion caused by silage. Corroded surfaces are difficult to clean. Therefore, it is inevitable that feed residues are broken down microbiologically and the freshly dispensed feed is contaminated. Concrete protection by tiles or coating with epoxide provide fast, lasting success. In order to guarantee good long-term performance, every animal place must also be assigned a feeding place. Whether the animals are better controlled by pipe barriers or feeding gates is a question which is frequently discussed in practice.

As a general rule, a sufficient number of feeding gates must be provided in every dairy cow stable for the examination and treatment of cows. In herds consisting of fewer than 200 animals, the installation of feeding gates in the entire stable area should not be dispensed with. In larger dairy cow facilities, at least 50 to 60 places should be equipped with feeding gates so that sufficient efficiency is guaranteed during vaccinations or when blood samples are taken. The width of the feeding places should range between 65 and 75 cm. In order to avoid technopathies and damage to the integument in the wither and dewlap area, one must make sure that the position of the pipe barrier, the height of the feeding gate, and the height of the trough edge are adapted to the body measurements of the cows.

Lying Place Design

The lying box should restrict the natural motion sequences of the cow as little as possible while the animal is lying down and getting up. In addition to the installation of soft floor covering and soft lying surface covers, the shape and the measurements of the lying box bars also contribute to a noticeable improvement in the freedom of motion and the lying position. Especially in this area, the focus is on new developments, which are raising hopes for interesting innovations.

For optimal care of the lying area in high boxes, a gradient of 2% must be provided. In deep boxes, the lying area should be evenly level or rise slightly. Secure footing and slip protection on the lying surface must be guaranteed during all motion sequences.

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For many separating bars, the neck pipe has important functions. In addition to the proper positioning of the standing cow for the cleaning of the lying areas, the neck pipe guarantees stability within the lying boxes. The classic shape and height of the bar generally also determines the height of the neck bar. Since cows have become significantly larger, it is important to be able to vary the height of the neck pipe. The use of flexible neck pipes (rope, chain, or belt) requires that the box is stable in itself. When lying boxes are newly equipped, one should therefore make sure that the neck pipe is no longer absolutely necessary in order to guarantee stability. Depending on the box system and the size of the cows, the horizontal distance between the neck pipe and the dung step should range between 160 and 175 cm. The vertical height of the neck pipe above the lying area should be 125 to 133 cm depending on cow size.

Box partitioning bars are intended to guarantee that the cows have the resting zone which they need in the front and on the sides. At the same time, they should control the motions and the lying behaviour of the cows such that the lying areas remain clean. Unfortunately, it is still impossible today to integrate all positive characteristics of an ideal partitioning bar into just one bar shape. The length of the partitioning bars primarily depends on the length of the lying boxes. In addition, there is a relation between the shape of the bars and their width.

Cows need sufficient space so that they can assume diverse lying positions. For this reason, it is important to harmonize the shape of the partitioning bars and the width of the lying boxes. Given lying box widths of 115 cm, long box partitions (at least 60 cm behind the shoulder threshold) are best suitable to bring the cows into a straight lying position. Since cows generally lie with their heads slightly inclined to the side, partitioning bars should not have any vertical fastening pipes in the head area.

Walking Surface Design

In order to promote animal-appropriate behaviour and to maintain health, the requirements to be met by walking surfaces must be clearly defined. Walking surfaces must be clean and provide secure footing and slip protection at any time. In dairy cow stables which feature a modern design, the size of classic walking surfaces is approximately 5 m^2 per cow. This is a sufficient reason for intensive occupation with the design of these areas. In order to avoid stress, cul-de-sacs should absolutely be avoided. When planning particularly animal-friendly stable concepts, one should increase the number of partitions. Every 15 m, a transition at least 2.5 m in width should be provided. If width is sufficient, the transition area can be used to set up drinkers and brushes. The aisle at the feeding table should be at least 4 m wide. The normal width of the aisle between the box rows is 2.5 m. When low boxes are installed, the walking surfaces should be able to be used by vehicles for filling. In this case, the width of the aisles must be increased to at least 3 m.

With regard to their different use, the aisles should be divided into dwelling and motion areas. In the dwelling areas, i.e. the aisle at the feeding table, the waiting area in front of the milking parlour, and the milking parlour itself, the animals sometimes stand for a longer time. For this reason, the floors in these areas should be equipped with soft covers. The walking surfaces between the lying areas are primarily used for animal traffic and should provide better claw abrasion in order to prevent excessive claw growth. The question of whether walking surfaces are level concrete or perforated areas has no system-related effects on walking behaviour and claw health in contrast to the influence of different materials and production techniques.

Due to the high degree of standardization in production, concrete often leads to better results with regard to animal welfare and durability. When asphalt is used, this often causes problems with regard to slip protection and excessive horn abrasion.

The function of the slatted floor is the drainage of faeces and urine into the slurry cellar. The ratio of the foothold and the slit surface varies depending on the system. The width of the slits is always a compromise between the highest possible slurry drainage rate and the necessity to guarantee slip protection on the walking surface. Recommendations provide 3.5 cm wide slits and 8 to 10 cm wide footholds. The soiling degree of walking surfaces not only depends on the kind of slatted floor, but also on stocking density, the composition of the rations, and humidity in the stable.

The cleaning intervals must be chosen depending on stocking density and the climatic conditions in the stable. One must absolutely make sure that the slurry is pressed through the slits during pushing off or that the slurry is pushed off outside the walking area of the cows. From the viewpoint of production technology, the walking surfaces should be cleared permanently or at least hourly.

Light and Illumination

Light and illumination in dairy cow stables have become an important production-technological criterion. The introduction of illumination programmes providing intervals of 16 hours of light and 8 hours of darkness at a light intensity of 150 lux and the resulting reduction of the melatonin level in the blood influenced the performance of dairy cows positively. It is important that dry cows are exposed to an inverted illumination rhythm of only 8 hours of light during this phase.

For economic reasons, the use of high-pressure steam lamps has established itself. From an energetic and physiological viewpoint, light yield and light distribution must be considered ideal.

Sodium steam lamps have by far the greatest energy efficiency. Given a light flux of 130 lumen per watt and a service life of approximately 20,000 hours, they are currently still superior to high-pressure steam lamps. One must take into account, however, that sodium steam lamps radiate a yellowish light due to the gas mixture.

The choice of fittings depends on the installation height and the radiation characteristics of the reflector. For targeted, efficient installation, the installation points must be calculated with the aid of light calculation programmes.