Planning of Large Scale Farms with Robotic Milking Systems

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In the past years planning of farms with robotic milking systems mainly focused on farms up to four milking boxes. Even though these farms still represent most of the realised projects, the demand for larger units (more than six milking boxes or approx. 350 – 400 milked cows) is growing continuously. Therefore a German working group was established to compile basic principles for planning large scale farms with robotic milking systems.

The main difference compared to "small" farms is that in large farms there has to be a **division into central and peripheral functional areas**. The milking boxes more or less have to be located nearby the animals to provide for smooth cow traffic, to avoid a bottleneck at the entrance to the milking boxes and to reduce walking distances. At the same time other functional areas for calving or diseased cows should be centrally grouped to reach good solutions concerning labor organization or animal requirements. Moreover the planning of such a central area should ensure future expansion steps as robotic milking systems offer the unique possibility of a modular extension by adding milking boxes.

The placement of the milking boxes also influences the possible **grouping strategies**. Aside from criteria used so far as lactation number, days in milk, milk yield, body condition, special need cows etc., new criteria as group size, social interactions or the minimum amount of concentrates have to be considered when regarding robotic milking systems. Unfortunately these new criteria are contradictory to certain feeding and management requirements. Presumably there are advantages in regard to the social structure when cows stay in a stable group throughout the whole lactation. GRANT AND ALBRIGHT (2001) found a small decline in milk yield when cows had to change groups. On the other hand a stable group does not allow feeding according to milk yield in all stages of the lactation which is even more critical in a robotic milking system, where cows need to receive a minimum amount of 1.5 – 2 kg of concentrates to ensure regular milking intervals. A further disadvantage of not grouping cows according to their yield or stage of lactation concerns the reproductive management, as all animals have to be monitored in a stable group.

When milking with robots the **reasonable group size** is determined by the number of milking boxes which are joined with one waiting area. There is no clear position in literature concerning this number. GRANT AND ALBRIGHT (2001) stated that cows do not have a particular problem with the social structure in large groups. However other studies give strong evidence that the access to the waiting area and the waiting area itself leads to stress or represents at least a difficult situation for the cow (HARMS ET AL., 2005). At the actual state of knowledge groups of less than 130 cows or two milking boxes respectively seem to be reasonable. When groups become larger, there are more animals in the waiting area, even though the average waiting time might stay the same. According to MELIN ET AL. (2006) and HALACHMI (2009) this significantly prolongs the (waiting) time for a low ranked animal to enter the milking box.

Summing up the collected arguments led to the schematic farm layout for 500 milking cows in groups of 125 cows shown in figure 1. This layout allows further modular expansion up to 1,000 cows, offers short distances for both human and animals and is characterized by clearly separated functional areas. In the 2 x 4 rowed barn for the productive cows all forms of cow traffic can be realized and a separation area as well as a special need group near to the connection alley allows an efficient handling of the cows. The barn for diseased, dry, calving and transition cows concentrates the time consuming activities and ensures a good observation of these groups of cows.
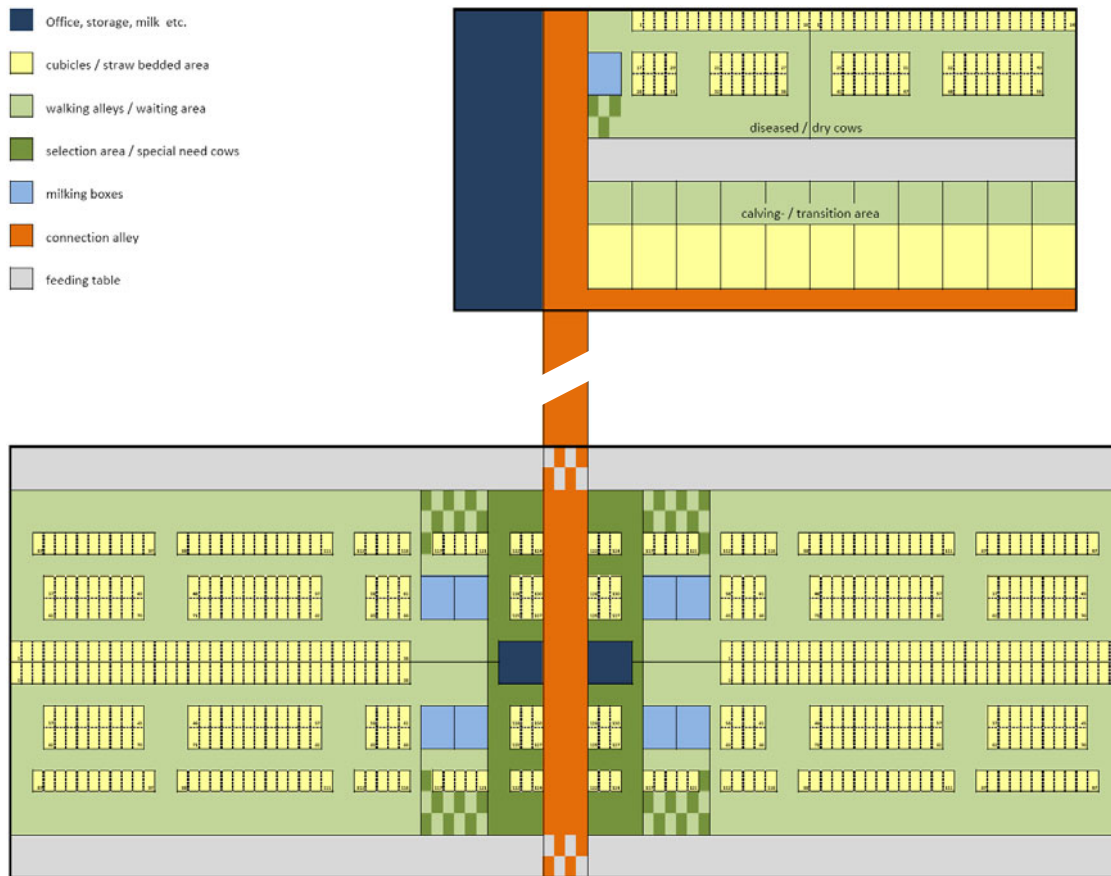

Figure 1: Schematic layout for large scale farms with robotic milking systems

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