Appendix 1 – Case Studies

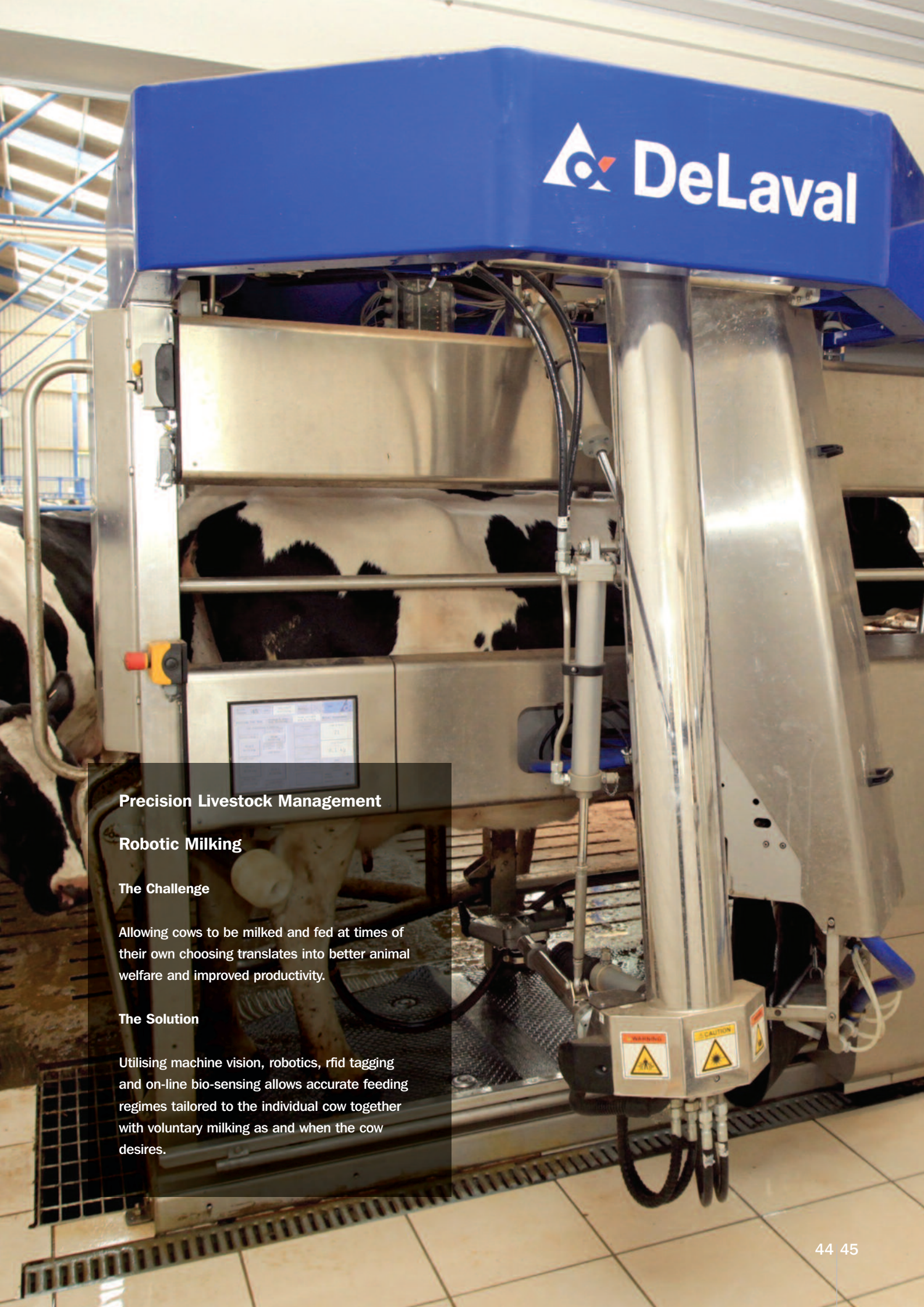
Case Study 2:

Robotic milking leading to precision livestock management

The invention of the single arm robotic milking system by British research engineers in the early 1990s opened a new era in automated management of dairy cows. The choice of a pneumatic arm gave a machine that was more compliant, suiting the sensitive interactions between machine and animal. Robotic milking permitted cows to be milked and fed at times of their own choosing, which translated both into better animal welfare and improved productivity. Once the herdsman/farmer was relieved of the repetitive task of milking, they could focus on animal husbandry issues (such as foot condition and artificial insemination) that are often overlooked under the time pressure of long hours in the pit of a milking parlour. Routine human observation of the cow can also be greatly enhanced by the development of novel sensing systems such as on-line biosensing for compounds in the milk, potentially indicating the health and fertility status of cows. UK research engineers have also developed the wireless rumen-monitoring bolus, the cow breath sampler and the wireless lameness-monitoring collar. These systems can be a major asset to the management of the modern high production cow, especially to meet the rising standards set for animal welfare.

The opportunities are considerable. Improved monitoring of the dairy cow will reduce feed costs and permit the development of diets high in forage and food sources unusable by humans (wheat tailings, sugar beet pulp etc.) without reducing the enormous potential for high yields. In-parlour and within-rumen monitoring techniques have the potential to address methane emissions monitoring, which amount to a 5% loss of feed energy by the cow, and assist GHG emissions reductions. Emerging technologies permit the automatic monitoring of lameness and calving, further reducing losses by disease. On-line monitoring of progesterone in milk to improve insemination management, with better than 80% specificity, would reduce the 300,000 cows slaughtered annually due to the limitations of detecting oestrus by behavioural methods. Keeping fewer young stock as replacements could cut methane emissions from the UK dairy herds by 15%. There is huge potential, especially with the large commercial-minded dairies now in existence, to improve animal welfare and reduce emissions without reducing margins.

The 250 million dairy cows worldwide (FAO, 2010 estimate) provide a ready market for the development and implementation of new technologies. Biosensing implementation needs a large demand to justify the investment in the final stage of R&D, and thus health, welfare and quality concerns associated with the management of dairy cows provide an important opportunity for new sensing technologies. The handling and analysis of the information streams associated with such monitoring will also provide a major technical challenge in information technology, data mining and optimal decision-making. These improvements will come about through integrating sensors, computers and machines.



Precision Livestock Management

Robotic Milking

The Challenge

Allowing cows to be milked and fed at times of their own choosing translates into better animal welfare and improved productivity.

The Solution

Utilising machine vision, robotics, rfid tagging and on-line bio-sensing allows accurate feeding regimes tailored to the individual cow together with voluntary milking as and when the cow desires.