

A Review of Studies on the Ergonomics of Milking  
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29 October 2006

Milking is a task that has a high risk of repetitive stress injury (Gustafsson and Lundqvist, 1987; Lundqvist, et al., 1997). Milking in Round-The-Barn Pipeline systems places repetitive stress on knee, hip and lower back joints. Milking in an elevated milking parlor shifts the major stress zones to wrists, elbows, shoulders and upper back regions. Following is a review of papers published on the subject of milking ergonomics.

Gaudin et al (1998) state that the working posture in an elevated milking parlor should be as close as possible to an erect stance with arms and hands in a natural working position. The dimensions of the parlor and location of milking stations and stalls must be designed to accommodate good working postures.



Hand and wrist problems are common for milkers. Stal and Juliszewski (2001) reported on a study to quantify the positions and movements of the wrist during machine milking. Flexion and deviation angles were recorded for both right and the left wrists in eleven milkers. High values of dorsiflexion and radial deviation were found which might contribute to the high prevalence of hand and wrists symptoms (e.g. carpal tunnel syndrome) among milkers. Furthermore, the velocity and repetitiveness were close to those values described in repetitive work with a high risk of elbow and wrist disorders. Milking in the modern milking system the load has increased with respect to dorsiflexed hand position and repetitiveness. They concluded that the negative effects on wrists positions and movements must be observed when building new milking systems. A study of carpal tunnel syndrome (CTS) indicated that of 3125 consecutive patients 43 cases (1.38%) were associated to manual milking (Kouyoumdjian and de Araujo, 2006). The mean time in the milking profession of these cases was 247 months; the mean daily milking time was 146 minutes and 83% were bilateral. They concluded that manual milking could be a natural model for occupational CTS.

Vostrikov (1995) reported that after 2 hours of uninterrupted work, the efficiency of even highly trained and experienced operators can decrease because of physical tiredness, resulting in interruptions and errors and adversely affects productivity.

Pinzke, et al., (2001) conducted that the high muscle loads in combination with extreme positions and movements of the hand and forearm might contribute to the development of injuries among milkers. For milking with high-level pipeline systems, a stool tied to the back can reduce stress on the workers knees. Milking machines mounted on rails or cables carry much of the weight of the milking unit and relieve stress on the workers shoulders and back. The aim of their study was to quantify the workload on the upper extremity for fundamental work tasks during machine milking. Eleven milkers working in a loose-housing system with a milking parlor in Sweden participated in the study. Muscle activity for the biceps and the forearm flexors, and positions and movements of the wrists, were simultaneously measured. The milking work was broken up into three main tasks "Drying (the cow's udder)", "Pre-milking (the first milk)" and "Attaching (the milking unit to the udder)" and three supplementary tasks. All three main tasks

showed high muscle load values and almost no time for rest. The highest load values for the biceps and flexor muscles were found during the tasks "Attaching, holding the milking unit" and "Drying", respectively. For 10% of the recording time, the milkers held active hands in 42 degrees of dorsal flexion during the milking tasks "Pre-milking" and "Attaching" and in deviated positions exceeding 50% of their maximum values during "Attaching" and "Drying". The high muscle loads in combination with extreme positions and movements of the hand and forearm might contribute to the development of injuries among milkers. The results from the study can form a basis for technical improvements of the milking equipment to decrease the risk of arm, wrist and hand disorders.

Pinzke (2003) reported that 83% of the male and 90% of the female dairy farmers in Sweden reported some kind of musculoskeletal symptoms. This is an increase compared to the farmers in 1988. The highest significant changes were an increase of symptoms in the shoulder, neck and in the wrists/hands. The milkers reported most often incidental as well as persistent symptoms in the shoulders. The frequency of hip symptoms was significantly higher among those male milkers who had quit milking during the interim than for the active milkers in 1988. The milkers studied in 2002 had, on average, increased their working time per week, increased the number of cows milked as well as the use of more milking units. In 1988, almost all the milkers studied were working in tethering systems while in 2002 more than one quarter were working in loose-housing systems. The opinion among most of the farmers, both in 1988 and in 2002, regardless of age or sex, was that silage handling and the milking procedure were the most strenuous work operations. On the other hand, the milkers obtained their greatest pleasure from the actual milking job as well as from their work to promote the welfare of the animals. Unprofitability and great investment demands had a bearing on the retirement of milkers but, on the other hand, a high potential of the milkers could have continued 10–15 more years as dairy farmers if the work conditions had been better, e.g. associated with fewer health problems.

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