

## **Implications of the introduction of automatic milking on dairy farms**

A large integrated EU project is started

In the end of 2000, the European commission granted a research proposal on the implications of automatic milking. The project involves 7 research institutes and at least 4 manufacturers of automatic milking systems from 6 countries. The project is managed by the Research Institute for Animal Husbandry, Lelystad, The Netherlands. The project started December 1, 2000 and is expected to be finished in February 2004. In this article a broad description on the background of the project and the work plans of the project are given.

### **Background**

The idea of automating the complete milking process has been around for at least the past 25 years. Initially, the major challenge was to develop reliable, swift and practical techniques for locating teats and attaching teat cups. Various pioneering attempts showed the possibilities, but it was only in the late 1980's that machines with potential for commercial exploitation began to appear. The term Automatic Milking System, also indicated as Robotic Milking System or Voluntary milking System, refers to a system that automates all the functions of the milking process undertaken in conventional milking systems by a mix of manual and machine systems. In contrast to conventional milking, where humans bring the cows to be milked at regular times (usually twice a day), automatic milking places emphasis on the cows motivation to be milked in a self-service manner several times a day. Supplying a (small) amount of concentrates in the automatic milking system enhances motivation. In addition, specific cow traffic management based on the cow's motivation to eat or drink may be applied to direct her on a path through the feeding and lying areas by control gates in order to achieve an optimum number of milkings per day without human interference. Location of a concentrate dispenser in the exit area of the milking system can also be used as a stimulus to visit the milking system. Main benefits of automatic milking are an increase in milk yield from more frequent milking, reduction of labour and the lack of necessity for the farmer to be present at regular milking times.

The past two years automatic milking systems are being installed at an increasing rate, mainly on dairy farms in North-west Europe. Currently, approximately 700 dairy farms in Europe are milking with an automatic milking system. Introduction of automatic milking systems on dairy farms involves far more than just replacing labour by equipment. It changes the whole method of farming. Nature and organisation of labour will alter in the sense that manual labour is partly replaced by management and control, and presence at regular milking times is no longer required. Regular visual control on cow and udder health at milking times will, at least partly, be taken over by automatic control. Satisfactory facilities for cleaning of cows and teats, as well for separation of abnormal milk have to be incorporated into the automatic system. Milking equipment will be used for 24 hrs a day, which requires a high reliability of the system and adapted cleaning schemes and cooling systems. Permanent admittance to the system will change cow activities, may require adjusted cow routing within the barn and will influence the possibilities of grazing. Moreover robotic milking may have an impact on the public acceptance of dairy farming and dairy products. Up to now, research on automatic milking has mainly concentrated on technical improvements of automatic milking systems to improve performance and capacity, and on development of cow routing systems which ensure the desired frequency of visits to the milking robot. However, many questions remain in the realms of the following themes:

1. Farm-level adoption determinants of automatic milking, and on-farm social-economic and environmental implications of adoption;
2. (Conditions for) societal acceptance of this new technology;
3. Impact on milk quality and possibilities to produce milk of indisputable quality;
4. Impacts on animal health and welfare, including combination of automatic milking with grazing;
5. Requirements for management information systems.

## Objectives

Based on the themes described above, the following objectives were defined:

1. To identify determinants for the adoption of automatic milking on dairy farms in North-west European member states;
2. To assess the implications of the adoption of automatic milking systems, in the realms of farm-level social-economic aspects, public acceptance, milk quality, animal health, animal welfare and farm management support requirements;
3. To generate solutions for any adverse effects of a widespread use of automatic milking in an early stage of adoption;
4. To disseminate results among research centres, policy makers, farmers and farmers' services, manufacturers of milking equipment and dairy industry.

## Work

The total project is divided into 11 work packages. A description of the workpackages, including the workpackage manager is given below.

Title	Workpackage manager	Expected achievements
Socio-economic aspects of automatic milking	Prof. Erik Mathijs Catholic University Leuven Belgium	Relevant variables which may affect the adoption of automatic milking identified; Farm-level implications of the adoption of automatic milking, technical as well as social, have been assessed
Public acceptance of automatic milking	Prof. Keith Roe Catholic University Leuven Belgium	It has been established whether and under which conditions automatic milking is a production technology that is or can be accepted by society at large
Redefinition of acceptable milk quality	Dr Morten Dam Rasmussen Danish Institute for Agricultural Sciences Denmark	Options for (re)definition of acceptable milk quality and abnormal milk in the spirit of directive 89/362/EEC have been developed, and systems to automatically detect and separate abnormal milk have been tested
Milk quality on farms with an automatic milking system	Yvonne van der Vorst M.Sc. Research Institute for Animal Husbandry The Netherlands	Effects of automatic milking on quality aspects of farm milk have been established, technical and managerial factors affecting milk quality have been identified and methods for control have been formulated
Prevention of antibiotic residues	Dr Karin Knappstein Federal Dairy Research Centre Germany	The excretion characteristics of antibiotic residues in milk in a situation of varying milking intervals as they occur during automatic milking is determined
Effectiveness of automatic cleaning of udder and teats and effects of hygiene management	Dr Karin Knappstein Federal Dairy Research Centre Germany	The teat cleaning procedures of automatic milking systems are evaluated and applicable measures for prevention of teat, and subsequently, milk contamination are obtained
Optimal cleaning of equipment	Eric Schuiling M.Sc. Research Institute for Animal Husbandry The Netherlands	The effectiveness of cleaning methods of automatic milking systems, under optimal use of water, energy and chemicals, has been established and proposals for technological optimisation have been identified and tested
Health of dairy cows milked by an automatic milking system	Dr Eric Hillerton Institute of Animal Health United Kingdom	The impact of changing from conventional to automated milking systems on the incidence of diseases has been assessed, best management

		practices and technical solutions to reduce the disease risk and safeguard milk quality have been formulated
Welfare assessment of dairy cows in automatic milking systems	Prof. Hans Wiktorsson Swedish Agricultural University Sweden	Welfare indicators have been developed for implementation in a welfare assessment protocol, cow welfare on farms with automatic milking systems has been assessed and relationships have been established between behaviour, physiological, metabolic and health parameters
Automatic milking and grazing	Prof. Hans Wiktorsson Swedish Agricultural University Sweden	Grazing strategies on farms with automatic milking have been surveyed, possibilities have been examined and tested to exploit the cows' natural behaviour in systems combining grazing with automatic milking
Demands and opportunities for operational management support	Wijbrand Ouweltjes M.Sc. Research Institute for Animal Husbandry The Netherlands	Requirements for management information on farms with automatic milking systems have been generated, and possibilities to use data collected by an automatic milking system for management information have been identified

Besides the partners mentioned in work package description, the Swedish Institute for Agricultural Engineering and the companies Fullwood, Lely, Prolion and Westfalia are participating in the project.

### **Current status**

At the moment that this paper was written, preparatory work on the work packages was being done. It is anticipated that after June 2001, the first experimental work will start giving first results by the end of 2001.

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