J. of Ag. Eng. - Riv. di Ing. Agr. (2007), **3**, 9-15

ANALYSIS OF THE MAIN RISK FACTORS FOR WORKERS' SAFETY IN SOME DAIRIES

Pier Riccardo Porceddu, Valentina Babucci

1. Introduction

The mechanization and plant engineering of agroindustries have made a notable contribution to the socio-economic development of industrialized countries and to the consequent well-being of their populations. This has also led to a need for safe working conditions for workers at work, which has resulted in the issuing of 89/391 [8], the first European Directive in this area, and later norms, acknowledged in Italy with the D. Lgs. (Legislative Directive) 626/94 [6]. In the agroindustrial sector, small companies, for example those which rely on the high quality of their products, often find it difficult to comply with such laws due to the family-centred organization of their production, the limited size of their farms, and the absence of a real culture of work safety. This has slowed down investments due to the perception that there would be no immediate economic returns.

Dairy industries have become a very widespread productive sector in Italy, their activity taking place throughout the year, with quite high levels of working production, determined in particular by the daily production and consequent processing of the milk, and its processing times. In the Umbrian Region there are 28 companies working in the dairy industry sector which produce almost 607×10^5 kg of milk per year, half of which is used for the processing of cheese and the other half for direct consumption. The most widespread productive units are family-managed which include their own sales outlet and a market concentrated in units of local sales (grocery stores, supermarkets, restaurants) [11].

The problem of workers' safety in dairy industries has not yet been extensively studied and only some studies have dealt with a few aspects of the subject such as the level of lighting and noise [1]. However, the limited amount of information gathered and the need to consider other risk factors, such as the interactions between man, industrial plant and building, suggest that the topic of workers' safety in dairy industries should be dealt with in greater depth.

A new approach needs to be taken, linked to the prevention of injuries and the provision of better working conditions for workers, which would be a valid presupposition for increases in productivity. The analysis of the main risk factors enables the identification of possible preventative measures, as well as the elaboration of guidelines to intervene in current structures or plan new production industries.

2. Materials and methods

This study, with the aim of identifying and analyzing the main risk factors for workers, was carried out on 5 dairies of small-medium size, between 5 and 10 workers in the Umbrian Region, all having the same productive capacity (about 10^4 kg of milk per day) and similar production process.

Moreover these dairies have in common the fact that all the phases of the processing of milk are carried out in the same place, which houses the machinery (pasteurizing machines, multipurpose boilers, skimming machines, churning machines, packaging machines), while the maturing and stocking of the products takes place in appropriate refrigeration units. The dairies were built in the early 70's and are split into two levels with a total surface area of around 350 m^2. The ground floor is used for the productive activity while the upper floor serves as a residence for the owner (Fig. 1). Structurally there are brick perimeter walls, central pillars in re-enforced concrete as well as brick and concrete floors. On the ground floor there is only the dairy farming area, the maturing area, the refrigeration units and bathrooms. The milk processing area is approximately 3.70 m high, with plastered walls covered with white tiling up to a height of around 2.20 m. The buildings have wooden windows which ensure good lighting and ventilation, and avoid

Paper received 18.07.2006; accepted 15.06.2007

Dr. PIER RICCARDO PORCEDDU, University Researcher.
Dr. VALENTINA BABUCCI, PhD student. Dept. of Agricultural and Environmental Sciences. University of Perugia.
Authors contributed equally to the research.

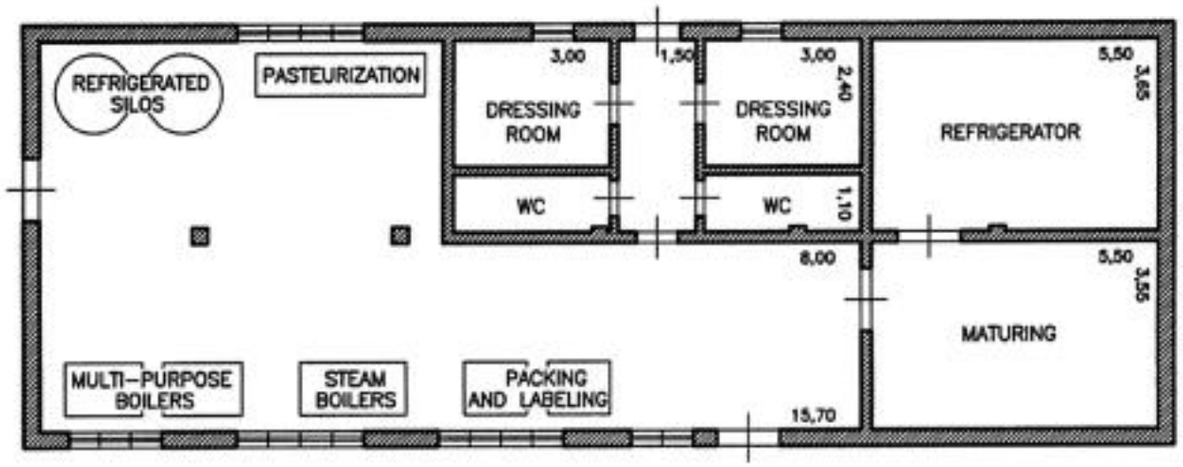

Fig. 1 - Ground floor plan of one dairy.

draughts for the workers. Aeration is also guaranteed by ventilators. In the processing areas there are also some thermo-ventilators in order to regulate the temperature inside the building.

Initially, the production process was identified and divided into the elementary activities. This allowed to carry out a better evaluation of the safety conditions the workers are exposed to with respect to the machines they use and the principle environmental parameters: noise and microclimate. During the on-site visits of the dairies under study the issue of safety was evaluated together with the workers in order to identify other possible risks with respect to legislative references: D.P.R. (Republic Presidential Decree) 547/55 [5], D.P.R. 54/97 [3], D.Lgs. 303/56 [4] and D.Lgs. 626/94.

The determination of noise was carried out by means of a series of on-site evaluations in each of the dairies under study. Trough this evaluation the general uniformity during the phases of caseification with respect to work hours (8 hours) and season was evident. The phonometric data gathered according to D.Lgs. 277/91 [7] and D.Lgs. 195/06 [2], was carried out using a Class 1 phonometric integrator [13], positioned on a tripod 1.65 m above the ground, the average distance of the ears from the ground. Evaluation were carried out in the normal locations occupied by the workers during each phase of production. Each evaluation consisted of five random measurement each with a duration of 10 minutes. The results obtained were subject to an analysis of variance to evaluate the effect of variability between different establishments as well as between different locations in the same establishment. The calculation of L_{EPd} (level of personal daily exposure) was extremely complex and was not carried out since the workers did not have fixed locations but frequently moved around the establishment between the different phases of the production even on the same day.

The microclimate was studied with reference to UNI EN ISO 7730/97 [10] [12]. To measure the microclimate parameters the following instruments were used: a globothermometer to measure the average radiant temperature (T_r), a bulb thermometer to measure air temperature (T_a), and another with forced ventilation to measure relative humidity (RH), a hot-wire anemometre to measure air speed (v_a) and connected to a data collecting station for the gathering and storing of data. Data was gathered in the processing areas corresponding to the two zones most frequently occupied by the workers (positions 1 and 2) and always in the same room near the packing machines. Moreover the environmental parameters were gathered and the microclimatic indices were also calculated for the maturing room. The data was collected over the course of a whole working day in January and July 2005. The data obtained was elaborated with specific software which enabled the calculation of Fanger microclimatic indices: PMV (Predicted Mean Vote) and PPD (Predicted Percentage of Dissatisfied) [9].

The software took into account the clothing worn by the workers. Winter clothing was assumed for the calculations relative to the maturing environments since summer clothing was considered inappropriate. Reference values identified by Fanger for similar activities were used to evaluate the energy utilization of the workers.

3. Results and discussion

3.1 *Production process*

In the dairies studied the production phases are:

Supply and stocking: the milk arrives at the dairy in tankers, is filtered to remove the larger impurities and stocked in refrigerated silos which are stirred at low speed. The capacity of these silos is normally three times the daily volume in order to allow for milk conservation which also takes place during the weekend.

Preliminary treatment: this consists of pasteurization which requires that the milk reaches a temperature of 72 °C for around 30 seconds.

Production of fresh cheese: the milk is immersed in multi-purpose boilers where it undergoes further heat treatment. Then lactic enzymes and rennet are added and after a slow mixing phase the curd forms which is then cut into small cubes in the multi-purpose boiler by small rotating blades. The excess whey is eliminated using pumps and the curds are placed on steel trolleys with an opening which lets the whey of the curd trickle through. The curds are subsequently placed on perforated moulds which allow for final trickling of the whey and serve to give the cheese the typical desired shape. Then follows the phases of steam treatment in the closed tanks into which steam is pumped.

Salting: this can take place in dry conditions, sprinkling the salt manually onto the moulded forms, or by immersing them into a saline solution as occurred in the dairies studied.

Maturing: the length of this phase can vary and is carried out in air conditioned rooms within which the cheeses are placed on wooden shelves. The cheeses are turned over periodically and, at regular intervals, any mould that has developed on the rind is cleaned off.

Packing and labeling: the cheeses can be sold whole or in segments. In two of the studied dairies the cutting of the segments was manual. In the others it was carried out using a portioning machine.

Stocking of the final product: this is carried out in refrigerators at a temperature of 4 °C.

Sanification: this consists of the cleaning and disinfection of the fixed plant and fixings (furnishings, machinery, containers and various tools).

3.2 *Noise*

The analysis of variance shows a significant variability in the results obtained for the different dairies as well as between the results obtain for the different phases within the same establishment. Moreover, the interaction between these two effects is also significant. Table 1 shows the average values calculated for the different phases of each dairy.

The noise data gives rise to some important considerations. During the preliminary treatment the noise is mainly due to the use of pumps to move the milk through heat exchangers. In such cases the maintenance of the machinery should be checked and in any case it is necessary to make sure the pumps are sectioned off with sound-proofing screens or with panels which confine the pasturizing machines, or better still the whole operation, which in any case does not require much human intervention apart from turning the machines on and off. During the phases of cheese production the noise is due to the direct input of steam into the milk in the multi-purpose boiler, in order to heat it. To lower the noise level it could be useful to provide these containers with sound-proofing lids even if the workers suggest that this would prevent them from visually checking the procedure. The noise of the salting operation is caused by the ventilators for the air exchange, which must be maintained periodically to check the wear on the spherical pads which the axis of the rotating blades rest on. During the maturing process sound-proofing and transparent screens could be applied to the brushing machine. The machines used for packaging and labelling use compressed air and the noise they produce is short and irregular. A way of improving this could be to use sound-proofing transparent panels. During the operation of sanification the noise is generated by hydro-cleaners particularly when the water is being sprayed out.

As stated previously the calculation of $L_{EP,d}$ was not possible. Nevertheless, even if a worker is exposed to the maximum noise levels measured (Tab. 1) for the whole working day, values of $L_{EP,d}$ would range between 80 and 85 dB(A). at these levels the current directives only require the employer to inform the workers on the risks such an exposure could have on hearing. Moreover, the higher values obtained for the measurements in the dairy 1 with respect to the others, was probably due to the older production system in use.

3.3 *Microclimate*

The clothing worn by the workers during January consisted of underwear, a t-shirt, long socks, trousers, boots, an apron and a cap. With respect to such clothing the software calculated a total thermal resistance of 0.15 m^2 °C W^{-1}. During July the workers wore

Dairy	1	2	3	4	5
Preliminary treatment	83.1	78.8	81.5	79.4	74.3
Production of fresh cheese	82.6	76.3	78.7	79.8	77.6
Salting	81.3	77.5	82.5	74.8	76.3
Maturing	70.7	71.5	68.7	69.8	68.5
Packing and labeling	84.0	68.9	79.4	75.8	75.2
Sanification	n.a.	n.a.	70.5	74.2	73.8

TABLE 1 - L_{Aeq} (equivalent A-weighted level), expressed in dB(A). S.E.M. (Standard Error of the Mean) = 0.65.

lighter clothing composed of underwear, a t-shirt, socks, shorts, boots, an apron and a cap, giving a total thermal resistance of 0.06 m^2 °C W^{-1}. This value is nearly half that calculated for the winter clothing. This difference is due, apart from the use of shorts or trousers, to the type of materials used particularly thick cotton during the winter and thin cotton during the summer. The energy utilization of the workers was calculated by means of the data of Fanger of other production systems considered similar to dairies, and could be quantified as follows: 112.11 W m^{-2} for milk transformation operations, 110.48 W m^{-2} for the transport and cleaning of the moulds in the refrigerated chambers and 98.85 W m^{-2} for packaging of the final products.

Data gathered for environmental parametres (T_a, T_r, v_a, RH) in January and the calculations of microclimatic indices have shown that during the processing phase the PMV values were negative and close to thermal neutrality (PMV=0) (Tab. 2). The microclimate is therefore moderate with PPD values under 10% which is the upper limit of acceptability for a microclimate; this means that the level of dissatisfied workers is very low.

Therefore, in reference to the clothing worn and the activities carried out, the workers involved in processing work in comfortable microclimatic conditions. On the other hand the data gathered in July reveals that in the transformation area the PMV levels are above 1: the microclimate is slightly hot with a high percentage of dissatisfied workers (PPD>10%). As far as the packaging workers are concerned, who clearly spend less energy, in winter the PMV values are different from conditions of thermal neutrality and their microclimate can be defined as "slightly cold" (Tab. 3). The percentage of dissatisfied workers is above 10% in all cases and this determines conditions of discomfort. During the packaging operations carried out in the summer there is a slightly hot microclimate with a high percentage of dissatisfied workers.

The results obtained generally show that the workers are more comfortable in the winter. In particular it could be suggested that they wear slightly heavier clothing during the packaging of the products. On the other hand, in the summer there is a warmer microclimate and notwithstanding the lighter clothing, the workers are not comfortable. Infact the measurements for the summer period show that even though the ventilators were functional, this did not necessarily result in adequate and homogenous ventilation. In such cases the need to relocate or add other ventilators is indispensable, since it is not possible to intervene on the clothing which is already minimal. Regarding the cheese-maturing rooms, the workers should not wear the same clothing as in the the production areas because they would undergo sharp temperature changes especially in the summer (Tab. 4), when they are lightly dressed. It is therefore essential that the workers wear heavier clothing when they move from the production areas to the stocking rooms, with a short period of time to adapt to the new temperature if possible. Moreover, during the turning over and cleaning of the cheese the workers have to work inside the cold rooms with heavier clothing. In conclusion, the microclimatic data shows that there is a need for the workers to adapt their clothing to the operations they carry out. However, these simple changes are not always accepted by the workers both because of the "loss of time" they require and because of the way heavier clothing would impede their movement.

Dairy		Position	T_a [°C]	T_r [°C]	v_a [m s^{-1}]	RH [%]	PMV	PPD [%]
January 2005	1	1	13.74	14.03	0.04	84.91	-0.30	6.86
		2	13.10	14.61	0.01	79.86	-0.32	7.18
	2	1	12.96	13.96	0.02	85.06	-0.33	8.04
		2	12.56	13.59	0.04	84.81	-0.45	9.19
	3	1	14.20	15.32	0.01	90.06	-0.15	5.47
		2	14.84	15.57	0.02	87.81	-0.08	5.14
	4	1	16.32	17.25	0.03	85.20	0.15	5.45
		2	15.98	16.70	0.02	86.80	0.09	5.19
	5	1	13.81	14.59	0.04	88.01	-0.26	6.37
		2	13.20	14.29	0.03	89.91	-0.33	7.19
July 2005	1	1	26.42	28.84	0.02	54.15	1.28	39.05
		2	28.41	28.09	0.16	48.11	1.45	48.25
	2	1	27.45	28.72	0.09	50.18	1.38	44.18
		2	27.96	28.55	0.10	58.16	1.50	50.64
	3	1	24.99	26.59	0.01	56.49	0.87	20.78
		2	26.58	26.02	0.17	57.27	0.99	26.67
	4	1	28.03	29.88	0.13	53.77	1.58	55.30
		2	27.95	28.47	0.07	46.70	1.43	47.22
	5	1	26.03	29.08	0.01	53.85	1.24	37.17
		2	26.83	28.73	0.01	53.80	1.34	42.35

TABLE 2 - Environmental parameters and microclimatic indices for the processing area.

Dairy		T_a [°C]	T_r [°C]	v_a [m s^{-1}]	RH [%]	PMV	PPD [%]
January 2005	1	11.83	13.29	0.01	81.94	-0.95	24.27
	2	13.41	14.51	0.04	86.04	-0.74	16.69
	3	14.51	15.61	0.02	88.00	-0.52	10.74
	4	16.06	16.96	0.02	86.65	-0.27	6.55
	5	13.68	14.83	0.04	88.25	-0.69	15.02
July 2005	1	29.50	27.43	0.09	38.02	1.21	35.57
	2	28.27	27.84	0.05	47.13	1.12	31.61
	3	27.08	28.18	0.12	45.55	0.88	21.23
	4	28.68	27.93	0.06	38.50	1.14	32.23
	5	26.97	28.38	0.02	55.72	1.04	28.02

TABLE 3 - Environmental parameters and microclimatic indices for the packaging area.

Dairy		T_a [°C]	T_r [°C]	v_a [m s^{-1}]	RH [%]	PMV	PPD [%]
January 2005	1	6.50	7.19	0.01	96.5	-1.57	54.49
	2	6.41	7.69	0.02	93.6	-1.57	54.76
	3	5.78	7.27	0.01	95.8	-1.64	58.47
	4	5.89	7.36	0.03	96.3	-1.65	59.24
	5	5.93	6.58	0.02	98.1	-1.67	60.07

TABLE 4 - Environmental parameters and microclimatic indices for the maturing area.

3.4 *Other risks*

During the on site visit it was possible to identify and analyse, together with the workers, other risks resulting from the use of machines and related to their activities. Different situations were identified for which favourable interventions were possible involving minor and major adaptations to the machines and workplace and with appropriate behaviour of the workers. During the loading, unloading and washing of the tanker there is minimal biological risk resulted from contact with milk which could be contaminated (D.P.R. 54/97). This is due to veterinary checks at the stables. However the washing of the tanker is a riskier operation because of possible falls. Therefore stable ladders, parapets, handrails and foot blocks should be installed (Tit. II D.P.R. 547/55). Moreover the tankers should have a clear path set out within the dairy forecourts, especially when there is a sales outlet for the public (art. 8 and 11 D.P.R. 547/55).

The pasturizing machinery is made up of thermal plate exchangers and can therefore lead to the risk of contact with hot surfaces (art. 40 D.P.R. 547/55). During the functioning of the multi-purpose boiler there is the risk for the workers of contact between with the upper limbs and the machines cutter-churners. The boilers should therefore have a safety grating and/or safety barriers with automatic blocking systems in case the machine opens or is moved (art. 68 and 72 D.P.R. 547/55).

During the salting it is necessary to dose the solution with salt which should be purchased in sacks which weigh no more than 30 kg (Tit. V D.Lgs. 626/94). There is also the risk of skin and eye irritation due to contact with the saline solution; appropriate P.P.E.s should be worn such as gloves and goggles (D.Lgs. 303/56). The maturing takes place in rooms with air-conditioning which should have ducts which can be disinfected and inspected (D.P.R. 54/97) in order to avoid the growth of mould on the cheeses, which could circulate in the air and be inhaled by the workers with the risk of asthma and rhinitis. The cheese cleaning process which involves the abrasion of the surface of the cheeses takes place using rotating brushing machines controlled by the machine operator. The brushing causes a high concentration of mould particles and mites to be expelled into the air and therefore some sort of air filter system which retains these particles is required (D.P.R. 54/97). Moreover the machine engines must be equipped with protective systems and blocking mechanisms to avoid the risk of workers getting caught or dragged by the machinery (Tit. III Capo III D.P.R. 547/55 and art. 68 D.P.R. 547/55). Moreover appropriate P.P.E.s should be worn, such as gloves, goggles and masks. During packaging a portioning machine, which has a vertical blade to cut the cheese is used. In order to avoid injury the machinery must be activated by using two buttons simultaneously, positioned at a distance such that the worker has to use both hands. In this way the workers' hands are kept from the cutting area (art. 81 D.P.R. 547/55). The packaging machines which are usually pneumatic, also involve risk of workers being caught and dragged (Tit. III Capo III D.P.R. 547/55).

Stocking takes place in refrigerators. Risks are due to the manual movement of the loads (Tit. V D.Lgs. 626/94) and drastic changes of temperature due to the movement of the cheeses from the processing areas to

the refrigerators, and from there outside to the lorries which will transport them.

If a fork-lift is used to lift the boxes containing a number of cheeses, then it is necessary to check that there is sufficient space to manoever, and that the flooring is well-maintained (Tit. II D.P.R. 547/55).

In the sanification phase the risks are due to the manipulation of dangerous substances such as caustic soda and sodium hypochlorite which can cause burns to the skin and eyes, nose and throat irritation, and can have fatal consequences if swallowed. Appropriate P.P.E.s should be worn such as gloves and masks (Tit. VIII D.P.R. 547/55). The packages should be labelled and stored under lock (art. 355 D.P.R. 547/55). If hot water and steam spray cleaners are used appropriate P.P.E.s should be used to avoid burns.

A common risk is that of slippery floors which can lead to workers slipping and injuring themselves. The floors should be laid with anti-slip paving, having a wide drainage both to allow better outflow of liquids and because wide drainage enables the flooring to be less continuous and therefore less slippery (art. 7 D.Lgs. 303/56). In recent years there has been an increasing tendency to use flooring with liquid products with a quartz base as an anti-slip surface. They have the undeniable advantage of being easy to lay and can be renewed with another layer applied to the first.

4. Conclusions

The study has enabled the identification of safety risks for workers in some dairies, of small medium size in the Umbrian Region, all possessing the same productive capacity and similar production process. The productive units are family-managed.

The study focused on the workers' safety conditions concerning the main environmental factors: noise and microclimate and on other risks linked to production and to the use of various kinds of machinery. Regarding the machinery used, the main risk factor was noise; to reduce it, other than ordinary machine maintenance, sound-proofing panels can be easily installed, so as to limit the noise sources. Nowadays dairy employer can install cabins or single mobile panels which are particularly solid and provide good insulation against heat and sound. They can be free-standing, thanks to an internal structure in zinc-covered steel, with a smooth or pyramid external surface. The thickness and density of the internal material varies, in order to adapt to different degrees of isolation.

It is nonetheless necessary to highlight the influence the age of a machine could have on noise generation as was observed for dairy 1. Even though noise mitigation interventions are always advisable, the contemporary consideration of the upgrade of obsolete machinery is also necessary.

The study of the microclimate has shown the need to pay particular attention to temperature changes which can be caused especially during the phase of transport of the final products into the maturing areas. In all the cases it is however possible to reduce the risk factors with correct behaviour on behalf of the workers.

There was a lack of the most elementary P.P.E.s, such as gloves and masks, and heavier clothing in certain conditions. All of these factors hint at a lack of efficiency in the training and information for the workers, which is one of the important points of D.Lgs. 626/94, which, twelve years after its introduction still needs to be applied more vigourously.

5. Acknowledgments

Research carried out with MIUR PRIN 2005 funds, titled "Analysis of the applicability and extent of workers' safety norms and of the quality and safety of food products: studies for some processing factories", national coordinator Prof. G. Zoppello.

6. References

[1] BELLI M., DIOGUARDI L., PESSINA D., SANGIORGI F., *Analisi delle condizioni ambientali in tre aziende lattiero-casearie lombarde*, Rivista di Ingegneria Agraria, 2005, 1, 17-24.

[2] D. Lgs. 195/06, *Attuazione della direttiva 2003/10/CE relativa all'esposizione dei lavoratori ai rischi derivanti dagli agenti fisici (rumore),* 2006.

[3] D.P.R. 54/97, Regolamento recante attuazione delle direttive 92/46 e 92/47 CEE in materia di produzione ed immissione sul mercato di latte e di prodotti a base di latte, 1997.

[4] D.P.R. 303/56, Norme generali per l'igiene del lavoro, 1956.

[5] D.P.R. 547/55, Norme per la prevenzione degli infortuni sul luogo di lavoro, 1955.

[6] D. Lgs. 626/94, *Attuazione delle direttive 89/391 CEE, 89/654 CEE, 89/655 CEE, 89/656 CEE, 90/269 CEE, 90/270 CEE, 90/394 CEE, 90/679 CEE, riguardanti il miglioramento della sicurezza e della salute dei lavoratori sul luogo di lavoro,* 1994.

[7] D. Lgs. 277/91, *Attuazione delle direttive n. 80/1107/CEE, 82/605 CEE, 83/477 CEE, 86/188 CEE, 88/642 CEE, in materia di protezione dei lavoratori contro i rischi derivanti da esposizione ad agenti chimici, fisici e biologici durante il lavoro, a norma dell'art. 7 della Legge30 luglio 1990 n. 212,* 1991.

[8] EEC (European Economic Community) 89/391, *Introduction of measures to encourage improvements in the safety and health of workers at work,* 1989.

[9] Fanger P.O., *Thermal Comfort*, Mc Graw Hill, 1970, New York

[10] MONARCA D., PORCEDDU P.R., CECCHINI M., BABUCCI V., *La valutazione del rischio da microclima negli ambienti di lavoro agroindustriali*, Rivista di Ingegneria Agraria, 2005, 4, 89-93.

[11] PORCEDDU P.R., BABUCCI V., *Profili di rischio nei caseifici*, Atti Convegno L'Ingegneria Agraria per lo sviluppo sostenibile dell'area mediterranea, 2005, Catania, Italy.

[12] UNI EN ISO 7730, *Moderate thermal environments – Determination of the PMV and PPD indices and specification of the conditions for thermal comfort*, 1997.
[13] UNI EN ISO 7726, *Ergonomics of the thermal environment – Instruments for measuring physical quantities*, 2002.

SUMMARY

This work has analysed the principal risks for workers, with respect to current legislation, resulting from noise, microclimate and other risks related to the production system and use of machinery, in a number of dairies having similar production systems and capacities.

Noise emission values fell within the range for which current directives require the employer to inform his workers on the risks related with noise production. Measurements of the microclimate have identified different situations that depend on the workers' clothing and activity. In the transformation area workers experience a comfortable environment during the winter which tends to be slightly hot during summer. In the latter case it is necessary to improve the ventilation system of the area since little could be done to improve the clothing. During packaging the lower rates of metabolic energy utilization, result in a slightly cold environment during winter while being still hot in summer. In the former case it is necessary to act on the clothing while in the latter intervention on the ventilation system is required. With respect to the maturing areas heavier clothing is necessary. Other risks related to the machinery used, the workplace and the behaviour of the workers have been identified. In particular, the lack of use of adequate P.P.E.s during different activities has been observed. This makes it necessary for the employer to give the necessary importance to the education and training of the workers.

Key words: Dairy, workers' safety, noise, microclimate, other risks.

CONFERENCES

Second International Symposium
"MONITORING OF MEDITERRANEAN COASTAL AREAS:
PROBLEMS AND MEASUREMENT TECHNIQUES"
Naples 4-6 June 2008

Sessions
I) Evolution of coastlines and coastal erosion
II) Coastal vegetation: stress, recovery and protection
III) Environmental law and coastal protection
IV) Coastal anthropization, socio-economic exploitation of the territory and environmental recovery
V) Sea beds, plant cover and water quality
VI) Coastal and submarine archaeology and cultural heritage