

**ANALYSIS OF MILKING TECHNIQUE EFFECT ON SOMATIC
CELL COUNTS****O. Hanuš, A. Ticháček****Abstract**

Machine milking is utilized as a principal method of cow milking nowadays. Effect of functional parameters of milking apparatuses on health condition of cows is known and evident (Nyhan and Cowhig, 1967, Nyhan, 1969, Konermann, 1992, Capuco et al., 1994). Qualitative functional parameters of the milking apparatus affect directly mastitis incidence in cows herds thanks to the polyfactorial character of mastitis. The study was aimed at qualitative and quantitative specification of individual functional parameters as related to secretion disorders. The paper classifies functional parameters (FP) of pipeline milking apparatuses (or of milking line apparatuses - MLA), mentions the most frequent and most relevant defects and their impact on secretion disorders frequency in herds.

Exact regular monitoring of functional parameters of milking apparatuses (subvented by government) included into the system of routine mastitis prevention is recommended. Results of monitoring would be utilized in evaluation and interpretation of the actual situation. Regular monitoring and precise quantification of functional parameters of milking apparatuses completed with consecutive qualified maintenance and repair service and eventual well-timed innovation of milking technique are recommended. The mentioned precautions are necessary for guarantee of simultaneous good-quality milk production and high milk production level-these are principal prerequisites of milk production rentability all over the world.

Introduction

Machine milking is utilized as a principal method of cow milking nowadays. Effect of functional parameters of milking apparatuses on health condition of cows is known and evident (Nyhan and Cowhig, 1967, Nyhan, 1969, Konermann, 1992, Capuco et al., 1994). Qualitative functional parameters of the milking apparatus affect directly mastitis incidence in cows herds thanks to the polyfactorial character of mastitis. The

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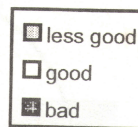
Materials and methods

Functional parameters (FP, Rouha, 1980) of 317 milking line apparatuses (MLA) and somatic cell counts (SCC in THS./ml) in pool milk samples were determined immediately before apparatuses control (two measurements SCC during one month before control MLA). Effect of ten functional parameters of milking line apparatuses on somatic cell counts in pooled milk was studied in a field trial (figures and tables). Older pipeline milking apparatuses (MLA) are most frequently used in compare with milking in parlour (> 75%) in the conditions of our contry all the time. In this study functional parameters of milking line apparatuses and their impact on milk somatic cell counts in the cases of cow's herds with problems at milk quality were studied. Milk somatic cell counts were determined with milk cel counter Fossomatic 90 (Foss Electric - Denmark) in the milk laboratory RICB Rapotin. Functional parameters of milking line apparatuses were measured with the instrument Milkotest 2000 (Gebrüder-Bilgery, Swiss). The measurements were performed by workers of Milking Machine Service at RICB Rapotin. The list of measured FP of MLA is metioned in the figures and tables.

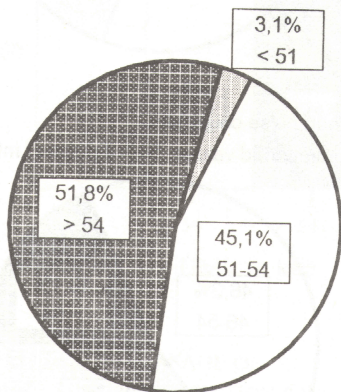
Results and discussion

Results are mentioned in the figures and tables. The most relevant effects on increase of milk somatic cells counts (from 11.7 to 21.0%; figures 3,4 and 6; correlation coefficietns $r=0,21$, $0,32$ and $-0,07$; Tbl. 1; Fig. 8) were mentioned in cases of: milk line leakage, underpressure distribution leakage, low passage capacity of underpressure distribution. Increased underpressure of milk line and inadequate pulse count (frequency) are significant factors too (Fig. 2 and 5). More than one important distturbance were detected in most functioning apparatuses. Cumulated effect of simultaneous relevant dysfunctions (from 2 to 4) was demonstrated in 54,5% MLA (Fig. 7). The cumulative effect of simultaneous action of several relevant defects (5 according to individually increased comatic cell counts on column graphs in the figures 2, 3, 4, 5 and 6) results in significant SCC increase (16,7% Fig. 7, $r=0,26$, Tbl. 1). Results reflect on relatively high frequency of milking apparatus defects (from 14 to 84%, at several relevant defects that were from 15 to 54%, Fig. 1).

Figure 1. - THE ANALYSIS OF FUNCTIONAL SCORE OF PIPELINE MACHINE MILKING EQUIPMENTS

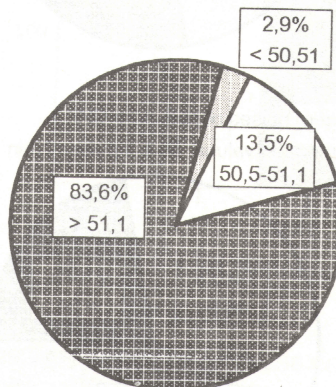


A. Underpressure of milk line UML 53,4 and 52,0 kPa
Recommended values



B. Underpressure of vacuum distribution UVD 50,7 - 50,9 kPa
Recommended values

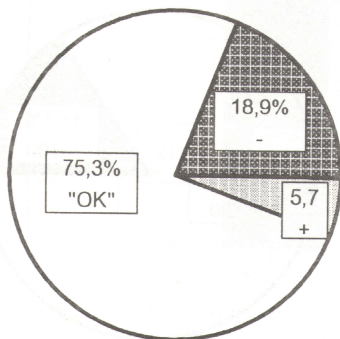
Recommended values



C. Accuracy the measurement of vacuometers AMV

Recommended values:

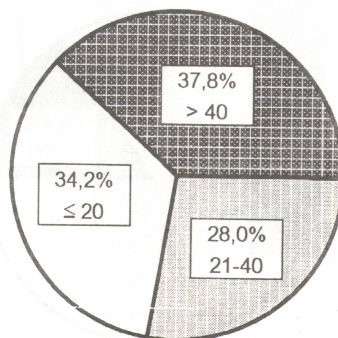
max. difference 2,6 kPa



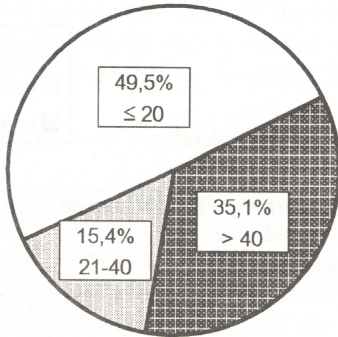
D. Leakage of milk line LML

Recommended values:

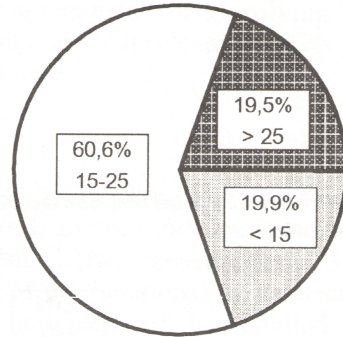
max. 67 l/min



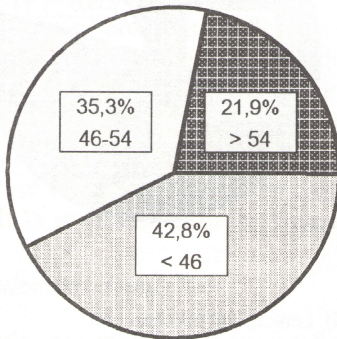
E. Leakage of underpressure distribution LUD
Recommended values: max. 50 l/min



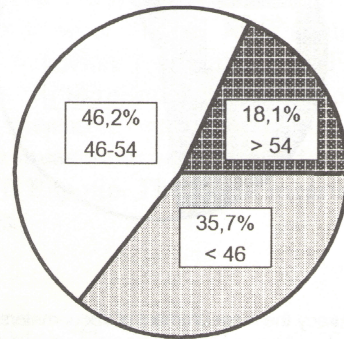
F. Mean air consumption on one apparatus MAC
Recommended values: 15 - 25 l/min



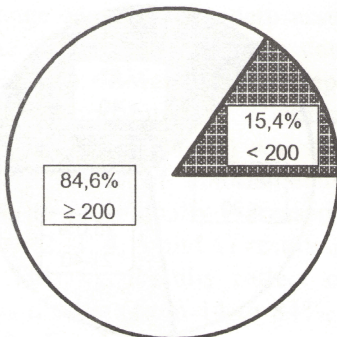
G. Count of pulses of pulsators CPP
Recommended values: 50 ± 4 pulses / min



H. Mean pulse count MPC
Recommended values: 50 ± 4 pulses / min



I. Passage capacity of underpressure distribution PCUD
Recommended values: Min. 200 l/min



J. Air pump efficiency APE
Recommended values: Min. 700 l/min

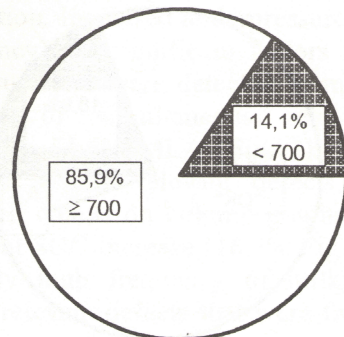


Fig. 2. - EFFECT OF UNDERPRESSURE OF MILK LINE (UML) ON SOMATIC CELL COUNT (SCC) IN POOLED MILK SAMPLES

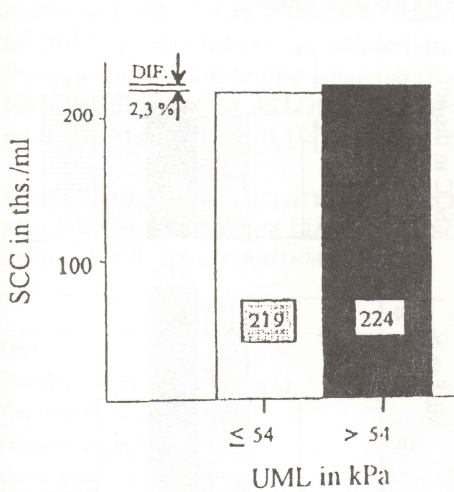


Fig. 3. - EFFECT OF LEAKAGE OF MILKING LINE (LML) ON SOMATIC CELL COUNT (SCC) IN POOLED MILK SAMPLES

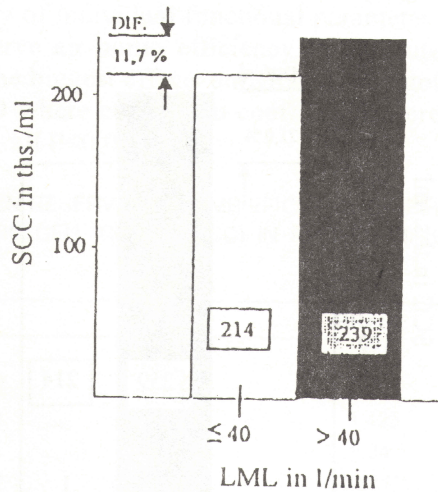


Fig. 4. - EFFECT OF LEAKAGE OF UNDERPRESSURE DISTRIBUTION (LUD) ON SOMATIC CELL COUNT (SCC) IN POOLED MILK SAMPLES

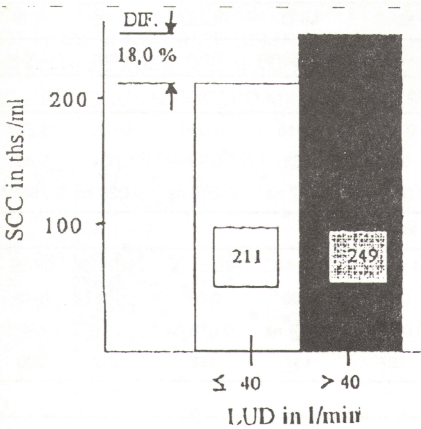


Fig. 5. - EFFECT OF MEAN PULSE COUNT (MPC) ON SOMATIC CELL COUNT (SCC) IN POOLED MILK SAMPLES

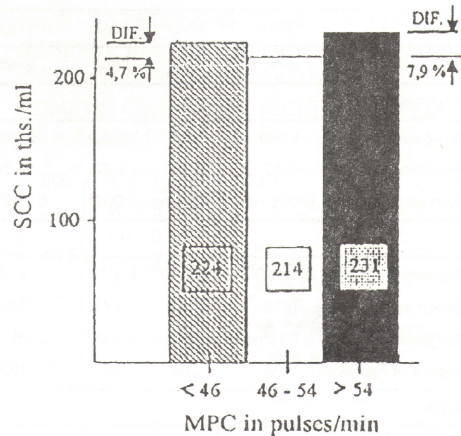


Fig. 6. - EFFECT OF PASSAGE CAPACITY OF UNDERPRESSURE DISTRIBUTION (PCUD) ON SOMATIC CELL COUNT (SCC) IN POOLED MILK SAMPLES

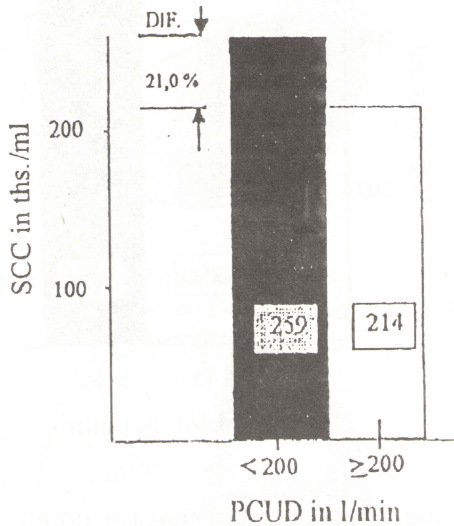


Fig. 7. - CUMULATIVE EFFECT OF SIMULTANEOUS EXISTENCE OF RELEVANT MILKING LINE APPARATUS (MLA) DYSFUNCTION (SED) ON SOMATIC CELL COUNT (SCC) IN POOLED MILK SAMPLES

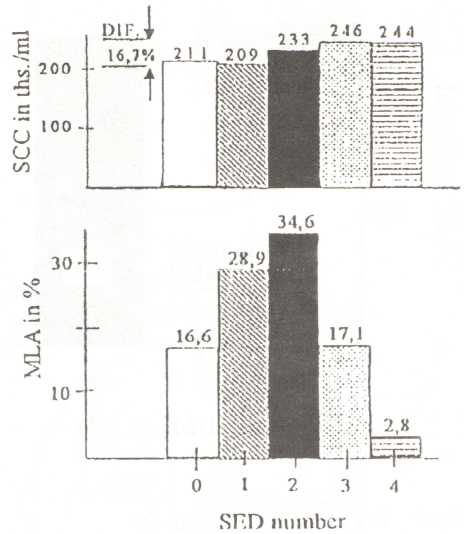


Table 1. - ANALYSIS OF RELATIONSHIPS BETWEEN FUNCTIONAL PARAMETERS (FP) OF MILKING LINE APPARATUSES (MLA) AND SOMATIC CELL COUNT (SCC) IN POOLED MILK SAMPLES AND ITS LOGARITHM (LOG)

FP/MLA	UML	UVD	LML	LUD	MAC	MPC	PCUD	APE	SED
Unit	kPa	kPa	l/min	l/min	l/min	pulses/min	l/min	l/min	number
Coefficients:					to SCC				
Regression	1.089	1.89	0.482	0.489	0.403	1.515	-0.036	0.010	18.827
Determination (%)	0.12	0.41	4.27	10.35	0.19	1.88	0.43	0.04	6.55
Correlation	0.035 ns	0.064 ns	0.207**	0.322***	0.044 ns	0.137 ns	-0.065 ns	0.020 ns	0.256***
					to log SCC				
Regression	23 x 10 ⁻⁴	30 x 10 ⁻⁴	9 x 10 ⁻⁴	8 x 10 ⁻⁴	4 x 10 ⁻⁴	25 x 10 ⁻⁴	-86 x 10 ⁻⁶	-14 x 10 ⁻⁸	0.038
Determination (%)	0.13	0.28	3.72	6.60	0.04	1.30	0.61	0	6.48
Correlation	0.037 ns	0.053 ns	0.193**	0.257***	0.021 ns	0.144 ns	-0.078 ns	0	0.255***
Degree of Freedom	200	204	205	199	197	137	188	209	209
Notice									

Statistical significance: ns = P < 0,05; * = P > 0.05; ** = P > 0.01; *** = P > 0.001.

Results of the study demonstrate a significant relationship between functional parameters of the milking technique, health condition of cows, and milk quality in a routing field trial. Effect of the complex parameter (reserve air pump efficiency $r=-0.23$, Tbl. 2 and Fig. 9) on health condition of the mammary gland was found too. Relevancy of individual functional parameters of milking apparatuses as related to reserve air pump efficiency in absolute form and the relative one was specified (the biggest effects on RRAPE had got LML, LUD, MAC, PCUD APE and SED where correlation coefficients were $r=-0,55, -0,65, -0,42, 0,19, 0,46$ and $-0,52$, all $P<0,01$).

Table 2. - ANALYSIS OF RELATIONSHIPS BETWEEN RESERVE AIR PUMP EFFICIENCY (RAPE) AND ITS RELATIVE FORM (RAPE) AND SOMATIC CELL COUNT (SCC) IN POOLED MILK SAMPLES AND ITS LOGARITHM (LOG)

	RAPE	RRAPE
Unit	l/min	%
Coefficients:	to SCC	
Regression	-0.050	-1.425
Determination (%)	1.4	5.34
Correlation	-0.118*	-0.231**
	to log SCC	
Regression	-11×10^5	-27×10^4
Determination (%)	1.6	4.94
Correlation	-0.126*	-0.222**
Degree of Freedom	209	209
Notice		

Fig. 8. - RELATIONSHIP BETWEEN LEAKAGE OF UNDERPRESSURE DISTRIBUTION (LUD) IN MILKING APPARATUS AND SOMATIC CELL COUNT (SCC) IN POOLED MILK SAMPLES

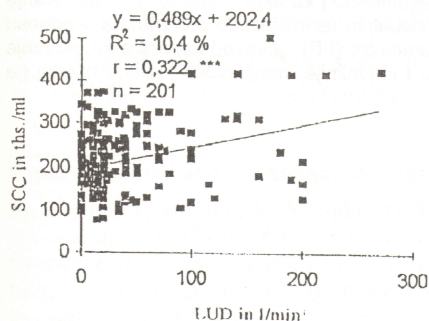
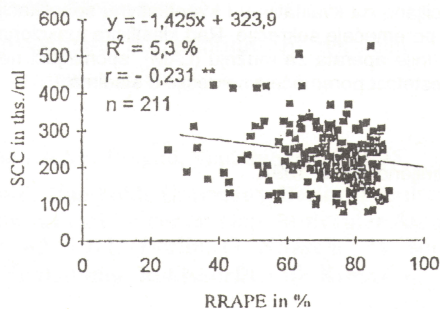


Fig. 9. - RELATIONSHIP BETWEEN RELATIVE RESERVE AIR PUMP EFFICIENCY (RRAPE) OF MILKING LINE APPARATUS AND SOMATIC CELL COUNT (SCC) IN POOLED MILK SAMPLES



Conclusions

Exact regular monitoring of functional parameters of milking apparatuses (subvented by government) included into the system of routine mastitis prevention is recommended. Results of monitoring would be utilized in evaluation and interpretation of the actual situation. Regular monitoring and precise quantification of functional parameters of milking apparatuses completed with consecutive qualified maintenance and repair service and eventual well-timed innovation of milking technique are recommended. The mentioned precautions are necessary for guarantee of simultaneous good-quality milk production and high milk production level-these are principal prerequisites of milk production rentability all over the world.

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ANALIZA UTJECAJA TEHNIKE MUZENJA NA BROJ SOMATSKIH STANICA

Sažetak

Danas se strojno muženje koristi kao glavna metoda muženja krava. Utjecaj funkcionalnih parametara aparata za muženje na zdravstveno stanje krava je poznato. Aparati za mužnju utječu izravno na pojavu mastitisa u stadima krava zbog polifaktonijalnog karaktera mastitisa. Proučavanje je ciljano na kvalitativnu i kvantitativnu specifikaciju individualnih funkcionalnih parametara u odnosu na poremećaje sekrecije. Rad klasificira funkcionalne parametre (FP) cjevovoda aparata za muženje (ili linije aparata za mužnju (LAM), spominjući najčešće i najvažnije manjkavosti i njihov utjecaj na učestalost poremećaja sekrecije u stadima.

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