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Research of Some Properties the Teat Rubbers

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Abstract: The work showes the results of physical and mechanical characteristics of teat rubbers and condition their of inner side. These rubbers from two producers of milk technique were used in the working conditions. Hardness of teat rubbers is changing during the operational time statistically significant. The microstructure on inner side surface of rubbers verified the changes in expored area after 600 hours of service.

Key words: Properties, Teat rubbers

Introduction

One of the basic assumption for surety of good health of mammary gland and quality milk is correct working milking equipment. Each milking unit is influenced to mammary gland through rubber teats, which is the most laboured element. It is necessary in defined intervals to change the teat rubbers. By wearing of teat rubbers are changing the physical and mechanical characteristics.

Many authors have been busy with observation of physical and mechanical properties in their labours (Prikryl, 1988; Karas, 1996). These authors mention, that changes in the physical and mechanical properties are very small comparing the starting values.

Rough, hard and craced teat rubbers traumatized the peak of teat (Lowe 1981; Malik *et al*., 1989). By influence of mechanical strain is be coming on inside sutface of teat rubbers to creating microcrack, whose by time of usage growing and enlarget to all directions. Microorganizms setted in fissurer of teat rubbers by its damage with unwanted made contaminated milk (Galik, 1998).

Materials and Methods

Depending on working time of tested teat rubbers we detected the followed indexes (in the regular intervals after 300 hours of operation).

Physical and mechanical characteristics of teat rubbers in laboratories of Researching center of processing and aplication of syntetics in Nira.

Hardness [Sh A] by STN 62 1431 (1980): This method is based on measurment of rubber resistance against stuffed needle. The hardness will be read on scale of experimental equipment ZWICK 7201 after 15 second from the moment of load application on the experimental body.

Resistance by breaking [MPa] by STN 62 1436 (1983): Entity of test is torsion of tested body by poling with constant speed until its broke. The testing bodies must be figured as two side shovel.

breaking of testing body. The results will be evaluated by methods of variety analysis, calculation of correlative relationships and regressive analysis.

Condition of inner side of teat rubber tested on raster scan scope: On tested teat rubbers at the same time was monitored the damage of microrelief by raster scan slop Tesla BS 301 on zoom 400x. The tested peaces was cutted out from the most stressed parts of teat rubbers (in flexion places).

Results and Discussion

The measured results of physical and mechanical properties of teat rubbers produced by different producers after different function times are showed in Table 1 and 2.

Following the achieved results the hardness of teat rubbers, expressed in Sh A, increased during the operating time till 300 hours, later decreased (besides sample number 1, new rubber, by which the hardness changed only minimally after 600 operating hours). The hardness increased achieved the significant differences between the variats of individual rubber samples.

Following the statistical evaluation, the hardness of sample number 1 increased opposite the all other operating times statistically significantly after 600 hours.

Alike by the sample number 2 we registered the statistically significantly differences in hardness, where the highest hardness was found out after 300 hours and the differences were significant opposite the other variants of sample number 2 (a new rubber, after 600 hours, after 900 hours and a rubber after 1200 hours of function).

Our results show, that the hardness of researched samples the teat rubbers increases during the operating time untill 300-600 hours, then decreases, what is in certain contradiction with cited author (Prikryl, 1988). According to samples of teat rubbers and their operating time the average value of hardness was in the scale 43,1-54,9 Sh A.

By the calculation of correlative relationships between operating time and hardness we found out the significant and statistically certified correlative coeficient. Because of the high correlative coefficient by samples number 1 and 2 ($r = -0.751$; $r = -0.5643$) we realized the calculation of

Table 1: Physical-mechanical characteristics of teat rubbers (sample num. 1)

Operation	Thickness mm		Resistance by cracking MPa		Elongation by cracking (%)		Hardness, Sh A	
time (h)	x̄	s	x̄	s	x̄	s	x̄	s
new	2,00	0,11	10,9	1,32	448	22,8	54,9	0,71
300 h	2,18	0,12	9,8	1,21	428	59,3	54,5	0,41
600 h	1,74	0,11	12,1	1,75	416	41,0	53,9	1,56
900 h	2,14	0,14	9,3	0,62	432	17,9	45,9	1,18
1200 h	2,18	0,12	10,4	1,34	480	28,3	49,7	2,36

Table 2: Physical-mechanical characteristics of teat rubbers (sample num. 2)

Operation	Thickness mm		Resistance by cracking MPa		Elongation by cracking (%)		Hardness, Sh A	
time (h)	x̄	s	x̄	s	x̄	s	x̄	s
new	2,18	0,06	12,3	1,67	456	8,9	47,7	1,63
300 h	1,98	0,12	15,0	1,15	408	11,0	54,8	1,01
600 h	2,49	0,08	11,7	0,26	448	11,0	44,9	1,82
900 h	2,12	0,09	13,7	0,56	420	24,7	43,1	1,57
1200 h	2,49	0,08	12,3	0,87	476	21,9	45,1	0,86

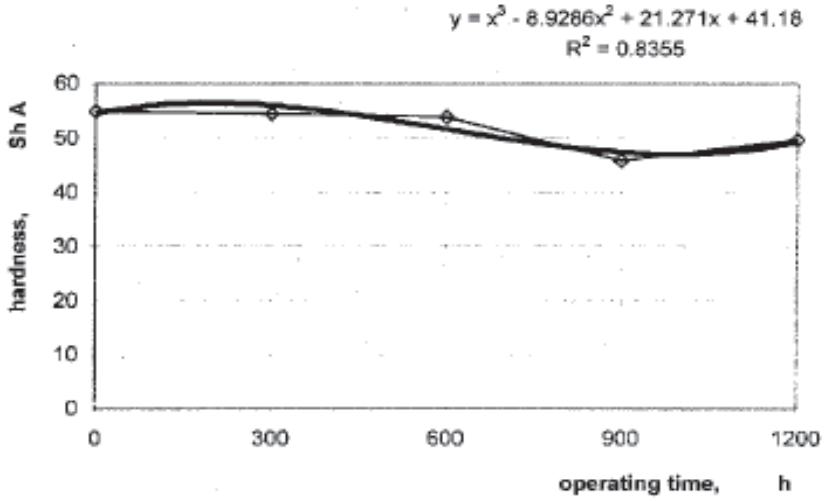

Fig. 1: Regressive relation between operating time and hardness (sample number 1)

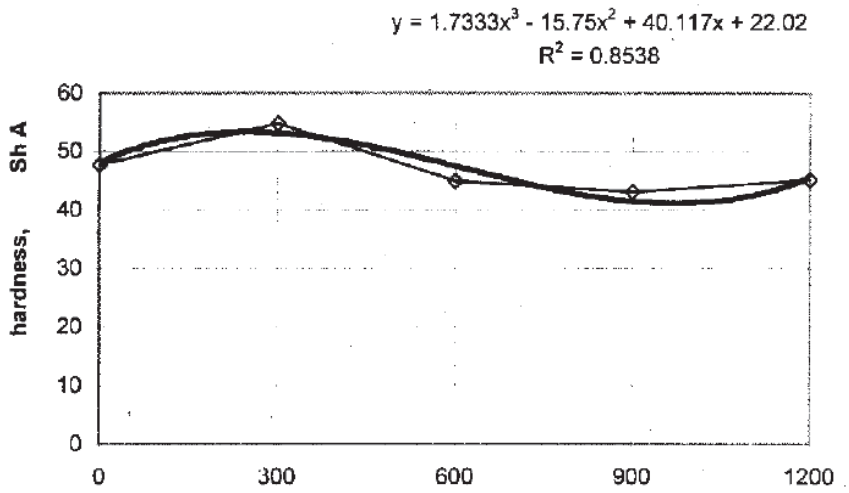

Fig. 2: Regressive relation operating time and hardness (sample number 2)

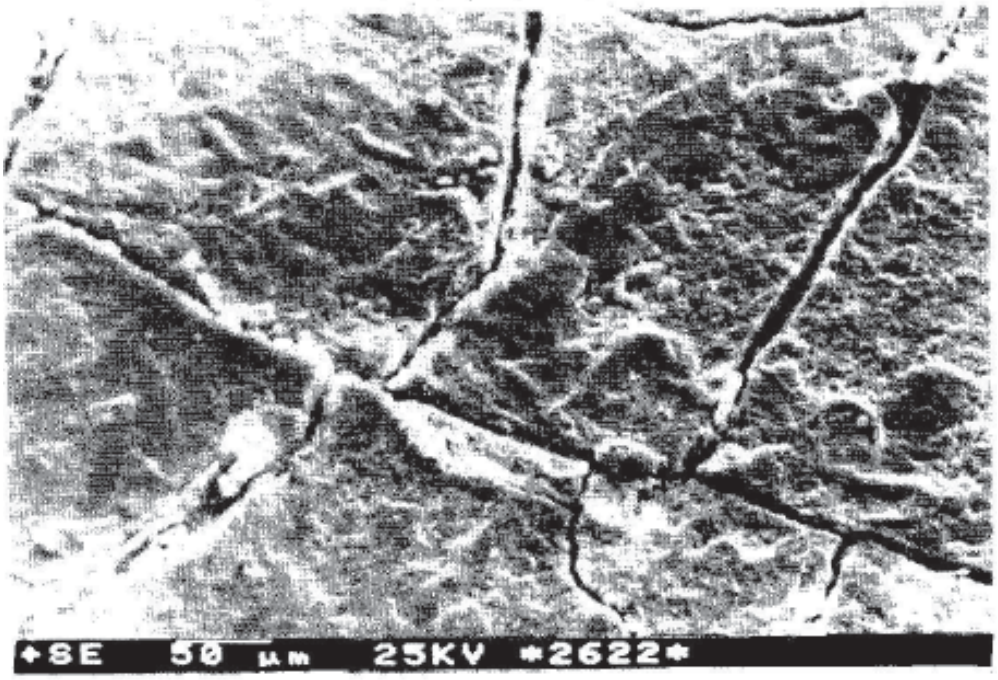

Fig. 3: Microstructure of rubber teat after 600 hours operating (zoom 400x)

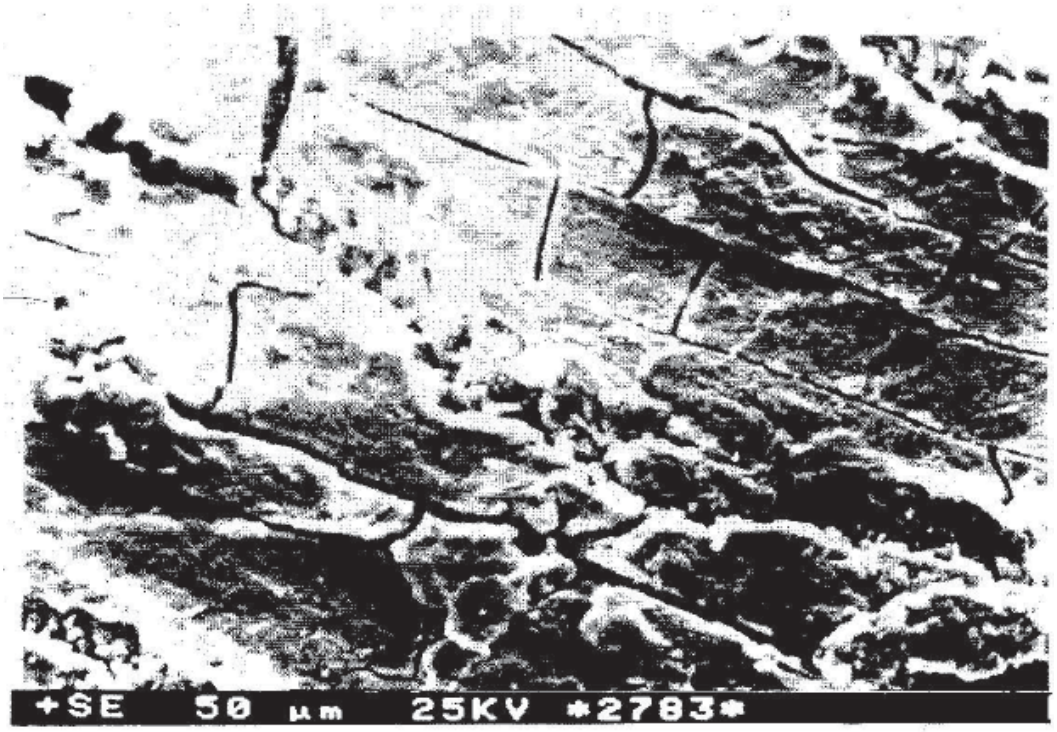

Fig. 4: Microstructure of rubber teat after 900 hours operating (zoom 400x)

Following the regressive analysis the indipendent variable (operating time) influaces the dependent variable (hardness) by the expression of used regressive function on 83,55 percent respectively and 85,38 percent. Graphical figurations these relationships by the regression are on the Fig. 1 & 2. Evaluation of microphotographs by method of sqare grid we discovered, that the cracks ratio by teat rubbers after 600 hours usage is 9,4 percent, by teat rubbers after 900 hours usage is 13,4 percent (accumulation 42.6%, Fig. 3, 4). The results is that the cracks are growing on all directions with operational time.

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