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THE SQUEEZING AND EXAMINATION OF THE SEEDS OF VARIOUS PLANTS

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Abstract:
Our cold mouldering examinations were performed on a two headed OP-222 screw-press in our Mechanical Department and on a one headed screw-press found in a private economy in Szeghalom. The aim of our research was to determine how the pressing output subject to unit of time change with the modification of the rpm of the screw or rather of the diameter of the nozzle, and to determine how the electric power needs of this change as well. During the measurements we used sunflower-, rape-, and flax seeds. QN-10 type electric measuring box was made use of in determining the electric power needs. Our further aim was to determine if there were such relations between parameters that can be described with mathematical-statistical methods.
Keywords: *screw-press, pressing power, electric power needs, diameters of the nozzle*

INTRODUCTION

Our cold squeezing examinations were performed in our Mechanical Department ‘partly’ on a two headed OP-222 screw-press manufactured by SZIMMETRIA Ltd, Karcag. On the other hand we applied a one headed screw-press found in a private economy in Szeghalom as well.

METHOD USED

The aim of our research was to determine how the pressing output subject to unit of time change with the modification of the rpm of the screw or rather of the diameter of the nozzle, and to determine how the electric power needs of this change as well. QN-10 electric measuring box was made use of in determining the characteristics of the earlier mentioned. During the measurements we used sunflower-, rape-, and flax seeds. Further on, we produced engine fuel from the oil squeezed through “Unifilter PP-200”, with the help of German Schur additive (diagram 1.)

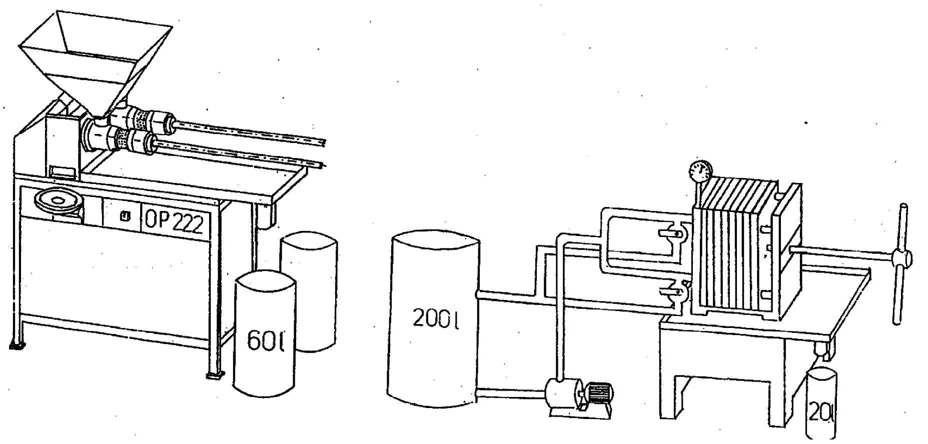

Diagram 1 Small-scale plant oil produce

RESULTS

The evaluation and results of the cold squeezing examinations

420 dm^3 of oil was produced out of 1,450 kg of seeds during the pressing of sunflowers. Taking (p = 0.924 kg/dm^3) density of sunflower oil into account the oil yield proportion is:

$$(420 \times 0.924/1,450) \times 100 = 26.76\% \approx 27\%$$

During the pressing of 120 kg rapes we obtained 40.4 dm^3 of oil. Counting with (p = 0.926 kg/dm^3) density of rape oil, the oil yield proportion is:

$$(40.4 \times 0.926/120) \times 100 = 31.18\% \approx 31\%$$

16 dm^3 of oil was managed to be produced out of 45 kg of flax seeds. The oil yield proportion in respect of the density of linseed oil is:

$$(16 \times 0.932/45) \times 100 = 33.14\% \approx 33\%$$

What caused the smaller oil yield proportion of the sunflower oil was that we used rough seeds during the pressing. The proportion of the oil yield can be considered appropriate, since according to literature (Maurer K. 1992.) “70-80% of de-oiliness” can be obtained in respect of seeds undergoing decentralized, small-scale squeezing.

Of the domestic squeezing examinations, outstanding is the activity performed by Vitéz F. and Kiss E. in 1991 in the then Seed oil and Detergent Research Institute. They made use of KOMET DD85 screw-press in their experiments and determined the pressing parameters of 17 types of oil seeds. Considering that the output of rpm of the screw-press can be altered with OP-222 press (20 l/min – 100 l/min in 6 steps), further on the machine was originally supplied with Ø 6 mm, Ø 6,5 mm, Ø 7 mm and Ø 8 mm nozzles, there was the opportunity to determine the power of pressing, or to register the electric power needs from the network.

In the case of rape seeds the formation of the pressing power in the function of rpm at each diameter of the nozzles can be seen in Table 1.

Table 1 Pressing power in the function of rpm

rpm [min^{-1}]	Pressing power [kg/h] at Ø 6 mm	Pressing power [kg/h] at Ø 6,5 mm	Pressing power [kg/h] at Ø 7 mm	Pressing power [kg/h] at Ø 8 mm
20	2.23	2.58	1.88	1.88
30	2.89	2.69	2.16	2.36
40	5.99	5.17	5.32	4.43
50	7.08	4.16	3.54	3.12
65	8.14	2.46	2.19	2.05
100	10.92	4.46	4.21	3.59

We were not able to determine the relations between the pressing power and the rpm with mathematical-statistical methods, because of the significant deviation of the data.

Diagram 2 shows that the greatest pressing output was obtained with the smallest nozzle.

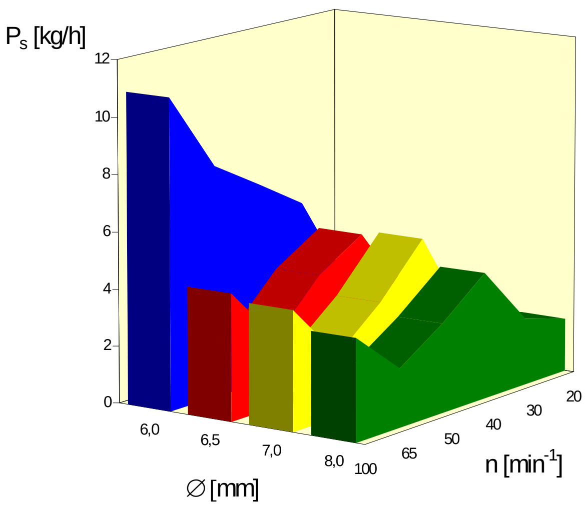

Diagram 2. The pressing output in the relations of the rpm of the screw-press and the diameters of the nozzles

Table 2 shows the relations of the rpm-s and the consumed electric power needs towards pressing.

Table 2 Relations of the rpm-s and electric power needs

rpm [min^{-1}]	Electric power needs [W] at Ø 6 mm	Electric power needs [W] at Ø 6.5 mm	Electric power needs [W] at Ø 7 mm	Electric power needs [W] at Ø 8 mm
20	703.00	638.40	638.40	638.40
30	718.20	638.40	801.80	801.80
40	801.80	801.80	801.80	801.80
50	961.40	1200.80	961.40	1041.20
65	1079.20	1440.20	1121.00	1041.20
100	1759.40	2078.60	1759.40	1759.40

We established the linear relations between the electric power needs and the rpm of pressing.

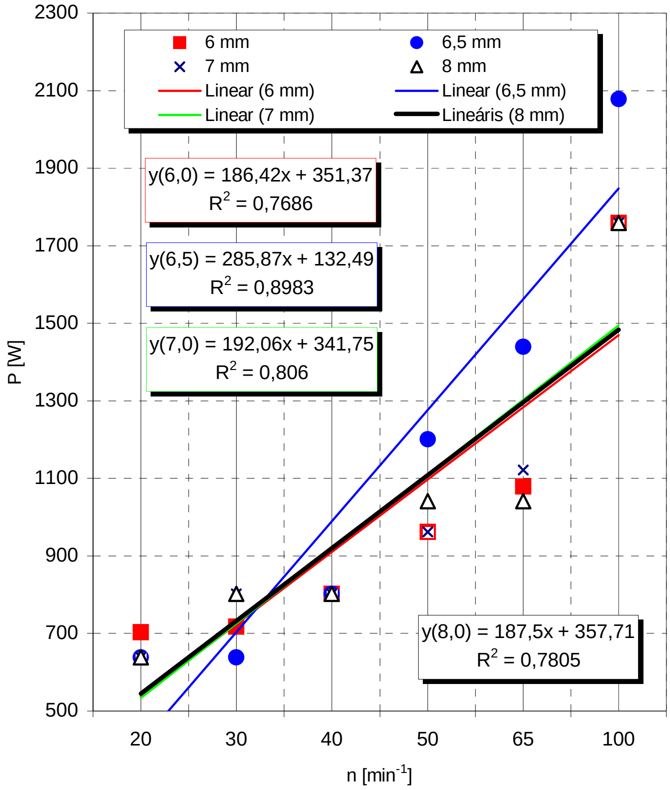

Diagram 3. The relations between the power needs and the rpm of pressing

Diagram 4 shows the formation of the amount of the obtained oil in the case of the applied nozzle diameters as a function of the rpm of the screw-press. It is clear enough to notice the assertion conformable to the literature, whereas the amount of the out-squeezed oil also increases with the rise of the rpm of the screw-press.

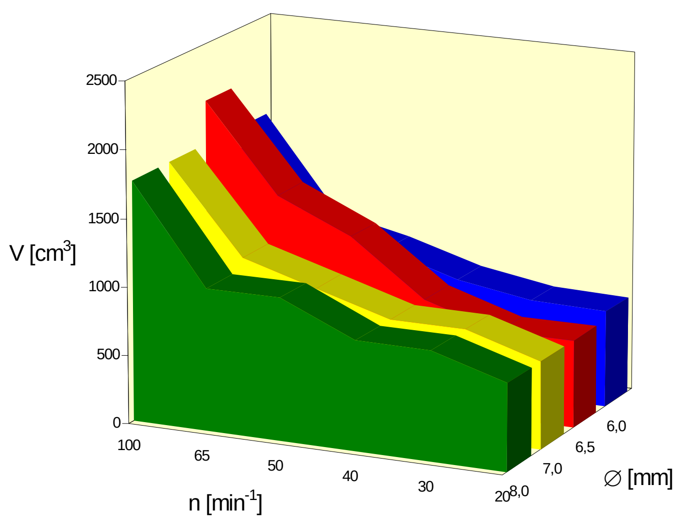

Diagram 4. The obtained oil quantity as a function of the rpm of the screw-press and the diameters of the nozzle

We were able to establish the curve of the second order to the relatively tight relations between the diameter of the nozzle and the obtained oil quantity. (diagram 5)

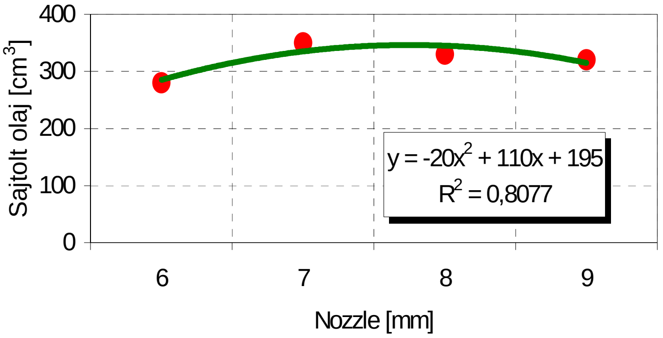

Diagram 5. The relations between the obtained oil quantity and the diameters of the nozzles

Tight conformable relations of the second degree can be discovered between the pressing power and the electric power needs of pressing, which diagrams 6-9 disclose.

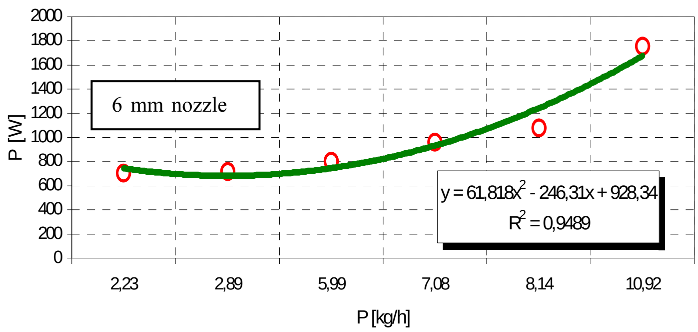

Diagram 6. The power needs of pressing and the pressing power at the nozzle of 6 mm diameter

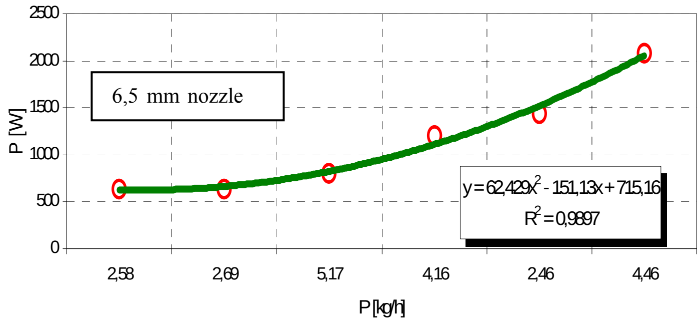

Diagram 7. The power needs of pressing and the pressing power at the nozzle of 6.5 mm diameter

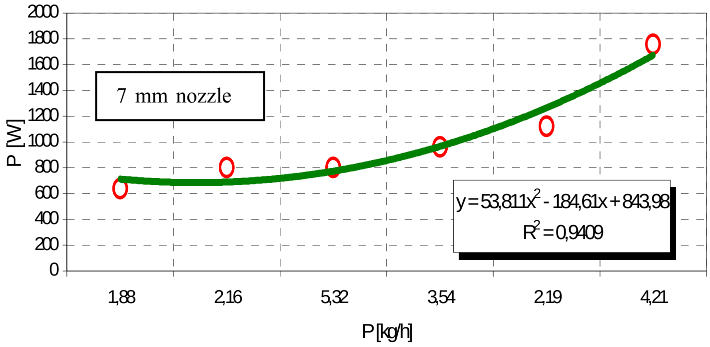

Diagram 8. The power needs of pressing and the pressing power at the nozzle of 7 mm diameter

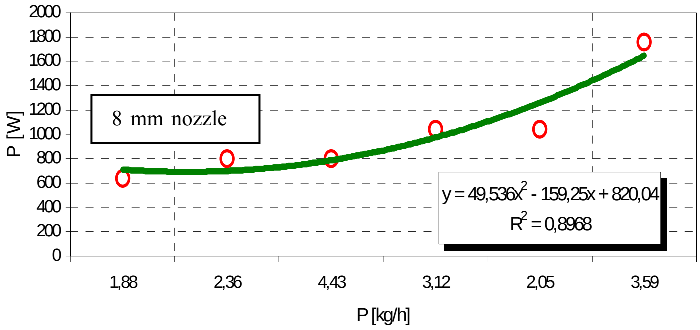

Diagram 9. The power needs of pressing and the pressing power at the nozzle of 8 mm diameter

CONCLUSION

Our first establishment was that there was no relation between the pressing power and the rpm of pressing.

On the basis of our further examinations we found relations that could be expressed with linear relations with extremely tight conformity between the power needs and the rpm of pressing.

The establishment – conformable to the literature – needed further confirmation that the quantity of the out-squeezing oil increases with rise in the rpm of the screw-press.

Subsequently, we explored the relation of the second degree with extremely tight connection between the diameters of the nozzle and the out-squeezed oil quantity.

Finally, we showed that the relations between the pressing power and the power needs of pressing can be expressed with functions of second degree.

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