UDC677.11.021

DETERMINING THE IMPACT OF INPUT RAW MATERIALS FACTORS ON INTENSITY OF RAW HEMP DECORTICATION

Klevtsov K.M., *Doctor of Technical Sciences, Docent*

HERSONNATIONALTECHNICALUNIVERSITY

The influence of humidity, density and duration of the processing load on the content of the fires, the linear density and the breaking load in the processes of raw hemp decortication.

The traditional scheme of mechanical processing of natural fibers has a significant draw back such as a beating in the process generates large amounts of waste beating which cleaning requires additional costs for their further processing [1].

The constructive features of decortications equipment are allowed easily to vary mode sof its work durong processing. Depending on the type of raw material: flax or hemp bast or stock.

The intensity of the action on the material during processing at AIT is much larger than the proposed drum decortication and conditions scutch removal of raw material vice versa more complex. Because of this raw material which has high humidity is cleared not enough. A sufficient degree of purification of fiber from scutch is achieved only when drying material to the minimum humidity. But the use of dryers leads to a significant increase in energy consumption [2], so research aimed at optimizing the energy intensity of the technological process of obtaining hemp fibers is actual.

According to the classical techniques of decortication of bast raw materials the research to determine the impact of different degree of stock humidity on the process of mechanical destruction between fiber and wood which effectiveness was evaluated by stock content index in received hemp fiber was conducted. For experiment it was used the stock which humidity indicators were 5,10 and 13%.

The results characterizing the stock content dependent are received after treatment in experimental drum decorticator hemp fiber from stock moisture shown in Fig. 1.

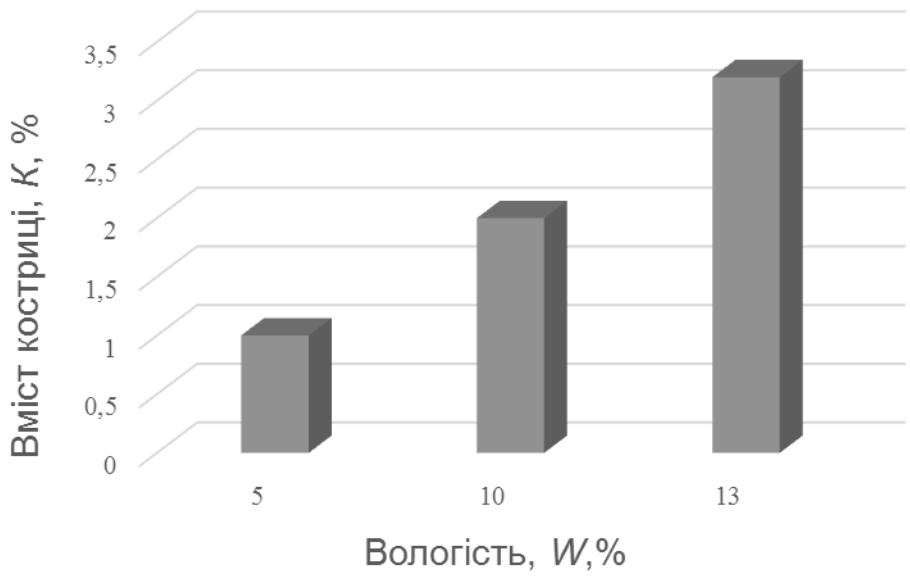

Fig. 1 *– Dependence scutch content in hemp fibre from stock moisture*

As shown in Fig. 1 with an increase in moisture stock the scutch content in fibre remains at the level prescribed by the state standard. However raising the humidity to 13% leads to a sharp increase of friction between the fibers, working bodies of equipment and scutch, thus dramatically increasing processing time of scutching stock and increases the percentage of defects.

Thus the application of the proposed technology becomes necessary preliminary drying stock to 8,7% moisture. Further reduction of humidity leads to additional power consumption which greatly influence on the efficiency of the process and cost of the resulting fibre. Further reduction of humidity leads to additional power consumption, which greatly affects the efficiency of the process and cost of the resulting fiber.

Impact of loading density of stock on the intensity of the process of scutch extraction in hemp fibre.

The density of the raw material load is determined by its mass per unit of volume of drum scutching section. Increased density load on existing MPA and CPA leads according to Smirnov N.N. and Kuznetsov H.K. [3] to insufficient making fibre from raw material and reduce efficiency of scutch extraction; the lower the density of the material, the better is the destruction of the link between fiber and wood. In our case, this ratio is largely dependent on the relative filling drum grinding balls =40%, which in turn is linked to the ratio /=1,2 and calculated (lowest) cylinder capacity drum $V = 3.18\ m^3$. With these technical characteristics of the drum and loading densities previously scutching hemp stock, its weight can vary from 50 to 100 kg.

During the studies on the process of scutch extraction on an experimental installation the dependence of scutch content remains in hemp fibre from density of load raw decortication drum was studied. The results are shown in Fig. 2.

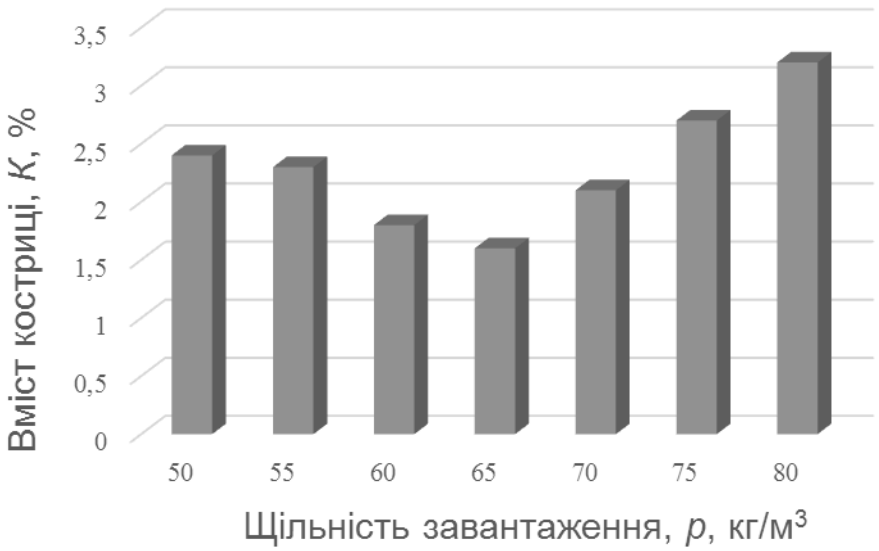

Fig. 2 *– Dependence scutch content in hemp fibre from loading density of stock.*

The data presented in the diagram in Fig. 2 show that with increasing density of load stock from 50 to 65 kg//m^{3}the efficiency of scutch removal becomes increasing, further increasing density of load leads to the opposite effects.

Effect of stock processing on linear density of hemp fiber indexes.

As a result of experimental investigations the optimum parameters of the pilot plant were determined which is part of the pilot production line for primary processing of bast fibers and most rational mode of processing that contribute to obtaining hemp fibers with desired final characteristics.

While research has been conducted the comparative analysis of linear density indexes of fibre from length of treatment received by an experimental technology from one party of hemp stock. According to the requirement of GOST 10379-76 “Scutched hemp. Technical terms” linear density indexes for 1st scutch variety should not vary more than 20÷50 tex.

The diagram in Fig. 3 shows the trend of change the linear density hemp fibre from length of processing.

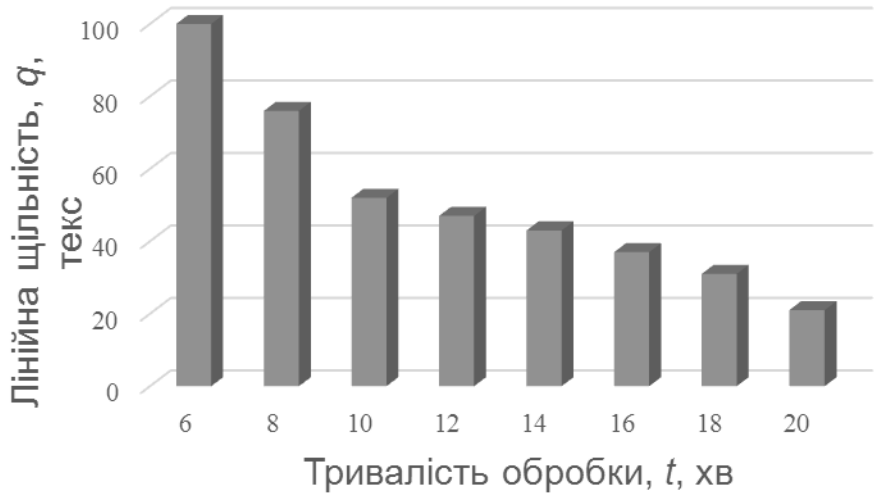

Fig. 3 *– The diagram of linear density changes on the duration of hemp fiber processing*

Analysis of the data presented in Fig. 3 shows that hemp fiber obtained by an experimental technology that meets current standards. Besides, the indexes of fiber linear density range from 20.4 to 98.7 tex which in tern proves the theory put forward by our ability to adjust the final parameters of hemp fiber by changing the technical parameters of the proposed installation.

Besides, thelinear density ofhemp fibre range from 20.4 to 98.7 tex which in turn proves the theory put forward by our ability to adjust the final parameters of hemp fiber by changing the technical parameters of the proposed installation.

The impact of hemp stock processing on indexes of hemp fibre breaking load.

The index of hemp fibre breaking load from processing on experimental technology are reduced depending on the increase in the duration of its processing. But this decrease is reduced to a lower value than after processing on KPAL or MTA. So as a result of prosessing on hemp tow aggregate breaking load decreases to 18.6 kgs and the processing of the experimental production line - only 7.4 kgs, so that the index of obtained fibre breaking load is 31.2 kg (Fig. 4).

Besides, after processing with an experimental production line there is a more even distribution of fibers on length intervals than the processing unit on hemp tow aggregate due to the influence of new mechanical action.

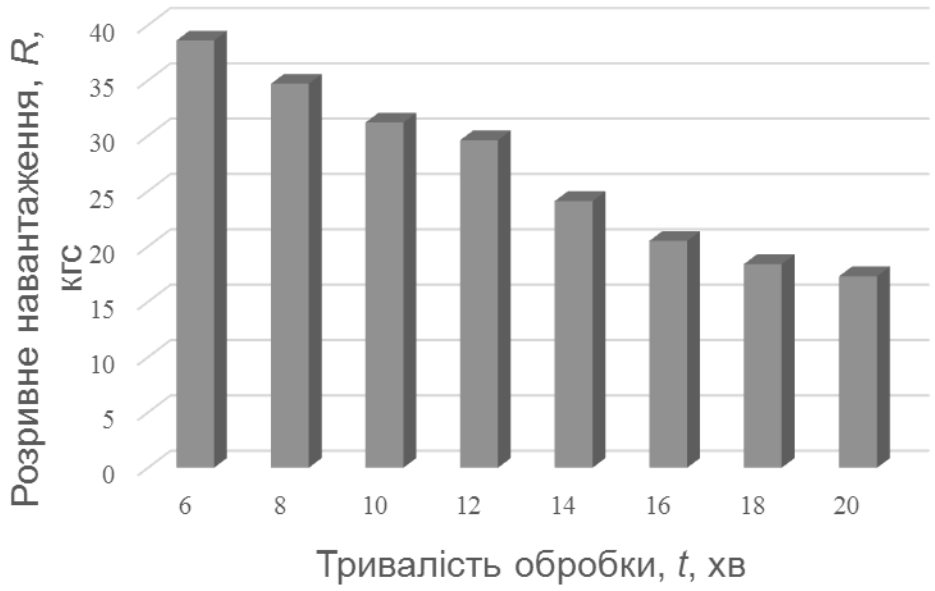

Fig. 4 *– The diagram of change of hemp fibre breaking load from duration of processing*

Thus the use of the proposed technology gives a high quality hemp fiber by reducing scutch content, preservation of strength fibers and reduce the degree of destruction compared to existing technologies.

According to experimental research conducted the optimal time of bast raw materials processing is 10-12 minutes. Given the fact that the process of mechanical scutch processing are continuous, hourly capacity of the experimental setup will be about 1020 kg / h.

1. *Сивцов А.Н.* Первичная обработка лубяных волокон/ А.Н. Сивцов. – М.: Гизлегпром, 1949. – 434 с.

2. *Клевцов К.Н.* Влияние параметров механического режима работы барабанных трепальных секций на качественные характеристики волокна / К.Н. Клевцов // Нове в селекції, генетиці, технології вирощування, збирання, переробки та стандартизації луб'яних культур: матеріали наук.-техн. конф. молодих вчених, 18 листопада 2003 р.: тези доп. – Глухів, 2004. – С. 77-82.

3. *Кузнецов Г.К.* Изменение массы слоя волокна в зоне трепания / Г.К. Кузнецов, В.И. Савиновский, Т.К. Лихачева // Технология текстильной промышленности. – 1984. – № 5. – С. 12-14.