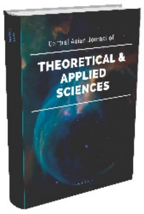

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Cotton Moisture Control Device

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Abstract: *A block diagram of an optoelectronic device for controlling the moisture content of raw cotton is presented. On the basis of the principle of operation of the proposed optoelectronic device lies a two-wave method in which the controlled object is irradiated with two antiphase rectangular pulse trains with wavelengths lying in the absorption maximum of the controlled component (measuring) and not in the absorption maximum of this component (reference).*

KeyWords: *optoelectronics, cotton moisture, control, absorption, emitting diode, photodetector, controlled object, reference radiation flux, measuring radiation flux, infrared range.*

Acceptance and technological processing of products of the agro-industrial complex involves technological processes such as drying, conditioning, humidification, pasteurization and storage [1-10].Among the parameters for monitoring and controlling technological processes, the most important parameter is humidity. For example, the moisture content of cotton is determined before picking heart cotton and during technological processing.

Improving the quality of materials obtained from raw cotton is possible with the correct organization of its storage and compliance with the optimal processing technology at all stages. Correct storage and choice of technological processing depend on the quality indicators of raw cotton, namely its moisture content. The currently used methods and devices for controlling the moisture content of raw cotton do not meet the requirements of expressiveness, although they have the required measurement accuracy.

In this regard, the control of cotton moisture is the most important task, the solution of which is necessary to ensure their quality.

Currently, many methods are known and automatic devices for continuous control of humidity have been developed on their basis. To measure the moisture content of raw cotton, the most widespread are conductometric, dielectric and microwave methods [1-10].

The undoubted advantage of these devices is their insignificant sensitivity to the physicochemical properties of the substances and materials under study. Further improvement of their metrological characteristics is associated with the transition from the middle and short-wave ranges to centimeter and millimeter. However, microwave moisture meters have not yet become widespread, which is, apparently, a consequence of the complexity and high cost of equipment.

The rapid development of optoelectronics and its elemental base, the creation of new highly efficient semiconductor radiation sources in the near infrared region of the spectrum create the prerequisites for the

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development of highly sensitive and accurate, reliable devices for controlling the humidity of various materials [11-23].

A block diagram of the devices developed by us for controlling the moisture content of raw cotton is shown in Fig. 1.

The controlled object CO is irradiated with two fluxes of radiation $\Phi_{0\lambda 1}$ and $\Phi_{0\lambda 2}$ at reference and measuring wavelengths, respectively.

For the reference channel, LEDs with a maximum emission spectrum λ_1=1,75 µm were used, and for the measuring channel - LEDs with a maximum emission spectrum λ2=1,94 µm.

The fluxes of radiation $\Phi_{\lambda 1}$ and Φ λ2 passed through the object are equal

$$\Phi_{\lambda 1} = \Phi_{0\lambda 1} e^{-k_1 m_1};$$
$$\Phi_{\lambda 2} = \Phi_{0\lambda 2} e^{-k_1 m_1} e^{-k_2 m_2};$$

where: m1- is the mass of the substance; m2 - moisture mass; k1 and k2 are absorption coefficients at wavelengths λ1 and λ2.

The flux at the reference wavelength changes in time according to the exponential law, i.e.

$$\Phi_{\lambda 1} = A e^{-t/\tau} e^{-k_1 m_1}$$

At the moment when the flows $\Phi_{\lambda 1}$ and $\Phi_{\lambda 2}$ are equal, we have

$$\Phi_{0\lambda 2} e^{-k_1 m_1} e^{-k_2 m_2} = A e^{-t_c/\tau} e^{-k_1 m_1};$$
$$\Phi_{0\lambda 2} e^{-k_2 m_2} = A e^{-t_c/\tau}$$

It follows from this expression that

$$m_2 = \frac{1}{k_2 \tau} t_c.$$

Where: t_c - time corresponding to the moment of comparison; τ is the exponential time constant.

The master generator of the MG produces a periodic sequence of pulses arriving at the input of the T1 trigger.

From the antiphase outputs of the latter, rectangular pulses are fed to the input of the frequency divider FD and to the pulse power supply unit PP.

The rectangular pulses in the exponential generator EG are exponentially modulated.

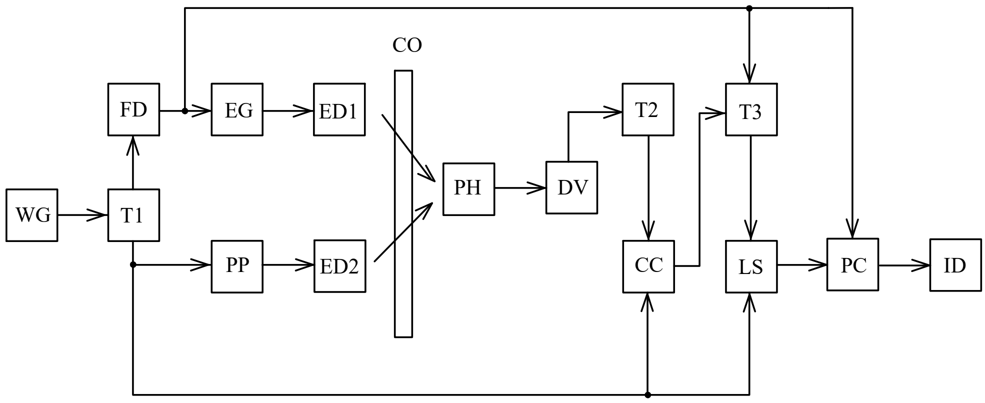

Fig. 1. Block diagram of a device for controlling the moisture content of raw cotton.

Through the emitters ED1 and ED2, connected to the outputs of the power supplies, currents flow, causing proportional fluxes of radiation at wavelengths and . We will assume that the dependence of the flux on the current is linear. This is typical for gallium arsenide emitting diodes.Otherwise, the current must be modulated so that, taking into account the nonlinearity of the radiation characteristic, the amplitude of the radiation pulses can also vary exponentially.

The fluxes passing through the controlled object at the reference and measuring wavelengths ( ) are summed up and fall on the photosensitive surface of the photodetector PH.

Next, the photoelectric signal is fed to the input of the differentiating device DV,from the output of which it enters the input of the trigger T2, and then - to one of the inputs of the coincidence logic circuit CC, to the other input of the latter, a signal is sent from the output of the trigger T1.

When the phase of the total flow and, therefore, the photoelectric signal changes, a signal appears at the output of the CC coincidence logic circuit, which is fed to the input of the T3 trigger with separate inputs.

This trigger operates and remains in this position as long as from the functional pulse power supply unitthe "Reset" signal is not received (start of exponential impulse).

Since the T3 trigger is cocked and the "Disable" signal from its output is fed to the input of the logical key circuit of the LS, then through the last pulses to the input of the pulse counter PC of the are not received.[24-30]

From the moment the next exponentially -modulated signal starts, the T3 trigger is reset and through the LS logic circuit the counting pulses coming from the T3 trigger are fed to the input of the pulse counter PC.

As soon as the phase of the total photoelectric signal changes, the T3 flip-flop closes the LS logic circuit and the counting stops.

At the end of the exponentially - modulated signal from the EG unit, the "Reset" signal is sent to the counter of pulses of the and the counter is prepared for the next cycle.

Thus, according to the number of pulses recorded in the counter, it is possible to determine the value of humidity that is displayed on the ID indicator.

The proposed device allows to improve the accuracy and reliability of measurements and to present the output information in a discrete (digital) form.

References

1. Машарипов Ш.М. Анализ современных методов и технических средств измерения влажности хлопковых материалов // Приборы. 2016. № 4. С. 31-37.
2. Mamasodikov Y., Qipchaqova G. M. Optical and radiation techniques operational control of the cocoon and their evaluation //Academicia: An International Multidisciplinary Research Journal. – 2020. – Т. 10. – №. 5. – с. 1581-1590.
3. Mamasadikov Y., Mamasadikova Z. Y. Optoelectronic device for remote control of hydrocarbon concentration in air //Scientific-technical journal. – 2020. – Т. 3. – №. 6. – с. 3-7.
4. Мамасадиков Ю. М. Оптоэлектронный двухволновый метод для дистанционного газового анализа //Современные технологии в нефтегазовом деле-2018. – 2018. – с. 158-160.
5. Мусаев Э. С., Бутаев Т. Б., Мамасадыков Ю. Устройство для удаления коконов-глухарей. – 1988.
6. Мухитдинов М. и др. Устройство для определения содержания одного вещества в другом. – 1983.
7. Мамасадиков Ю., Мамасадикова З.Ю. Разработка принципиальной схемы оптоэлектронного устройства для контроля концентрации углеводородов в воздухе // Universum: технические науки : электрон.научн. журн. 2021. 11(92).
8. Мамасадиков Ю., Мамасадикова З.Ю. Оптоэлектронное устройство для контроля концентрации углеводородов в воздухе на полупроводниковых излучающих диодах // Universum: технические науки : электрон.научн. журн. 2021. 10(91).
9. Мамасадиков Ю., Алихонов Э.Ж. Оптоэлектронное устройство для контроля линейной плотности хлопковых лент с функциональной разветкой // Universum: технические науки : электрон.научн. журн. 2021. 10(91).
10. Кулдашов О. Х., Кулдашов Г. О., Мамасодикова З. Ю. Оптоэлектронный двухволновой метод дистанционного контроля влажности растительного волокна //Вестник Московского государственного технического университета им. НЭ Баумана. Серия «Приборостроение». – 2019. – №. 4 (127).
11. Кулдашов О. Х., Кулдашов Г. О., Мамасодикова З. Ю. Инфракрасный датчик для дистанционного контроля влажности хлопка-сырца //Оптический журнал. – 2019. – Т. 86. – №. 6. – с. 77-80.
12. Стоянов Н.Д., Журтанов Б.Е., Астахова А.П., Именков А.Н., Яковлев Ю.П. Высокоэффективные светодиоды спектрального диапазона 1,6−2,4 мкм для медицинской диагностики и экологического мониторинга // ФТП. 2003. Т. 37. Вып. 8. С.996–1009.
13. Мухитдинов М. Оптические методы и устройства контроля влажности. М.: Энергоатомиздат, 1986. 96 с.
14. Якушенков Ю.Г. Теория и расчет оптико-электронных приборов. -М.: Машиностроение, 1989. - 360 с.
15. Kuldashov O. K., Kuldashov G. O., Mamasodikova Z. Y. Infrared sensor for remote monitoring of moisture content in raw cotton //Journal of Optical Technology. – 2019. – Т. 86. – №. 6. – с. 390-393.
16. Мамасодикова Н. Ю. Разработка алгоритма аналитического контроля технологических параметров динамических объектов //Известия Юго-Западного государственного университета.

Серия: Управление, вычислительная техника, информатика. Медицинское приборостроение. – 2019. – Т. 9. – №. 4. – с. 153-162.

17. Мамасодикова Н. Ю., Мирзаахмедова Х. Б. Система аналитического контроля параметров технологических агрегатов нефтехимических производств //Наука. Образование. Техника. – 2020. – №. 1. – с. 15-22.
18. Ergashev S. F., Kuldashov O. K., Mamasodikova U. Y. Optoelectronic device for remote temperature monitoring of the components of solar engineering facilities //Applied Solar Energy. – 2007. – Т. 43. – №. 2. – с. 68.
19. Siddikov I. X. et al. Formalization of the task of monitoring the technological safety of industrial facilities in conditions of indistinctness of the initial information //Journal of Physics: Conference Series. – IOP Publishing, 2020. – Т. 1679. – №. 3. – с. 032022.
20. Mamasadikova Z. Y. Optoelectronic devices for controlling the concentration of hydrocarbons in air with exponential scan //Academicia: An International Multidisciplinary Research Journal. – 2020. – Т. 10. – №. 11. – с. 1328-1333.
21. Obidov J. G., Alixonov E. J. Organization of the education process based on a credit system, advantages and prospects //Academicia: An International Multidisciplinary Research Journal. – 2021. – Т. 11. – №. 4. – с. 1149-1155.
22. Алихонов Э.Ж. Определение линейной плотности хлопковые ленты фотоэлектрическим методом // Universum: технические науки : электрон.научн. журн. 2021. 11(92).
23. Alikhonov, E. J. Determination of linear density of cotton ribbons by photoelectric method//Science and Education. – 2021. – Т. 2. – №. 11. – с. 461-467.
24. Jamoldinovich A. E. The importance of metrology and standardization today AlikhonovElmurod //International scientific and technical journal “innovation technical and technology”. – 2020. – Т. 1. – №. 4. – с. 1-3.
25. Маликов, З. М., and М. Э. Мадалиев. "Численное моделирование течения в плоском внезапно расширяющемся канале на основе новой двужидкостной модели турбулентности." *Вестник Московского государственного технического университета им. НЭ Баумана. Серия Естественные науки* 4 (2021): 24-39.
26. ABDULKHAEV, Z. E. (2021). Protection of Fergana City from Groundwater. Euro Afro Studies International Journal, 6, 70-81.
27. ЙулдашевХ. Т. и др. Исследование процессов токового усиления в системе полупроводник-газо разрядный промежуток //Oriental renaissance: Innovative, educational, natural and social sciences. – 2021. – Т. 1. – №. 10. – с. 114-123.
28. U.S. Rustamov. идр. Farg‘ona viloyati aholisini elektrenergiyasi tanqisligini bartaraf etishda Mikro-GESlardan foydalanish //Orientalrenaissance: Innovative, educational, natural and social sciences. – 2021. – Т. 1. – №. 11. – с. 114-123.
29. Abdurakhmanov A. A. et al. The optimization of the optical-geometric characteristics of mirror concentrating systems //Applied Solar Energy. – 2014. – Т. 50. – №. 4. – С. 244-251.
30. Мадрахимов, М. М., & Абдулҳаев, З. Э. (2019). Насос агрегатини ишга туширишда босимли сув узатгичлардаги ўтиш жараёнларини ҳисоблаш усуллари. Фарғона Политехника Институти Илмий–Техника Журнали, 23(3), 56-60.

31. Klychev S. I., Abdurakhmanov A. A., Kuchkarov A. A. Optical-geometric parameters of a linear Fresnel mirror with flat facets //Applied Solar Energy. – 2014. – Т. 50. – №. 3. – С. 168-170.
32. Madraximov, M. M., Abdulxayev, Z. E., Yunusaliev, E. M., & Akramov, A. A. (2020). Suyuqlik Va Gaz Mexanikasi Fanidan Masalalar To'plami. Oliy o 'quv yurtlari talabalari uchun o 'quv qo 'llanma.-Farg'ona, 285-291.
33. Usarov, M., G. Mamatisaev, J. Yarashov, and E. Toshmatov. "Non-stationary oscillations of a box-like structure of a building." In *Journal of Physics: Conference Series*, vol. 1425, no. 1, p. 012003. IOP Publishing, 2019.
34. Kuchkarov A. A. et al. Calculation of thermal and exergy efficiency of solar power units with linear radiation concentrators //Applied Solar Energy. – 2020. – Т. 56. – С. 42-46.
35. Мадрахимов, М. М., З. Э. Абдулҳаев, and Н. Э. Ташпулатов. "Фарғона Шаҳар Ер Ости Сизот Сувлари Сатҳини Пасайтириш." *Фарғона Политехника Институти Илмий–Техника Журнали* 23, no. 1 (2019): 54-58.
36. Kuchkarov A. A. et al. Optical energy characteristics of the optimal module of a solar composite parabolic-cylindrical plant //Applied Solar Energy. – 2018. – Т. 54. – №. 4. – С. 293-296.
37. Akbarov R. Y., Kuchkarov A. A. Modeling and Calculation of Optical-Geometric Characteristics of a Solar Concentrator with Flat Fresnel Mirrors //Applied Solar Energy. – 2018. – Т. 54. – №. 3. – С. 183-188.
38. Z.E. Abdulkhaev, M.M. Madraximov, A.M. Sattorov (2020). Calculation Of The Efficiency Of Magnetohydrodynamic Pumps. SCIENTIFIC –TECHNICAL JOURNAL of FerPI, 24(1), 42-47.
39. Абдукаримов, Б. А., О. А. Муминов, and Ш. Р. Утбосаров. "Оптимизация рабочих параметров плоского солнечного воздушного обогревателя." In *Приоритетные направления инновационной деятельности в промышленности*, pp. 8-11. 2020.

