Tursunov, J Textile Sci Eng 2017, 7:1
DOI: 10.4172/2165-8064.1000285

Journal of Textile Science & Engineering

ISSN: 2165-8064

Research Article | Open Access

Study of the Dynamics of Cotton Seeds Movement under the Influence of Air Flow

Tursunov AY*

Ph.D., at Namangan Institute of Engineering and Technology, Uzbekistan

Abstract

It is known that to increase the cotton yield, getting the qualified fibre and other products depends on the preparation of cotton seed. After accepting the cotton harvest at the plant, it is initially dried up, cleaned from small and large demons and after it goes through a machine for separating cotton from its seeds. During the process of separating from its fibre seeds lose their natural quality. Prepared for planting cotton seeds under the main governmental standard UzDST663-2006/1/ and their growth depends on the degree of contamination and mechanical damage. In general, by separating the seeds with different mixes, not fully ginned and do not meet the standard of filament it is possible to prepare quality seeds.

Keywords: Selecting seeds; Optimal; Surfaces factions; Aerodynamic resistance; Planting cotton; Characteristics of seeds

Introduction

Increasing the cotton harvest depends on the techniques of selection and preparation of the seeds of the same degree of ripe seeds in terms of biological factors. It was observed that cotton harvest was up to 20% low due to not duly selected crop seeds, a reduction of crop up to 30% due to selecting unripe seeds /2/. An effective screening technology for creating aggregate production is one of the most important issues of today. There are the following methods of selecting seeds of cotton at cotton plants:

a) With the help of different net surfaced mechanical equipment

b) In a Streamlined way

As it is known, the seeds selected by the net surfaced mechanical equipment seeds mesh on the net surfaces factions will not be enough due to the clogging and damaging of the seeds. When we use vertical /3/ air flow for selecting seeds the energy consumption is high. And preparing the equipment and ensuring the device for a continuous process certain challenges.

So, based on the above issues come out the following procedures to be resolved

- Optimal selection of seeds taking into consideration the geometric measurements, physical-mechanical and biological properties of new device
- Learn fully the laws of seed movement in the new device's chamber;
- According to the structural parameters of the devices, achieve its continuous performance and process efficiency

Taking into consideration of above mentioned, the parameters of seed selection by fractions was theoretically researched in this article. Movement equations and mathematical model of cotton seed moving under the influence of air flow was done by the MAPLE program [1-5].

Mathematical analyze

In compiling the equation of Cartesian coordinate system OX axis OU dynamics of seeds movement which can be expressed by using Newton's II law and we can get the following:

$$\begin{Bmatrix} m\bar{x}_1 = c(\upsilon_{ox} - \dot{x}_1) \\ m\bar{y}_1 = c(\upsilon_{oy} - \dot{y}_1) + mg \end{Bmatrix} \quad (1)$$

Where: m-mass of seeds; V,ox woy are initial speed of air flow according to the V,ox woy arrows of speed. C: air flow coefficient of aerodynamic resistance to the movement of seeds.

(1) We divide the both sides of the equation by m and we get the following:

$$\begin{Bmatrix} \bar{x}_1 = \lambda(\upsilon_{ox} - \dot{x}_1) \\ \bar{y}_1 = \lambda(\upsilon_{oy} - \dot{y}_1) \end{Bmatrix} \quad (2)$$

Here:

$$\begin{Bmatrix} \dot{x}_1 = \upsilon_{1x}\bar{x}_1 = \dfrac{d\upsilon_{1x}}{dt} \\ \dot{y}_1 = \upsilon_{1x}\bar{y}_1 = \dfrac{d\upsilon_{1y}}{dt} \end{Bmatrix} \quad (3)$$

λ=c/m is flying coefficient which depends to the level of hairiness, and it was ascertained by the results of experiments

$$\begin{Bmatrix} \dfrac{d\upsilon_{1x}}{dt} = \lambda(\upsilon_{ox} - x_1) \\ \dfrac{d\upsilon_{1y}}{dt} = \lambda(\upsilon_{oy} - y_1) \end{Bmatrix} \quad (4)$$

We put the second formula (2) x=v1x instead of x1 of the first formula and we get the following equation:

$$\int [\![(d\upsilon_{\downarrow}1x)/(\upsilon_{\downarrow}0x - \upsilon_{\downarrow}1x) = \int [\![\lambda dt = \ln|\upsilon_{\downarrow}0x - \upsilon_{\downarrow}1x - || \lambda t + \ln c - |]\!] \quad (5)$$

***Corresponding author:** Tursunov AY, Ph.D. in Namangan Institute of Engineering and Technology, Uzbekistan; Tel no: +998 (369) 232 5493; E-mail: tursunovabdirasul@gmail.com

Received January 20, 2017; **Accepted** February 20, 2017; **Published** February 27, 2017

Citation: Tursunov AY (2017) Study of the Dynamics of Cotton Seeds Movement under the Influence of Air Flow. J Textile Sci Eng 6: 285. doi: 10.4172/2165-8064.1000285

Find the 4-formula

$$\frac{\ln C}{\upsilon_{ox} - x_I = \lambda t}$$

We heighten derived equation to *e* degree and get the following:

$$e^{\lambda t} = \frac{C}{\upsilon_{ox} - \upsilon_{Ix}} \quad (5)$$

$$\text{ёки } \upsilon_{ox} - \upsilon_{Ix} = Ce^{-\lambda t}$$

When t=0 (5) formula will be the following:

$$\upsilon_{ox} - \upsilon_{Ix} = C \quad (6)$$

$$\upsilon_{ox} - \upsilon_{Ix} = Ce^{-\lambda t}$$

We put the expression instead of **c** and we get the following result:

$$\upsilon_{ox} - \upsilon_{Ix} = (\upsilon_{ox} - \upsilon_{Ix})e^{-\lambda t} \quad (7)$$

$$\upsilon_{Ix} = \upsilon_{ox} - (\upsilon_{ox} - \upsilon_{xn})e^{-\lambda t} \quad (8)$$

$$\upsilon_{Iy} = \upsilon_{oy} - (\upsilon_{oy} - \upsilon_{yn})e^{-\lambda t} \quad (9)$$

$t=0.\ x_I=0$

We write the formula as follows:

$$X_1 = \upsilon_{ox}t - (\upsilon_{ox} - \upsilon_{(xn)(1-)e}^{-\lambda t}) * \frac{1}{\lambda} \quad (10)$$

$$y_1 = \upsilon_{oy}t - \frac{(\upsilon_{ox} - \upsilon_{(yn)(1-)e}^{-\lambda t})}{\lambda} + h \quad (11)$$

In the selection process seed's level of hairiness is one of the main characteristics of seeds. The following table shows seed's flying distance depending on the seed's level of hairiness, as well as values of a given air flow rate to working camera [6-10].

In the Table 1 shown the seeds coefficient of aerodynamic resistance that characterizes λ, in λ=3,5,7,9,11 in the horizontal direction corresponding to the value of x (m) values. The air flow velocity V_0=4 m/s, by the increase of the level of hairiness seeds are separated from the air stream from 0.05 to 0.7 mm in the horizontal direction of the camera. The time of the seed flow makes from 0.1 c to 0.7 c by the increase of λ coefficient. The speed of the seeds' flow in the horizontal direction makes t=3c, stabilized V_0=1.3 m/c [11-15].

λ \ №	x,м	y,м	t_0, c	y(const)	x, m	v_x(t),m/c
3	0.05	0.3	0.1	0.3 m	0.3<t	1.3
5	0.1	0.3	0.3	0.3 m	0.3<t	1.3
7	0.3	0.3	0.4	0.3 m	0.3<t	1.3
9	0.5	0.3	0.5	0.3 m	0.3<t	1.3
11	0.7	0.3	0.7	0.3 m	0.3<t	1.3

Table 1: Here: v_0 =4м/c. is seed's flying distance depending on the speed and coefficient of aerodynamic resistance.

λ \ №	x,м	y,м	t_0, c	y(const)	x, m	v_x(t),m/c
3	0.1	0.3	0.1	0.3 m	t>0.2	1.4
5	0.3	0.3	0.3	0.3 m	t>0.3	1.4
7	0.41	0.3	0.42	0.3 m	t>0.4	1.4
9	0.79	0.3	0.61	0.3 m	t>0.5	1.4
11	1.2	0.3	0.9	0.3 m	t>0.6	1.4

Table 2: Here: v_0 =5м/c is seed's flying distance depending on the speed and coefficient of aerodynamic resistance.

λ \ №	x,м	y,м	t_0, c	y(const)	x, m	v_x(t),m/c
3	0.1	0.3	0.1	x>1	1.6	1.4
5	0.2	0.3	0.3	x>0.8	1.6	1.4
7	0.6	0.3	0.5	x>0.6	1.6	1.4
9	1.2	0.3	0.8	x>0.3	1.6	1.4
11	1.8	0.3	2	x>0.2	1.6	1.4

Table 3: Here v_0=6м/c is seed's flying distance depending on the speed and coefficient of aerodynamic resistance.

λ \ №	x,м	y(const)=v(0.3)	y(const)=v	t.c	x, m	v_x, *m/c*
5	0.1					
7	0.2	0.3	1.3	0.32	0.6<	1.5
9	0.5	0.3	1.3	0.4	0.8<	2.5
11	0.72	0.3	1.3	0.45	1<	2.7
13	1.2	0.3	1.3	0.5	1.2<	3.2

Table 4: Here: λ=4 is seed's flying distance depending on the speed and coefficient of aerodynamic resistance.

The above process, When the speed of the air flow $V_{0=}$5 m/s, V_0=6 m/s was tested (Tables 2 and 3), seeds' flying distance in the horizontal direction increased by the increase of air flow rate. At V_0=5 m/s, λ=3 shows that x=0,1 λ=11 of x=1.2 m; V_0=6 m/s, l=3 shows that x=0.1 m x=11, x=1.8 m long. In this case, the seeds speed is accordingly speed is V_0=4 m /sec, and V_0=1.6 mm /sec.

In Table 4 shows the numbers that when the hairiness of seed is λ=4 its flying distance is from V_0=5,7,9,11,13 m/sm/s. That is, V_0=5 m/s. and flight speed is also growing accordingly i.e., V_0=5 m/s v=1.3 m/s V_0=13 m/s at V_0=3.2 mm/sec.

Conclusion

This article explains the mechanism of selecting seeds depending on their level of hairiness.

Table 4 shows that when the level of hairiness of seeds is high the distance of their flight is also longer.

There was created the possibility of choosing the distance for placing the seeds according to the factions of hairiness in the working chamber. When the air flow is v_0=5 м/c it is possible to take the optimal distance of placing the pockets as follows 0.1 м, 0.3, 0.4, 0.8, 1.2 м according to the level of hairiness of seeds.

References

1. Miroshnechenko GI (1972) Bases of Designing of Machines of Primary Processing of Cotton. Book Theory of Ginning Machine, Moscow.
2. Sorokin NS (1970) Aspiration of machines and pneumatic transporting in textile industry, Moscow: 5-10.
3. Ahmedhodzhaev HT, Karimov AI, Tursunov A (2016) Researches of the movement of cotton seeds in the two chamber sorter under the influence of horizontal air flow, Tashkent. Journal of Problems of Mechanics: 54-57
4. Ahmedxodjaev HT, Tursunov A (2000) Pneumatic separator for the selection of cotton seeds Scientific and technical. Journal of Cotton and Grain 2: 30-32.
5. Ahmedxodjaev HT, Tursunov A, Karimov A (2001) Study of move of the seeds in the variable horizontal aerodynamic device. Problems of Mechanics, Tashkent: 56-57.
6. Mamamtovich AS (2016) Analysis of the Influence of Geometric Characteristics of the Saw and the Gasket of Saw Gin on the Life of Saw at Different Distances between the Saw. Journal of Textile Science Engineering 6: 256.
7. Mamatovich AS, Abdusamat K (2011) Definition of Increasing the Fibre

Capturing Surface of Saw Teeth of Cotton Ginning Machine through Mathematic Modelling. World Journal of Mechanics 1: 122-126.

8. Mamatovich AS, Abdusamat K, Arras P (2013) The Mathematical Simulation of Brush Drums in a Dual Saw Cylinder Chamber Gin for the Purpose of Increasing the Quantity of Captured Cotton Fiber from Saw. World Journal of Mechanics 3: 58-61.
9. Pancoast D (2013) SolidWorks, Concord, Massachusetts, USA.
10. Mardonov B, Ahmedxodjaev HT, Tursunov A, Karimov A (2012) Study of cotton seeds movement under the horizontal air flow influence. Textile problems Magazine, Tashkent: 43-45.
11. Ahmedxodjaev HT, Tursunov A (2012) Theoretic study of cotton seeds movement change in the proportional pneumatic separator 2 Ferghana -2012 scientific and technical magazine: 28-33.
12. Goran Duduković, Milutin Ogrizović- The advantages of inteligent approach to machining presented through processing technology design developed by I-machining. Journal of Applied Engineering Science 11(2013)4 215, 266. 209-215.
13. Mamamtovich, ASh and Axmedhodjaev XT 2015 Theoretical Analysis of Gin Cylinder for Simulating Dual Saw Cylinder Chamber Gin for Increasing Wear proof, Energy Efficient, Saving Resources.
14. Stanisavljev S, Ćoćkalo D, Đorđević D, Minovski R (2013) The Production Cycle Time in Serial Production: Reduction of the Duration in Metal Processing Industry Case. Journal of Applied Engineering Science (Istraživanjaiprojektova njazaprivredu) 11: 116-122.
15. Abdusamat K, Mamatovich AS, Muhammadziyo I (2014) Mathematical Modeling Of the Technological Processes Original Processing Of Cotton. International Journal of Innovation and Applied Studies 6: 28-39.