EduVision: Journal of Innovations in Pedagogy and Educational Advancements
Volume 01, Issue 08, August, 2025
brightmindpublishing.com
ISSN (E): 3061-6972

PRINCIPLES OF LIQUID PRESSURE EFFECT ON THE COCOON SHELL

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Abstract
In this work, the force of the hydrostatic pressure of the liquid on the shell of the cocoon during the steaming of the cocoon in a universal vacuum cocoon steamer is theoretically studied. Since the cocoon consists of a curved surface, the effect of fluid pressure on the curved surfaces is also determined. Equations are also presented for finding the pressure force itself through the horizontal and vertical components of the pressure applied to a curved surface.

Keywords: Liquid, pressure, cocoon, curved surface, cocoon shells, steaming, raw silk, hydrostatic pressure force, horizontal organizer, vertical organizer, elementary surface.

Introduction

The demand for silk fiber, which is an expensive textile raw material, is increasing every year. The production of high-quality raw silk that meets the requirements of world standards is inextricably linked with the technological processes of growing cocoons, pre-treatment of cocoons, and preparation of cocoons for unwinding.
The technological processes of preparing the cocoon for unwinding mainly consist of the technological processes of sorting dry cocoons, steaming and finding the end of a single silk thread, among these processes, especially the technological process of cocoon steaming is one of the important technological processes.

II. LITERATURE SURVEY

In the technological process of cocoon steaming, the better the cocoon shell is steamed, the better the surface of the cocoon shell is washed, the better the loops are formed, which are formed by the silkworm in the process of wrapping the cocoon, the better the places where the silk threads adhere to each other, and the sericin substance on the surface of the silk thread melts and softens for an even wash.

To determine the strength of the hydrostatic pressure of the liquid during steaming cocoons in a universal vacuum steaming device for steaming cocoons, the following theoretical studies were carried out.

Since the cocoon shell consists of a curved surface, to determine the effect of the hydrostatic pressure of the liquid on the cocoon shell in the process of preparing the cocoon for unwinding, that is, steaming, we used the scheme shown in Fig. 1 (see Fig. 1).

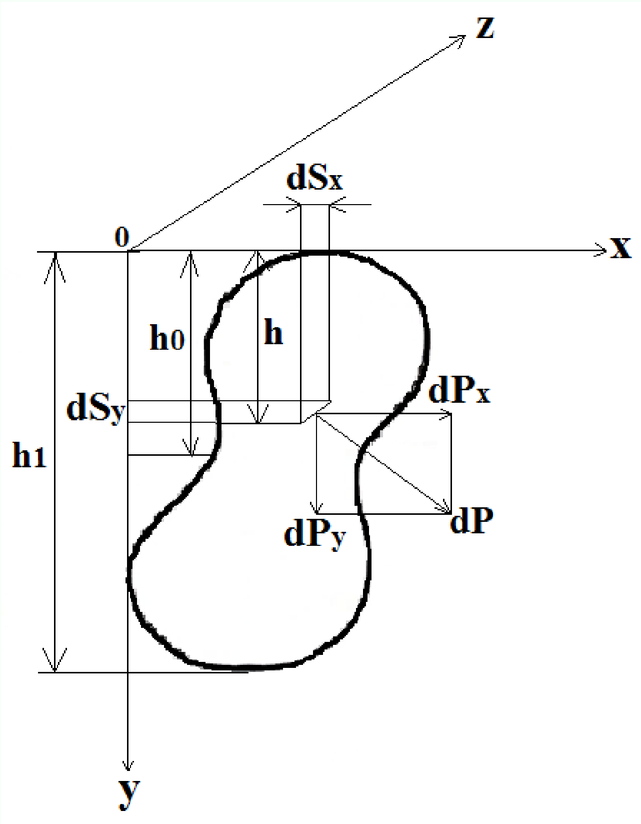

Figure 1. Hydrostatic pressure force acting on the curvilinear surface of the cocoon shell during the process of cocoon steaming.

III. RESEARCH METHOD

It is known that the fluid pressure force acting on a curved surface is the sum of the reduction pressure and hydrostatic pressure forces on the free surface and was expressed by the following formula:

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$$p = p_u + p_0 \qquad (1)$$

Where: P- is the pressure force acting on a curved surface,
P_u – restorative compressive strength,
P_0 – is the pressure force on the free surface.

To determine the force of the hydrostatic pressure of the liquid on the cocoon shell, a small surface dS was identified on the curvilinear surface of the cocoon shell. We have directed the coordinate axes as shown in the figure. Then the force of hydrostatic pressure of the cocoon on the small surface will have projections dP, dPx and dPy. The projections of the surface dS onto the planes xOz and yOz are equal to dSx and dSy. The force of hydrostatic pressure of a liquid falling on a small surface is expressed as:

$$dP = \gamma h dS.$$

where: dP is - the pressure on a small surface,
γ h - is the pressure of the liquid column,
dS - is a small elementary surface.

And his horizontal organizer:

$$dP_x = dP\cos\alpha = \gamma h dS\cos\alpha$$

Here: dP_x - is the horizontal component of pressure on a small surface,
dPcosa - dP - cosine of the angle between the OX axis of the force,
dScosa - is the cosine of the angle between the OX axis of the element surface.

On the other side $dScos\alpha = dS_y$ for being

$$dP_x = \gamma h dS_y.$$

Here: dS_y –dS is the projection of the elementary surface onto the yOz axis.

IV. THE OBTAINED RESULTS

To find the projection of the total pressure acting on the curved surface, we take the integral over the surface Sy:

$$P_x = \int_{(S_y)} \gamma h dS_y = \gamma \int_{(S_y)} h dS_y, \qquad (2)$$

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but $\int\limits_{(S_e)} hdS_y - S_y$ is the static moment of the surface O z about the axis.

That's why

$$\int\limits_{(Sy)} hdS_y = S_y h_0,$$

Here: Sy- is the projection of the curved surface onto the yOz axis;

H_0–S_y – depth of the center of gravity of the surface; $h_0 = \frac{h_1}{2}$. In this way, the horizontal component pressure on the curved surface is calculated according to the following formula:

$$P_x = \gamma S_y h_0. \qquad (3)$$

This formula is similar to the formula for calculating the hydrostatic pressure force of a liquid falling on flat surfaces, and differs from it only in that the surface Sy is a projection of a curved surface onto the plane yOz.

Now let's find the vertical component of the pressure acting on the curved surface (see figure 1).

$$dP_y = dP \sin\alpha = \gamma h dS \sin\alpha,$$

Here: dPsinα −dP sine of the angle between the force and the x-axis,
but $dSsin\alpha = dS_x$ for being

$$dP_y = \gamma h dS_x.$$

Find P_y by integrating:

$$P_y = \int\limits_{(Sx)} \gamma h dS_x = \gamma \int\limits_{(S_1 x)} hdS_x = \gamma W,$$

Here: $W = \int\limits_{S(x)} hdS_x$ – a curved surface consists of a volume between the vertical and free surfaces on its boundary and is called a pressing body.

V. CONCLUSIONS

Thus, the vertical component of the pressure acting on a curved surface is equal to the product of the volume of the pressing body and the specific gravity of the liquid, i.e.

$$P_y = \gamma W. \qquad (4)$$

It can be found through the horizontal and vertical components of the pressure on the curved surface:

$$P = \sqrt{P_x^2 + P_y^2}. \qquad (5)$$

So, the pressure on a curved surface is equal to the root of the sum of the squares of its components Px and Py [9]. The direction of pressure on a curved surface is determined by the following formulas:

$$\cos\alpha = \frac{P_x}{p} \quad \text{or} \quad \sin\alpha = \frac{P_y}{p} \quad \text{or} \quad tg\alpha = \frac{P_y}{P_x}.$$

The point of application of force is found graphically. It is located at the point of intersection of the curved surface with the direction of the force.

REFERENCES

1. Рахимов А. Ю., Рахимов А. А., Қодиров З. ПИЛЛАНИ ПИШИБ ЕТИЛГАНЛИК ДАРАЖАСИНИ СИФАТ КЎРСАТКИЧЛАРИГА ТАЪСИРИ //Academic research in educational sciences. – 2021. – Т. 2. – №. 11. – С. 33-41.
2. Қодиров З. А., Парпиев С. Ф. ПИЛЛАГА ДАСТЛАБКИ ИШЛОВ БЕРИШ ТЕХНОЛОГИЯЛАРИНИНГ ПИЛЛА СИФАТИГА ТАЪСИРИ //Academic research in educational sciences. – 2022. – Т. 3. – №. 2. – С. 637-645.
3. Қодиров З. А., Бобур М. Б. Ў. Ш., Мадаминова И. О. Қ. ИПАК ҚУРТИНИ БОҚИШ ВА ПИЛЛА ЎРАШ ДАВРИНИНГ ПИЛЛА СИФАТИГА ТАЪСИРИ //Academic research in educational sciences. – 2022. – Т. 3. – №. 4. – С. 630-639.
4. Рахимов А. Ю., Рахимов А. А., Қодиров З. ПИЛЛАГА ДАСТЛАБКИ ИШЛОВ БЕРИШ ВА САҚЛАШ ТЕХНОЛОГИК ЖАРАЁНЛАРИНИНГ

ТАҲЛИЛИ //Academic research in educational sciences. – 2021. – Т. 2. – №. 11. – С. 42-51.
5. Рахимов А. Ю., Рахимов А. А., Кодиров З. А. ИСПОЛЬЗОВАНИЕ ОТХОДА ШЕЛКОВОДСТВА ВАТЫ-СДИРА //Сборник научных трудов Международной научной конференции, посвященной 110-летию со дня рождения профессора АГ Севостьянова. – 2020. – С. 129-132.
6. Рахимов А. Ю., Рахимов А. А., Кодиров З. А. ИСПОЛЬЗОВАНИЕ ОТХОДА ШЕЛКОВОДСТВА ВАТЫ-СДИРА USING POLLUTION OF SILK WEAVING //НАУЧНАЯ КОНФЕРЕНЦИЯ. – 2020. – С. 129.
7. Қодиров З., Зулфиқоров Д. ПИЛЛАНИ БУҒЛАШ ТЕХНОЛОГИК ЖАРАЁНИНИНГ ХОМ ИПАК СИФАТИГА ТАЪСИРИ //Eurasian Journal of Academic Research. – 2023. – Т. 3. – №. 1 Part 3. – С. 159-165.
8. Қодиров З. А. ПИЛЛАНИНГ БУҒЛАНИШИГА АБСОРБЦИЯ ВА АДСОРБЦИЯ ЖАРАЁНЛАРИНИНГ ТАЪСИРИ //INTERNATIONAL CONFERENCES. – 2023. – Т. 1. – №. 2. – С. 559-562.
9. Абдумухтарович Қ. З., Собиров Х. А. ПИЛЛАГА ТАЪСИР ҚИЛУВЧИ КУЧЛАРНИНГ НАЗАРИЙ АСОСЛАРИ //Новости образования: исследование в XXI веке. – 2023. – Т. 1. – №. 11. – С. 771-776.