Journal of Computing and Electronic Information Management
ISSN: 2413-1660 | Vol. 10, No. 2, 2023

Integration-all-new-type cutting Simulation implementation of structural design and operation of leather machine

Tingjie Zhou

School of Mathematics and Statistics, Sichuan University of Science & Engineering, Sichuan Yibin 644000, China

Abstract: Using ABS to make the integrated-new peeling machine shell, using the electronic control device to control the operation of the rotary rotating tray, to realize the overall operation of the integrated-new peeling machine. The conclusion is that the peeling machine has the advantages of high precision, fast peeling speed, automation.

Keywords: Integrated-full new peeling machine; ABS; Telescopic rotating tray; Positioning needle chassis telescopic device.

1. Introduction

It is not difficult to hear the word "pesticide residues" in life, and the pesticide residues on the fruits and vegetables always make people fear. As early as 2014, the US Environmental Working Group (EWG) released the "2014 Fruit and Vegetable Pesticide Residue List", in which apples topped the list due to the worst pesticide pollution. China Xiaokang Network once conducted a survey on the most worrying food safety problems. The results showed that excessive pesticide residues in fruits and vegetables are the most concerned problem. It is worth noting that this problem has been at the top of the list for five consecutive years. In September 2021, the residue of citrus amine and sulfur phosphorus in a planting cooperative in Yingshan County, Nanchong City exceeded the standard. Once a large amount of human body is consumed, it will pose a great threat to human health. In 2021, the website of Shandong Provincial Market Supervision Bureau announced the sampling inspection of more than 20 kinds of fruits, among which bananas, oranges, oranges, oranges, grapes, pears, apples, peach and 7 kinds of fruits exceeded the standard, and the unqualified rate was 10.23%, 1.75%, 1.58%, 1.42%, 0.57%, 0.55% and 0.37% respectively. In the same year, the Economic District Branch of the Market Supervision and Administration of Deyang City, Sichuan province organized sampling inspection of edible agricultural products. The results showed that bananas, oranges, sugar oranges and navel oranges sold in many fruit stores had excessive agricultural residues. From January to April 2019, the market supervision bureau of fruit results, there are 29 batches of unqualified fruit. From 2020 to now, the local fruit sampling test results of the market supervision bureau show that bananas, oranges, oranges, apples, pears, kiwi fruit appear more agricultural residues exceed the standard. The test results are as shown in Table 1. It can be seen that in daily life, we may be exposed to contact with fruits with excessive pesticide residues at any time.

Choosing an appropriate way to avoid the human body's contact with pesticide residues. According to the research, the amount of pesticide residues can be reduced by cleaning or peeling. Engaged in food rapid detection technology of Beijing cloud technology co., LTD. Has done such an experiment, the market randomly buy apple in different ways, testing the treatment of the apple pesticide content change, the use of fruits and vegetables detergent, and running water scrub directly, also has certain effect, but choose detergent or water flour rubbing, the effect is not obvious, using the method of peeling can remove more than 70% of the residues. Although cleaning and peeling can reduce the amount of apple residues, peeling is the most convenient and effective way compared to cleaning. At present, most enterprises' fruit peeling block processing basically adopts the traditional artificial peeling, manual peeling efficiency is low, peeling thickness and health cannot be guaranteed, there is a serious waste. Therefore, the design of a simple operation, stable and reliable system, excellent processing effect of the integration-all new peeling machine equipment, has a broad market prospect. This paper mainly for apple, pear, kiwi and other fruits, design an integrated-new peeling machine.

2. Integration-external structure design and workflow of new pepeeling er

Product name: integration-full new peeling machine

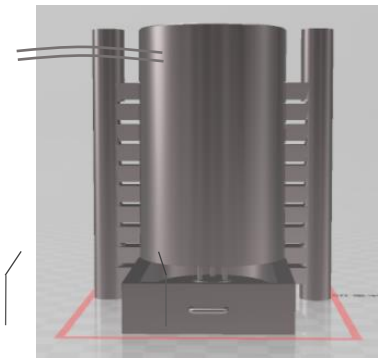


Figure 1. Integration-3D model of new peeling per shell

Product design: integrated-full new peel machine shell 3D model as shown in Figure 1, the peeling machine is made of ABS plastic, in the production process, the use of coated plastic products, can extend the service life, improve the performance of plastic, beautify the appearance of the product. After the coating, the purpose of replacing metal with plastic can be achieved, which not only improves the utilization rate of plastic, but also ensures the environmental protection and reduces the cost. Artificial ABS plastic production has comprehensive performance such as easy shell forming and

simple processing. It is widely used in home appliances, automobiles, mechanical parts and other fields, among which the home appliance market is the largest consumer market in China, accounting for more than 75% of China's ABS consumer market [1]. Therefore, ABS plastic products surface coating has also become one of the main ways of plastic products.

Table 1. Excessive residues of fruit food in the past two years

product	Non-qualified items	maximum residue limit	result(of inspection)	zone	date of issue
Wogan	triazophos	0.2mg/kg	0.36mg/kg	Guangxi	2021-10-29
Summer orange	Probromine phosphorus	0.2mg/kg	0.46mg/kg	Guangxi	2021-10-29
apple	dichlorvos, dichlorphos	0.1mg/kg	0.25mg/kg	Shanxi	2021-10-28
Wogan	Probromine phosphorus	0.2mg/kg	0.24mg/kg	Chongqing	2021-09-09
wail	carbofuran	0.02mg/kg	0.024mg/kg	Chongqing	2021-09-09
orange	carbofuran	0.02mg/kg	0.028mg/kg	Hebei	2021-09-06
nectarine	dichlorvos	0.2mg/kg	0.79mg/kg	Beijing	2021-08-06
peach	methamidophos	0.05mg/kg	0.11mg/kg	Guizhou	2021-08-05
pear	carbendazol	3mg/kg	4.00mg/kg	Shandong	2021-03-24
Gong pear	carbendazol	3mg/kg	5.1mg/kg	Hainan	2020-11-26
wild peach	methamidophos	0.05mg/k	0.12mg/kg	Liaoning	2020-11-25
pear	carbendazol	3mg/kg	4.56mg/kg	Jiangxi	2020-11-18
yangtao	carbendazol	0.5mg/kg	0.792mg/kg	Chongqing	2020-10-30
nectarine	dichlorvos	0.2mg/k	1.76mg/kg	Jiangsu	2020-10-23

2.1. Manufacturing process of the ABS shell

Due to the excellent comprehensive performance of ABS, such as forming and machining, dimensional stability, electrical insulation and impact resistance, through the performance requirements of ABS and its own characteristics. The optimization method of ABS peel er shell is determined. 1) Selection of ABS plastic coatings ABS plastic products can be selected paint: 8509 double component hardening acrylic polyurethane paint, raw paint, 50% small two urea type polyisocyanate, 50% hydroxymethacrylic resin and so on. 2) ABS plastic forming products and pretreatment Good quality plastic parts should be selected, that is, there is no lack of material, depression, air hole, fuse, silver, markings, warping and unstable size of the plastic parts. Then use the solvent gasoline and ethanol mixture of 1:1 scrub the surface of the products, remove dust, release agent, etc.[2] 3) Painting construction 8509 consists of varnish, curing agent, etc. The coating process is: seasoning construction placed at room temperature under baking cold to room temperature finished products for inspection.[2] 4) Notes for construction Plastic products injection processing is easy to form internal force, in the paint processing is very easy to produce force concentration and lead to plastic cracks, plastic parts surface often stained with oil, hand sweat and release agent, it will make the adhesion of paint raw materials poor, coating crack, foaming and fall off. At the same time, due to the poor adhesion between the substrate and the paint between the layer, it may lead to the paint loss of the material surface.

2.2. Design of the telescopic rotating tray

The tray has three positioning pins attached to fix the fruit. After the fruit is fixed, the tray delivers the fruit upwards to the peeling area. The tray is powered by the motor and drives the fruit to rotate automatically. Each blade is connected to a pipe that leads the peel to the periphery of the device and then falls into the peel storage box. Blade material we choose stainless steel 440A, this material has good rust resistance, hardness up to 58RC. 1) Positioning needle chassis expansion device application Figure 2 shows the positioning needle chassis expansion device. The positioning needle chassis expansion device has a brake, stroke switch and stop gear, which are accurate in positioning and ensure the smooth operation. The travel range of the electric control system adopts the control switch, and its position signal sensors can operate reliably. One group is set at each end of each track. Anti-inclination devices and electromagnetic control anchor devices are

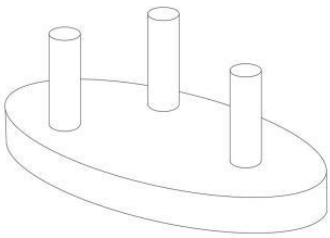


Figure 2. Positioning needle chassis telescopic device

provided on both sides of the head. Its container has enough stiffness and strength,

will not produce excessive force, vibration and other phenomena. [3]

2)Selection of vertical expansion device motors

In order to improve the efficiency of vertical expansion movement, the expansion time of the design vertical expansion device does not exceed 4s, the design expansion time is 2s, the maximum expansion length is 0.632m, and the expansion speed is $0.316m/s$. The vertical expansion unit shall carry the weight of the tray, and the tray weight is measured as 0.341kg. The friction force is mainly the sliding friction between the vertical expansion device and the block on both sides. Taking the sliding friction coefficient is $u = 0.5024$, the motor power in the vertical expansion device is 0.5412kw.

The DC XS motor is selected as the power source. The maximum output power of the motor is 0.955kw, the maximum speed is 5995r/min(RPM), and the output torque is 60.29N·m, which meets the design requirements.[4]

2.3. Workflow

The internal structure of the peeling er is shown in Figure 3. Among them, 1 is the drawer (acting to the water Fruit), 2 for the positioning needle base (applied

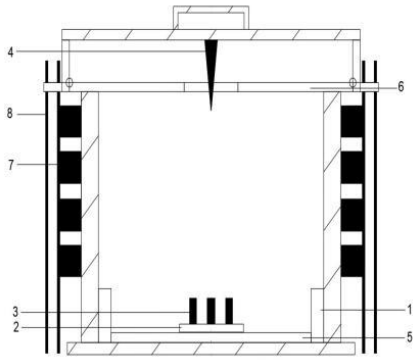


Figure 3. Internal plane structure design

to fix three positioning needles), 3 for three positioning needles (acting on fixed fruit).4 for the expansion thimble (acting on the top interspersed fruit, fixed fruit), 5 for the large disk chassis (used to connect the automation device, used for transporting the base), the structure display as shown in Figure 5.6 is the cutting device area (the cutting block acting on the fruit), 7 is the left and right expansion blade group (applied to peeling), 8 the peel delivery pipe (acting on the peel delivery to the outside).

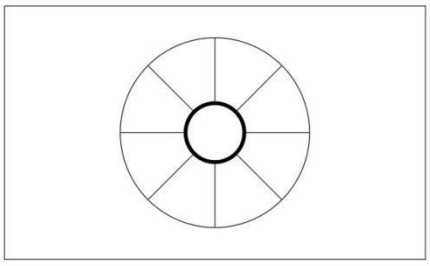


Figure 4. Large, circular chassis

Pull out the drawer 1, place the fruit on the small round base 2, through by the positioning needle 3; (2) After pressing the "Peel" option button, Extraction apex 4 elongation (initial shrinkage), The large circular chassis 5 is transported upward through the thrust action of the lower device, Transport below the cutting ring unit 6, The expansion thimble is inserted above the fruit, Left blade 7 extension, Upon reaching the epidermis of the fruit, it stays to the edge of the fruit surface through the pressure sensor, Large circular chassis 5 starts to rotate so that the expansion blade 7 starts to work, After the peeling work has ended, The fruit skin fell from the pipe 8 gap to the lower peel accumulation, Return of the blade to its original position (i.e. shrink), Large circular chassis 5 is transported downward to the initial position, Retraction apex 4 shrink, Fruit can be taken out by pulling out the drawer; (3) After pressing the "block" option button, the telescopic vertex 4 remains unchanged, and the large circular chassis 5 is transported to the bottom of the cutting block ring device 6 through the thrust action of the lower device. After the operation, the large circular chassis 5 is transported downward to the initial position, and the fruit can be pulled out through the drawer;

3. Product advantages and characteristics

The peel is fast

1)The cbs blade has the characteristics of high precision, lean, constant quality line, etc., etc. When peeling, two groups of blades are rotated and cut at the same time. It solves the problems of low efficiency, high labor intensity and high energy consumption existing in fruit deep processing enterprises. [5] 2) integration the button switch technology and automation technology are adopted to ensure the integration of peeling and cutting process. Start button 1 is mainly the peeling process, and start button 2 is mainly the cutting process. At the same time, the peel recovery tank is added to facilitate cleaning.3) robotization the product adopts the combination of multi-pressure sensor and computer information technology, distribution control system (DCS), field bus control system, PLC + upper system, direct digital control system, button switch technology and other modules to improve the level of product automation, so that customers can save a lot of time in the process of fruit peeling processing. 4) has a long service life Integrated-the new peel machine shell is ABS plastic design, the sensor is semiconductor pressure sensor, the blade is cbs steel, which has strong toughness, anti-corrosion treatment, good heat dissipation effect and other characteristics.

4. Conclusion

An example, it can greatly improve the resistance of the human body, which makes people more like to eat all kinds of fruits. According to the community statistics survey, through some common cleaning methods, the bacterial residue on the surface of fruit is still very high, so the peeling method is relatively higher in terms of safety and convenience. And we build the integrated-full new peeling machine using automation technology and computer technology to accurately process the fruit, integration, peeling fast, high precision. It meets people's life needs, and it is an efficient machine suitable for the current fruit processing.

References

[1] Zhou Cong, Qian Jianhua, Sun Wei. ABS to develop special material for home appliance shell [J]. Heilongjiang Petrochemical Industry, 2002 (01): 17-19.

[2] Lin Yu-zhi. ABS plastic products surface coating [J]. Aviation process technology, 1990 (03).

[3] Man yong mei. Design of three-station head expansion device of new belt conveyor [J]. Coal mine electromechanical. 2022,43(01):59-61.

[4] Feng Wenbo, Ding Song, Wang Xinli. Transmission module design of apple picking system [J]. Use and Maintenance of agricultural machinery, 2019 (01): 5-7.

[5] Kang Yuhui, Li Jingyang. Design and test of fruit automatic peel machine [J]. Food Industry, 2020,41 (10): 232-234.