

Destructive Test Analysis of Grinder Under Field in Complicated Agricultural Environment of Leizhou

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Abstract: In this paper, through the understanding of the basic structural features and working principle of the crushing and returning machine, the paper introduces Destructive testing process in detail a high perennial pineapple plant with high intensity and randomness and uniformly distributed shrubs in the field; b of the rubberwood land, and the growth of large areas of vines and shrubs within the forestland, with unknown environmental factors; c undergrowth of uncultivated land without main crops and hiding the working environment of construction waste and gravel. Through the comparison analysis of test and test indexes, the crushing and returning machine shows good production efficiency to the environment with stable texture of the working object; the fuel consumption is high and shows poor performance for the working conditions and unstable working conditions of the stability, but in the case of adequate throughput of the object has a better throwing uniformity, while rattan objects affixed to the situation there is not picking up the phenomenon; for high pole object, and the case of crushing overload, can not meet the normal crushing quality requirements. Working conditions for the flexible working environment, for transmission, transmission systems, connectors require a higher; c working conditions are rigid environment, the blade strength, knife holder and bearing the strength of the rack and other requirements. This disruptive test for the performance of universal crushing machine has a strong practical reference.

1 INTRODUCTION

Leizhou Peninsula is a part of China's tropical and subtropical regions. Affected by tropical and subtropical climate, nearly 200 tropical crops have been planted, including natural rubber, cassava, banana, lychee, longan, mango, pineapple, oil palm, pepper, Betel nuts, coffee, cocoa, sisal, cashew nuts, etc. Occupies an important position in China's economic development and national defense construction. At present, the most prominent and weakest link in the mechanized production of tropical crops is the need to eliminate and crush the wild weeds growing madly.

The Leizhou Peninsula is hot and dry in summer, with mild and rainy winters and humid air (Ou Zhongqing, 2013). The crops are often densely

populated and the growth rate is relatively fast. Most of the crops are hard-leaf, high-pole and multi-fiber tissues. At the same time, there are a large variety of tropical crops, The awareness of concomitant unified planning has a large gap between the benefits expected from farmers and their direct impact on farmers' recognition of intensive farming management. At the same time tropical crop agronomic and agricultural technology does not match, but also restricted the rapid development of mechanization (Ou Zhongqing, 2017).

For example: pineapple, which belongs to close planting crops, thick stems, leaf layers overlap, criss-cross, thickness of 20cm or more, and pineapple leaves contain more tough fibers, compared with other crop straw, has its own unique biology Features and mechanical properties, high

strength and thick. Existing pineapple stems and leaves crushed into the field of pineapple machine into the ground, often to be 2-3 times the smash in order to make the crushing effect to meet the requirements (pineapple stems and leaves less than or equal to 15cm in the proportion of not less than 90%), see Figure 1 (a, b).



Figure 1: Traditional models crush effect.

For example, due to the slow recovery of the global economy and the continuous decline in the prices of crude oil and other commodities, the world's natural rubber industry has shown a trend of oversupply. In recent years, the natural rubber in China has been discarded in large areas and abandoned. Recently, natural rubber has gradually started to resume tapping due to the obvious signs of natural rubber price recovery and favorable policies stimulated by the state for the natural rubber industry. However, for rubber tapping, the first step is to eliminate the shortage and the object to eliminate it is high over the tractor shrubs and run over people rattan and gravel and other environments, shown in Figure 2 (a, b).



Figure 2: The upcoming work environment.

Based on this, it is of great significance to develop a general purpose crushing and returning technology and its supporting equipment capable of carrying high-strength tasks while being able to handle hard-leaf, high-pole and multi-fiber tissue objects and achieving the desired results with good machine reliability (Li Ling, 2014).

2 DESIGN STRUCTURE AND PRINCIPLES

2.1 Design Principles

2.1.1 Principles applicable to the actual situation of crushing and returning fields under complicated environment

Combining with the requirements of the overall agronomy of main tropical crops for eliminating and returning farmland to crushing and returning to the fields and the effective connection of the actual supporting equipment, the paper designs a new method which is reasonable in structure, Design requirements of the model.

2.1.2 machine reliability principles

During the work of crushing and returning field machine, the processing of hard leaves, high bar, multi-fiber tissue objects caused by uneven force, so the whole machine to have high reliability, the use of double roll combination structure, the need to have better balance requirements and by Sexually-stressed structure, to fully protect the improvement of crushing efficiency.

2.1.3 The principle of common parts and interchangeability of key components

In the machine under the premise of the strength and the key structure to ensure the operation effect and reliability of the movable knife and knife roll between the use of the knife will be disassembled connection, knife balancing needs balancing design to reduce the weight of the host, saving materials, easy to transport, while taking into account the parts of the interchangeability, assembly and other requirements.

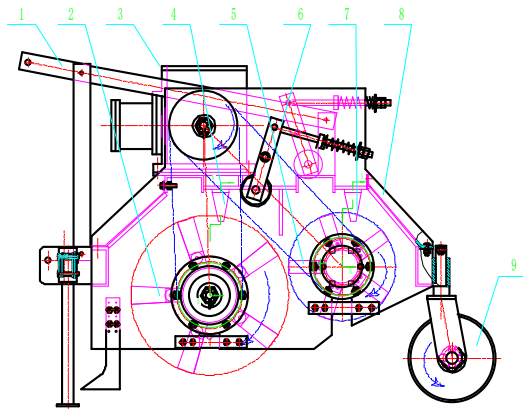
2.2 Machine structure and characteristics

Crushing machine mainly by the suspension mechanism, rack, transmission system, the knife stick assembly and contour support structure, the structure shown in Figure 3.

3 DESTRUCTIVE TEST AND RESULT ANALYSIS

3.1 Test plan and index

Destructive test environment of the main selected a: high-intensity and capricious pineapple perennial plants, and uniformly distributed throughout the shrubs; b: more than four years abandoned rubber tube woodland, and the growth of large areas of woodland in the forest and shrubs, there Unknown environmental factors; c: overgrown blocks without main crops and hidden working environment such as construction waste and rubble, as shown in Figure 4-6.



1. Three-point suspension mechanism; 2. Knife roller; 3. Transmission system; 4. Knife roller fixed knife; 5. Knife roller; 6. Tensioning mechanism; 7. Knife roller fixed knife; 8. Rack ; 9 ground

Figure 3: Crush the machine design.

The main equipment has the following structural features:

a. The role of the front roller is to cut the growing plants, pick up, and in the fixed knife with the initial crush it, and then fed into the knife roll. Knife roller in order to facilitate the pick up of materials, the design of the larger diameter rotary; Because of its knife operation from the ground near, inevitably hit the soil, stones and other hard objects, in order to protect the tool, so the tool design for the Y-rejection knife form, The pin shaft is hinged to the outer circumference of the front roller, and the rejection of the knife is arranged in the reverse double helix(Cui Zhende, 2013; Zhang Yuan, 2017).

b. After the role of knife roller is mainly cut cut, tear the material delivered by the front roller, in order to prevent contact with the soil, increasing energy consumption and collision with the soil damage, design its installation height is higher than the front roller and its the smaller diameter leaves the blades with a larger ground clearance. The blade is designed to be fixed on the knife roll to save power. Blade arrangement to take double helix way.

c. The role of the ground wheel in addition to supporting the weight of the field machine, the work can walk with the ups and downs of the terrain changes up and down movement, so as to ensure that the rejection of knife and the ground gap remains unchanged, the crushed object stubble height change.



Figure 4: Fiber + shrub land.



Figure 5: Rattan + shrub block.



Figure 6: Macadam plots.

The mill uses the "strong down, first out of head, broken rod," the step-by-step overall work program, uniform design work machine width of 1.5 meters, double-roll structure, double rejection of knife thick

structure and blade combination Mode, matching the Lovol 1204 wheeled tractor, the slow speed of the entire test process 3 block.

Main test indicators: productivity; fuel consumption per unit area; job stability; throwing uniformity; off-site height; average failure time; number of damaged sites and other indicators.

3.2 Test process

The use of the above program in abc three kinds of work environment, the test results of the machine shown in Figure 7-9:



Figure 7: Crushing effect of fiber + shrub land.



Figure 8: Crushing effect of rattan + shrub block.



Figure 9: Crushing effect of Macadam plots.

During the test, the machine suffered various degrees of damage in varying degrees, including

blade damage / rack cracking; drive system damage, and belt breakage / bearing burnout / transmission stuck. See Figure 10-12 for details.



Figure 10: Broken blade and seat.



Figure 11: Rack cracking.



Figure 12: Drive system is damaged.

In the case of machine damage, still show a good quality of work, some of which work with the quality of the bulldozer can be comparable.



Figure 13: Fiber + shrub land crushed unqualified effect.



Figure 14: Rattan + shrub block crushed unqualified effect.

3.3 Test results and analysis

In abc three kinds of working conditions of the relevant indicators tested in Table 1:

Table 1: This caption has one line so it is centered.

index	a	b	c
Productivity(hm ² /h)	1.21	0.97	1.23
Fuel consumption (kg/hm ²)	3.36	4.02	2.94
stability(%)	84.3	77.1	86.5
Sprinkle evenness(%)	90.1	90.2	89.3
Maximum ground clearance(cm)	42	37	12
Mean time to failure (h)	4.3	3.1	2.6
The number of damaged parts	3	4	2

From Table 1 shows that the machine in the completion of tasks under the circumstances, the destructive test feedback, the results of this test must significantly reduce the average failure time to ensure the stability of the machine, or can not be introduced to the market.

4 CONCLUSIONS

The results show that the crushing and returning machine has a good production efficiency for the stable working environment of the working object and has a higher fuel consumption for working conditions and unstable working conditions and shows a higher fuel consumption Poor stability, but in the case of adequate throughput of the object has a better throw uniformity, in line with crushing back to the agronomic requirements. At the same time, rattan objects affixed to the situation there is still not picking up the phenomenon, for high pole object,

and the crushing overload case, can not meet the normal crushing quality requirements, ab working conditions for the flexible working environment, for transmission, transmission systems, connectors require a higher; c working conditions are rigid environment, the blade strength, knife holder and bearing the strength of the rack and other requirements. This disruptive test for the performance of universal crushing machine has a strong practical reference.

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