Business plan

Project Title: Realizing in-situ recycling of office waste paper based on biological enzyme method-Deinker

Team Name: Paper Source Technology
## contents

Chapter One Project Introduction........................................................................................................... 5

1.1 Team profile.............................................................................................................................. 5

1.1.1 Team name.......................................................................................................................... 5

1.1.2 Team Philosophy.................................................................................................................. 5

1.2 Products and services.................................................................................................................. 5

1.3 Market Analysis.......................................................................................................................... 6

1.4 Marketing Strategy..................................................................................................................... 7

1.5 Company organization and management................................................................................. 8

1.6 Financial and financing analysis............................................................................................... 9

1.7 Risk analysis and countermeasures.......................................................................................... 10

Chapter 2 Market Analysis................................................................................................................. 11

2.1 PEST macro background analysis............................................................................................ 11

2.1.1 Political environment.......................................................................................................... 11

2.1.2 Economic environment....................................................................................................... 12

2.1.3 Social environment............................................................................................................ 13

2.1.4 Technical environment....................................................................................................... 14

2.2 Overview of China’s waste paper recycling market................................................................. 15

2.3 Market research data................................................................................................................. 19

Chapter 3 Products and Services..................................................................................................... 24

3.1 Summary.................................................................................................................................. 24

3.2 Product overview....................................................................................................................... 24

3.2.1 Product Principle................................................................................................................ 24

3.2.2 Product function.................................................................................................................. 26

3.2.3 Product application scenarios............................................................................................ 27

3.2.4 Technical parameters.......................................................................................................... 27

3.2.5 Appearance design............................................................................................................. 29

3.3 Product innovation.................................................................................................................... 30

3.4 Technical feasibility analysis.................................................................................................... 31

3.4.1 Required technology.......................................................................................................... 31

3.4.2 Whether existing personnel are competent........................................................................ 33
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.4.3 Required resources</td>
<td>33</td>
</tr>
<tr>
<td>3.5 Product R&amp;D and Design</td>
<td>34</td>
</tr>
<tr>
<td>3.5.1 Selection of chassis organisms and expression vectors</td>
<td>34</td>
</tr>
<tr>
<td>3.5.2 Selection of enzymes for deinking</td>
<td>34</td>
</tr>
<tr>
<td>3.5.3 Fibrosomes</td>
<td>35</td>
</tr>
<tr>
<td>3.5.4 Hardware design</td>
<td>36</td>
</tr>
<tr>
<td>3.5.5 Modeling design</td>
<td>38</td>
</tr>
<tr>
<td>3.6 R&amp;D progress</td>
<td>43</td>
</tr>
<tr>
<td>3.6.1 Completed part</td>
<td>43</td>
</tr>
<tr>
<td>3.6.2 Under development</td>
<td>44</td>
</tr>
<tr>
<td>3.6.3 Final product expectations</td>
<td>44</td>
</tr>
<tr>
<td>Chapter 4 Business Model</td>
<td>46</td>
</tr>
<tr>
<td>4.1 Value proposition</td>
<td>46</td>
</tr>
<tr>
<td>4.2 Customer group</td>
<td>46</td>
</tr>
<tr>
<td>4.3 Core resources</td>
<td>47</td>
</tr>
<tr>
<td>4.4 Key business</td>
<td>47</td>
</tr>
<tr>
<td>4.5 Channel access</td>
<td>48</td>
</tr>
<tr>
<td>4.5.1 Propaganda Channel</td>
<td>48</td>
</tr>
<tr>
<td>4.5.2 Delivery Channel</td>
<td>48</td>
</tr>
<tr>
<td>4.6 Cost structure</td>
<td>49</td>
</tr>
<tr>
<td>4.7 Revenue model</td>
<td>50</td>
</tr>
<tr>
<td>4.8 Customer Relationship</td>
<td>51</td>
</tr>
<tr>
<td>4.9 Important cooperation</td>
<td>51</td>
</tr>
<tr>
<td>Chapter 5 Marketing Strategy</td>
<td>52</td>
</tr>
<tr>
<td>5.1 STP analysis</td>
<td>52</td>
</tr>
<tr>
<td>5.1.1 Market Segmentation</td>
<td>52</td>
</tr>
<tr>
<td>5.1.2 Target Market</td>
<td>53</td>
</tr>
<tr>
<td>5.2 Marketing mix strategy</td>
<td>55</td>
</tr>
<tr>
<td>5.2.1 Product Strategy</td>
<td>56</td>
</tr>
<tr>
<td>5.2.2 Price Strategy</td>
<td>57</td>
</tr>
<tr>
<td>5.2.3 Channel Strategy</td>
<td>58</td>
</tr>
<tr>
<td>5.2.4 Promotion Strategy</td>
<td>59</td>
</tr>
<tr>
<td>Chapter VI Personnel Management</td>
<td>61</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>----</td>
</tr>
<tr>
<td>6.1 Company organizational structure</td>
<td>61</td>
</tr>
<tr>
<td>6.2 Company Organization and Structure Arrangement</td>
<td>64</td>
</tr>
<tr>
<td>6.2.1 Analysis of Team Advantages</td>
<td>64</td>
</tr>
<tr>
<td>6.3 Analysis of company departments</td>
<td>64</td>
</tr>
<tr>
<td>Chapter 7 Financial Analysis</td>
<td>67</td>
</tr>
<tr>
<td>7.1 Financing demand and investment direction</td>
<td>67</td>
</tr>
<tr>
<td>7.1.1 Financing plan</td>
<td>67</td>
</tr>
<tr>
<td>7.1.2 Direction of Fund Use</td>
<td>67</td>
</tr>
<tr>
<td>7.2 Ways to withdraw capital</td>
<td>68</td>
</tr>
<tr>
<td>7.3 Financial analysis</td>
<td>69</td>
</tr>
<tr>
<td>7.3.1 Basic assumptions of finance</td>
<td>69</td>
</tr>
<tr>
<td>7.3.2 Principles of Cost Estimation</td>
<td>70</td>
</tr>
<tr>
<td>7.3.3 Forecast of operating income</td>
<td>71</td>
</tr>
<tr>
<td>7.3.4 Cost and Expense Forecast</td>
<td>72</td>
</tr>
<tr>
<td>7.3.5 Income statement, cash flow statement</td>
<td>75</td>
</tr>
<tr>
<td>7.4 Analysis of return on investment</td>
<td>76</td>
</tr>
<tr>
<td>7.4.1 Net present value method (NPV)</td>
<td>76</td>
</tr>
<tr>
<td>7.4.2 Internal rate of return</td>
<td>77</td>
</tr>
<tr>
<td>Chapter 8 Risk Analysis and Countermeasures</td>
<td>78</td>
</tr>
<tr>
<td>8.1 Market risks and countermeasures</td>
<td>78</td>
</tr>
<tr>
<td>8.2 Technical risks and countermeasures</td>
<td>80</td>
</tr>
<tr>
<td>8.3 Product quality risks and countermeasures</td>
<td>82</td>
</tr>
<tr>
<td>8.4 Operational risks and countermeasures</td>
<td>82</td>
</tr>
<tr>
<td>8.5 Financial risks and countermeasures</td>
<td>83</td>
</tr>
<tr>
<td>8.6 User risks and countermeasures</td>
<td>85</td>
</tr>
</tbody>
</table>
Chapter One Project Introduction

1.1 Team profile

1.1.1 Team name

     Paper Source Technology Co., Ltd.

1.1.2 Team Philosophy

     Build a Better World with ZHI YUAN. Paper Source Technology is committed to helping waste paper recycling and high-quality recycling, and promotes the concept of environmental protection. Team members can give full play to their enthusiasm and ability in the company, break through the boundaries of solving environmental problems in the waste paper industry, promote more open cooperation between the papermaking and paper recycling industries, and build a better world.

1.2 Products and services

     The company's product-Deinker is an integrated deinking equipment for office waste paper, which can regenerate office waste paper in situ.

     Aiming at the current problems of difficult paper recycling and classification, and large impurity removal technology defects in the recycling process of waste paper, the quality of high-quality paper is greatly reduced after entering the recycling chain, and the integrated deinking and sorting and recycling of office waste paper are proposed. Waste paper recycling strategy, on the one hand, provides users with recycled paper more environmentally friendly, convenient and low-cost, on the other hand, achieves high-quality paper sorting and recycling. The current biological enzymatic deinking technology is mostly used in the beating and deinking process by large waste paper-based paper mills, and this product aims to apply enzymatic deinking technology to small equipment to realize waste paper recycling. The innovations of the equipment include the comprehensive application and independent design of equipment (no beating), biology (new fibrous bodies to improve deinking efficiency), mathematical modeling (ink spot recognition) and other technologies. At present, the equipment has been applied for patent protection.
In addition, after the company develops steadily, it will iteratively update its products and increase: ① Printing and copying functions to realize the integration of deinking, printing and copying; ② Producing special paper and printing ink to realize faster and more convenient deinking; ③ Incorporating waste paper recycling and sorting equipment in the hardware, so that our large-scale shared equipment can be used as Waste paper recycling outlets promote the renewal of the domestic waste paper recycling system; ④ Broaden the scene and realize the recycling method of waste paper.

1.3 Market Analysis

First, use the PEST model to analyze the macro environment of the project, as shown in Figure 1-1. From the perspective of the political environment, the policy favors environmentally friendly industries, does not support the import of waste materials, and pays attention to the use of renewable resources. It can help the recycling of waste paper and reduce the dependence of papermaking raw materials on the import of waste paper. From the perspective of the economic environment, China's office paper still ranks in the forefront of paper consumption and maintains a certain growth rate. In the long run, office paper usage will continue to grow steadily.

From the perspective of the social environment, the office paper group is larger and showing a growth trend, and its paper demand is correspondingly increased. Moreover, with the implementation of the concept of expressing self-will through consumption, office waste paper recycling technology based on environmental protection concepts should have corresponding market prospects.

From a technical perspective, although the current waste paper deinking technology is relatively mature, it is still lacking in many aspects such as use scenarios, use conditions, use effects, and use costs. Sorting and recycling, and biological enzymatic deinking technology have gained important entry points in the market. In summary, Deinker equipment conforms to the macro background trend.

Secondly, from the perspective of waste paper recycling and processing, it analyzes the development status of the domestic waste paper recycling market. The main problems facing the current waste paper recycling industry are: low recycling rate and insufficient amount of waste paper, greatly reducing the
efficiency of secondary utilization; waste paper recycling has not become an industry, lacking unified quality requirements and supervision standards; waste paper recycling is in progress. At the same time, the sorting work was not done well, so that all kinds of waste paper were mixed together, resulting in uneven quality of recycled pulp, which made it difficult to improve the recycling capacity; after the completion of recycling, there was a lack of correct storage and storage conditions, which made the quality of waste paper is seriously degraded. The traditional technology in the current waste paper processing market is relatively mature. However, the current utilization rate of waste paper is only about 50%, and high-quality recycled fiber materials are still required to be regularly supplemented. In terms of office waste paper processing, printing in the office market today Technology is not conducive to the deinking of office waste paper in the process of waste paper processing.

Finally, the team's market research results on the willingness to use Deinker equipment showed that the willingness to dispose of office waste paper is more obvious, and the use of government department workers is significantly higher.

![Figure 1-1 Overview of market analysis](image)

1.4 Marketing Strategy

After using the STP theory for market segmentation and the 4P theory to determine the marketing mix strategy, our marketing strategy is aimed at higher
paper consumption, the need for reuse or recycling of waste paper, the willingness to use equipment at the upper-middle level, and the pursuit of environmental protection Groups whose benefits are higher than economic benefits (mainly distributed among government workers, teachers, primary and middle school students, and office staff of enterprises and institutions), uphold the concept of environmental protection, and focus on advertising and business cooperation in specific market segments in the early stage. Advantages to promote the successfully developed small-scale bio-enzyme deinking machine Deinker and derivative services to increase visibility while forming a good product image; in the mid-term, it will be more targeted in product functions, pricing and marketing methods, and expand the differentiated target market to adapt to more Office paper recycling needs in multiple scenarios; later, we began to establish recycling systems and networks to develop more types of paper products recycling related technologies.

Due to the originality of the company's products, pricing and sales need to be adjusted in a timely manner according to the stage. At present, the pricing model is determined: price = unit cost * (1 + appropriate floating profit rate), and cost management is strengthened; the sales model adopts the direct sales model for equipment and accessories, and the cooperation model for equipment consumables and value-added services.

Figure 1-2 Overview of marketing strategy

1.5 Company organization and management

The company’s initial organizational structure was linear, as shown in Figure 1-3. As shown, the setup is simple, but the powers and responsibilities are clearly defined, and the information communication is convenient. The department
Entrepreneurship plan-Deinker

A responsibility system under the leadership of the general manager is divided into the personnel department, research and development department, production department, marketing department, and finance department. Each department has a department manager. The members come from the School of Innovation, Life, Computer, Automation, and Mechatronics, and have high cross-innovation capabilities. The members have strong professional strength and comprehensive quality, which can form a strong potential network resource for the company.

Figure 1-3 Company organization chart

1.6 Financial and financing analysis

The company’s share capital is 1 million yuan, of which the founding team uses technology and cash to invest 500,000 yuan to account for 80% of the shares, and external risk investors use cash to invest 500,000 yuan to account for 20% of the shares.

The company rigorously estimates the financial income and financial expenditure in the next five years. According to production and sales forecasts, the sales of deinker deinking equipment and enzymes from the first year to the fifth year increased from 1.127 million yuan to 18.726 million yuan, minus the required value-added tax, labor costs, and site rental costs. The company's net profit increased from the loss of 420,000 yuan in the first year of cong to the profit of 6.747 million yuan in the fifth year. Starting from the fourth year, 85%
of the company's annual profit will be used as capital accumulation as the company's fixed assets, and the remaining 15% of the income will be distributed according to shares.

1.7 Risk analysis and countermeasures

After comprehensively assessing the many risks that the company may have at various stages, our company believes that the main risks and corresponding countermeasures of the product are:

1. Biosafety risk: The deinking agent used is a modified enzyme produced by genetically engineered bacteria. The leakage of bacteria must be strictly controlled in the laboratory and production stage, and the product must be strictly reviewed before entering the market.

2. Document tampering risk: After the product achieves partial deinking, legal documents are easy to be tampered with. When preparing the ink, consider adding the components that mark the printing time of the ink, and design a special identification software.

3. Technical risk: Our company’s product technology research and development costs are relatively high, technology innovation is strong, and there is a large demand for talents. Before the establishment of research and development, it is necessary to thoroughly evaluate the feasibility and carry out a period of technical experimentation.
Chapter 2 Market Analysis

In this section, first use the PEST analysis model to analyze the macro environment of the project, including four levels: politics, economy, society, and technology. Then, analyze the development status of the domestic waste paper recycling market. Finally, we introduce the team's survey data on the usage groups and usage methods of waste paper.

2.1 PEST macro background analysis

2.1.1 Political environment

As a big country in the production and consumption of paper products, China's environmental protection policies cover many links from paper production to recycling. In the analysis of the political environment, the paper production link and the waste paper recycling link are more related to this product, which is also a point that we are more concerned about.

1. Paper production

In the production of paper, relevant policies are mainly focused on environmental protection and waste imports. On the one hand, as the country continues to attach importance to environmental governance, the People’s Congress of the People’s Republic of China issued the “Environmental Protection Law of the People's Republic of China” in 2018, which stipulates the quantity and specifications of the discharge of solid waste and water pollution from the paper industry. A series of policies have doubled the cost of corporate wastewater treatment. Companies that use chemical reagents and pollute more paper make serious losses and withdraw from the market. The more environmentally friendly biological enzymatic deinking is gradually replacing chemical deinking. Therefore, in order to meet the needs of environmental protection, our products use biological enzymatic deinking. On the other hand, the raw materials of China's paper industry were once heavily dependent on foreign imports of waste. In the past ten years, China's waste paper imports peaked at 30.07 million tons in 2012. During the same period, the domestic waste paper recycling volume was 44.73 million tons, and the national waste self-sufficiency rate was about 40%. In
June 2018, the Central Committee of the Communist Party of China and the State Council issued the opinions on comprehensively strengthening ecological and environmental protection and resolutely fighting pollution prevention and control. The opinions pointed out that by the end of 2020, we must strive to achieve zero imports of solid waste. After the import of waste materials was blocked, the domestic papermaking raw materials were insufficient. As a result, a large number of paper mills will be automatically shut down in 2021, and the price of paper will rise sharply. Some factories with good waste paper recycling systems continue to produce. In general, the recycling of paper is very important. At the beginning of the design, Deinker was based on reducing recycling costs and realizing more convenient paper recycling.

2. Paper recycling

Papermaking from waste paper has become the main development trend of the modern paper industry. One of the important reasons is that the government attaches great importance to the recycling and utilization of renewable resources. The corresponding series of policies and regulations have been established to establish a complete waste paper recycling system. In January 2017, the Ministry of Environmental Protection issued the "Guiding Opinions on Accelerating the Development of the Renewable Resources Industry", clearly supporting the standardized development of the waste paper sorting industry and supporting the development of regional waste paper trading centers. As an important part of renewable resources, waste paper is also the focus of the country's construction of a renewable resource recycling system. Deinker equipment realizes the recycling of waste paper, which is in line with the development trend of national renewable resources.

2.1.2 Economic environment

Office paper belongs to the category of uncoated printing and writing paper, and is the top three consumer varieties of paper and cardboard in China. In 2020, the consumption of uncoated printing and writing paper was 17.83 million tons, an increase of 1.94% over the previous year. The average annual growth rate of consumption from 2011 to 2020 is 0.62%.

In 2017, the global per capita paper consumption reached 54.71 kg/year, of which Europe and North America were the main forces of paper consumption, the
per capita paper consumption in Western Europe reached 178.7 kg/year, and
North America’s per capita paper consumption reached 229 kg/year. Per capita
paper consumption in Asia is only 41 kg/year, which is lower than the world
average. Since 2000, China’s per capita paper consumption has increased from 30
kg/year to 80 kg/year, a rapid growth rate, but it is still lower than the level of
developed regions in the world. On a global scale, China’s per capita paper
consumption There is still a lot of room for improvement.

In summary, at present, office paper in China is still in the forefront of paper
consumption, and maintains a certain growth rate. In the long run, office paper
usage will continue to grow steadily.

2.1.3 Social environment

In terms of social environment analysis, we mainly focus on the consumer
groups of office paper and the consumption stage that our country is currently in.

1. Consumer groups

The main consumer groups for paper are students and office groups. At
present, there are about 300 million student groups and 100 million office groups
in China. The numbers of the two groups are still increasing.

2. Consumption stage

In terms of consumption characteristics, the current high-tier cities in China
as a whole have gradually entered the consumption 3.0 era. The middle-class
population continues to expand and increasingly become the mainstay of high-tier
consumption. The relative differentiation of income and the crowding-out effect
caused by high housing prices have all made rational return to consumption
upgrade. Important trends in the new phase. "Light luxury" consumption, which
represents a higher consumer experience and the direction of high-end product
upgrades, and at the same time is relatively acceptable, is becoming more and
more popular. In terms of brand preference, consumers' recognition of local
brands and even regional brands has increased significantly.

In terms of consumption concept, no longer blindly pursuing the brand, the
trade-off between experience and price has become a key consideration; consumers seek to master the initiative, express their will through consumption,
and pay attention to the matching of attitude, spirit, tone and values; healthy and
environmentally friendly The concept of consumption is rising day by day. In
terms of consumption structure, the proportion of consumption of basic daily necessities has decreased overall, but the internal upgrading and differentiation are still ongoing. Brands that focus on subdivided groups, have good experience, and are reasonably priced can stand out.

To sum up, the office paper group is large and showing a growth trend, and its paper demand increases accordingly; and with the implementation of the concept of expressing self-will through consumption, the office waste paper recycling technology based on the concept of environmental protection should have corresponding market prospects.

2.1.4 Technical environment

In the field of waste paper recycling, the mainstream recycling method is to realize the reuse of waste paper through the process of recycling-deinking pulp-paper making.

An important issue of waste paper recycling technology is the deinking of waste paper. At present, it is commonly used to use chemical reagents to separate the ink from the paper, and then use the flotation method to screen out clean paper fibers. However, a large number of chemical reagents are expensive and harmful, and large-scale equipment is required to achieve a high temperature and high pressure reaction environment.

At present, the prerequisite for pulp deinking in the factory is the recycling of waste paper. The current waste paper recycling mechanism is relatively incomplete, and there is no mature technical industry chain. In addition, because the paper is mixed with the rest of the garbage in the recycling process, the paper is separated in the factory. The technology of the category is relatively poor, high-quality paper, after entering the recycling process, complex low-quality paper, cannot achieve high-value reuse. Therefore, we focus on the in-situ regeneration of enzymatic deinking to reduce the cost of the recycling process. In the later stage, we will establish a special sorting system for waste paper to send high-quality waste paper directly to the paper mill.

Since the 21st century, the country has adhered to the concept of scientific development and has successively issued a series of policies to encourage scientific research and innovation, which has greatly promoted the progress of science and technology. Many biotechnological disciplines such as molecular
Entrepreneurship plan-Deinker

15

biology and synthetic biology have been developed by leaps and bounds. This provides an opportunity for the use of biotechnology to solve the problem of waste paper recycling, and ultimately forms a deinking technology based on biological principles. Utilizing the characteristics of enzyme specificity, high efficiency, and mild reaction environment to effectively cut the adhesion between paper fiber and ink, and reduce the level of harmful substances in deinking wastewater, and reduce the burden of sewage treatment. At present, the biological enzymatic deinking technology has been developed for several years, and gradually began to replace the chemical deinking method, and its widespread application is just around the corner.

In summary, although the current waste paper deinking technology is relatively mature, there are still deficiencies in many aspects such as use scenarios, use conditions, use effects, and use costs. This happens to be in-situ recycled waste paper, paper sorting and recycling, Biological enzymatic deinking technology has gained an important entry point in the market.

2.2 Overview of China's waste paper recycling market

With the improvement of people's living standards, the requirements for paper are getting higher and higher. Under this background, China's paper industry is booming, and the development of waste paper recycling is also growing, and the amount of waste paper recycling that follows it also increased sharply. In 2020, the total consumption of paper and paperboard in China will reach 118.27 million tons, a year-on-year increase of 10.49%, and the per capita annual consumption will be 84 kg (1.400 billion people), of which 17.83 million tons of uncoated printing and writing paper will be consumed, a year-on-year increase of 1.94 %, the country’s total pulp consumption was 102 million tons, an increase of 5.27% over the previous year, of which waste paper pulp was 56.32 million tons, accounting for 55% of the total pulp consumption. At present, waste paper is the primary raw material for papermaking. The waste paper recycling industry is inseparable from the development of the papermaking industry. In the field of waste paper recycling, a larger market-scale industry has been formed for waste paper recycling and waste paper processing. This is also practical. Corresponds to the two most important links in the process of waste paper recycling.
In the current waste paper recycling market, most companies only operate one business in recycling and processing. However, due to the unstable supply of waste paper upstream of the industrial chain, the quality and type of recycled waste paper vary greatly in many aspects, which is not conducive to the middle reaches of the industrial chain waste paper is the development of paper-making enterprises. In the face of this situation, leading companies in the paper industry are making efforts to try to integrate the layout of the market, and gradually expand to the entire category and the entire chain, relying on scale to reduce recycling costs. With the gradual elimination of backward production capacity in the paper industry and the tightening of approvals for imported waste paper, some powerful paper companies have established recycling channels based on their own advantages to better control the quality and cost of domestic raw materials. However, China's waste paper recycling rate is still less than 50% at this stage. Compared with Japan (79.5%), Europe (71.6%), the United States (66.2%) and other developed countries and regions, there is still a big gap in waste paper recycling. The level of national waste recycling has room for improvement in the long run.

The main process of recycling is to collect scattered waste paper from various places, concentrate and sort, and finally pack the waste paper. According to the "Mid-Long Term Plan for the Construction of Renewable Resources Recovery System" issued by China in 2015, the waste paper recycling system is designed as a three-level network, from low to high, namely community recycling points, sorting stations and packaging plants, and regional recycling bases. The waste paper generated by the waste paper generation source can enter any level, and the waste paper between the levels will also pass from low to high. Waste paper at all levels also has channels to flow directly to paper-making enterprises, or pass along the levels and finally to paper-making enterprises. The waste from the waste paper production source will not be passed directly to the paper making enterprises. However, the construction of this system is not optimistic. In the face of scattered waste paper recycling front-ends, China still relies mainly on "scavengers" walking the streets and lanes, cooperating with smart recycling trash cans, garbage sorting centers, and corporate tenders and acquisitions. Converging waste paper to waste paper sorting and processing enterprises or individual packing stations, the source construction of waste paper recycling is still
insufficient.

According to incomplete statistics, there are more than 10,000 waste paper sorting and processing enterprises and individual workshops in China. After 2000, due to the cancellation of the special approval of renewable resources, the entry barrier of China's waste paper recycling industry was zero, and the employees of the waste paper recycling industry were mixed. Speculators. The industry is developing actively. Processing outlets are small in scale, unevenly distributed, and mostly self-employed at random. Unlicensed operations. Industry malpractices such as mixing water and shoddy products have been repeatedly banned. The industry has been in a state of disorderly competition and chaotic operation for a long time.

Summarizing the problems of the current recycling market, there are mainly the following points: the waste paper recycling rate is low and the amount is insufficient, and the efficiency of secondary utilization is greatly reduced; waste paper recycling has not become an industry, lacking unified quality requirements and supervision standards; When the paper is recycled, the sorting work is not done well, so that all kinds of waste paper are mixed together, resulting in uneven quality of recycled pulp, and it is difficult to improve the recycling capacity; after the recycling is completed, there is a lack of correct storage and storage conditions. As a result, the quality of waste paper is seriously degraded. These problems will seriously affect the ecology of the entire industrial chain.

The recycling industry is at the upstream of the industrial chain and is responsible for providing waste paper raw materials for midstream companies, which are mainly paper-making companies. At present, the impact of the epidemic on the international bulk market has led to the price increase of raw materials and stricter domestic and foreign waste zero import policies, which have increased the cost of paper companies to purchase foreign waste paper. Paper companies’ demand for domestic waste paper as raw materials for papermaking has increased accordingly. This is a major benefit to recycling companies with competitive advantages in the recycling industry.

This project is based on the office paper recycling model designed by Deinker, using the characteristics of Deinker's delivery scene and the function of equipment paper sorting collection, which can effectively sort out the waste office paper, and store it according to different specifications, and finally realize office
waste paper Point-of-sale collection, forming its own recycling network. In the field of office waste paper recycling, this model will greatly improve the original waste paper recycling system. The waste paper recovery rate is low, the waste paper has different specifications, and the waste paper storage conditions are poor. Paper recycling efficiency. In general, this project adopts standardized treatment methods from the waste paper source, carries out efficient innovation and improvement of the current waste paper recycling market, obtains waste paper resources that are more in line with the back-end market demand of the industrial chain, and creates a more suitable for the current market situation. The recycling model will eventually form an advanced competitive advantage.

After recycling, it is the processing market for waste paper. The processing and production of waste paper is connected with many mid- and downstream enterprises in the industry chain, including waste paper pulp production, cardboard paper production, waste paper material production and even the production of agricultural products, chemical industrial products and other enterprises, and the most important ones are It is still a waste paper pulp manufacturer. The current main business model of the waste paper processing industry is to purchase waste paper-pulp processing-to produce recycled paper products. According to different types of waste paper, the types of recycled paper products will vary accordingly.

China's waste paper can be roughly divided into paper bag waste paper, kraft waste paper, white waste paper, old books, old newsprint, waste paper box cardboard and mixed waste paper. Among them, white waste paper is mainly composed of office waste paper. After deinking, it can generally be used in the production of writing paper and toilet paper, and it can also be used to make portable paper bags. However, the copiers and printers used in offices on the market today mostly use thermosetting toner, which melts the ink at high temperature and physically bonds it to the fiber. Traditional chemical and physical methods are not only expensive and complicated in equipment, but also severely damage fibers while removing ink stains. Residual sodium hydroxide, sodium carbonate, diethylenetriamine pentaacetic acid, sodium silicate in the deinking waste liquid , Hydrogen peroxide and surfactants also bring about the problem of high wastewater treatment costs. Therefore, in the processing of office waste paper, deinking treatment has become a crucial step, and due to the low level of
construction of the recycling system, most of the current office waste paper recycling is mixed with waste paper of different quality, resulting in the formation of For these two reasons, it is difficult to regenerate office waste paper into office paper and can only be used to produce low-end paper products. Under this situation, the raw materials of office paper mainly come from wood pulp. 

Nowadays, the traditional waste paper recycling and deinking technology is very mature, forming a complete industrial chain. There are no obvious technical difficulties in technology, and there is a lack of room for improvement and innovation. However, in the industry, the utilization rate of waste paper is not high, about 50%. In addition, due to fiber strength problems in papermaking materials, it is necessary to import high-quality waste paper from abroad in a certain period to improve the quality of domestically produced paper products. These are all obvious In terms of waste paper recycling, there is still room for improvement.

Starting from enzymatic deinking, our team designed an effective solution to the problem of difficult handling and emission in the processing links of the office waste paper recycling industry-Deinker. Its advantages are

1. The deinking effect is good, the whiteness of the paper is improved, the dustiness is reduced, and the yield and efficiency are improved;
2. With environmental advantages, the biological dissolved oxygen (COD) and chemical dissolved oxygen (BOD) in the wastewater from enzymatic deinking are greatly reduced, and the content of inorganic salts in the sludge is low, which greatly reduces the cost of sludge treatment.

For the deinking and in-situ recycling of office waste paper, this product uses high-efficiency enzymes to form a composite deinking system for deinking effect, paper whiteness, wastewater treatment and other dimensions. Support the direct discharge of deinking wastewater. Therefore, our products directly improve the recycling of waste paper from the consumer side, which has broad new application scenarios and greatly improves the environmental protection of waste paper processing.

2.3 Market research data

Our team received 486 valid questionnaires in the early market research.
Some of the results are as follows:

1. Paper usage of each group

According to the survey data, the average daily paper consumption and average paper consumption of each group are estimated (see Table 2-1). It can be seen that the average daily paper consumption of government employees is the highest, and the average university birthday paper consumption is the lowest, and they are the only group whose paper consumption is lower than the weighted average.

Combined with the survey on the willingness to use Deinker equipment (see Figure 2-3), the groups with greater willingness to use Deinker are consistent with the groups with greater waste paper generation. Therefore, the government ranked first in terms of waste paper generation and use willingness. The staff is the main group used by Deinker, and the main application scenario of the corresponding Deinker is government agencies.

Table 2-1 Average daily paper consumption and average paper consumption of different groups

<table>
<thead>
<tr>
<th>College</th>
<th>Office staff</th>
<th>Government</th>
<th>Schoolchild</th>
<th>Teacher</th>
<th>Self-employed</th>
<th>Freelance</th>
<th>Weighed average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student</td>
<td>enterprises</td>
<td>staff</td>
<td>employees</td>
<td>workers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Entrepreneurship plan-Deinker

| Average daily paper consumption/sheet | 1.28 | 4.84 | 7.08 | 5.60 | 5.67 | 3.94 | 5.56 | 3.49 |

Note: The average amount of paper used for paperless office is 0, 0-2 is 1, 2-5 is 4, 5-10 is 7, 10-20 is 15, and more than 20 is 20)

2. How to use waste paper by groups

Judging from the survey results (Figure 2-2), at present, secondary use and direct discarding are common methods of office waste paper disposal. Among them, the proportion of secondary reuse is the largest, floating in the range of 40%-60%. It seems that various groups have a greater sense of identity for paper reuse, so Deinker's waste paper recycling concept is easily recognized.

Direct discarding is the second most used waste paper treatment method, and the proportion of accumulated money sold and sent to recycling agencies is obviously the smallest. It seems that there is no universal high-value use method for office waste paper, or the current environmentally friendly recycling methods are not enough. Complete. Therefore, Deinker's high-value reuse of waste paper based on deinked recycled waste paper is easily recognized; in order to promote waste paper recycling to be more portable, and to promote the environmental and social promotion value of the enterprise, our company considers subsequent introduction of sorting in the equipment Waste paper system.

Keep the stored and unused paper, mostly archived paper carrying personal information, directly discarding or recycling it is easy to reveal personal privacy, Deinker deinking can erase privacy and help this part of waste paper enter the recycling system.
3. Deinker device willingness to use

In the investigation of the use intention and the degree of use prediction, see Figure 2-3. The government workers, students, enterprises and institutions, office staff, teachers, and individual private owners are all more willing to use deinking equipment to dispose of office waste paper. Among them, the government The forecast data for the use of departmental workers is significantly higher.
Figure 2-3 The willingness to use equipment of different groups
Chapter 3 Products and Services

3.1 Summary

Traditional waste paper recycling uses chemical reagents and high-temperature and high-pressure environments, which not only has low deinking efficiency and is difficult to implement, but also has poor pulp quality and serious environmental pollution. Paper companies have to invest a lot of costs on imported waste paper pulp. However, biological enzymes have gradually received attention in industrial production due to their mild reaction conditions, high efficiency and low environmental impact. This product adheres to the concept of green and environmental protection, uses synthetic biology as a means, adopts biological enzymatic deinking, and develops a deinking process with deinking efficiency and paper performance, aiming to achieve in-situ regeneration of waste paper.

This product is aimed at the most commonly used laser printing method for office paper. It selects cellulase, xylanase, lipase and laccase to construct a multi-enzyme composite system, and transforms it, and is designed to be suitable for office or home. The small deinking paper machine that guarantees the quality of paper fiber and supports the direct discharge of deinking wastewater allows users to complete paper deinking and regeneration anytime and anywhere, and obtain brand new A4 paper. It has a wide range of application scenarios and extremely high environmental value.

3.2 Product overview

3.2.1 Product Principle

1. The composition of paper. A4 paper used in a typical office contains cellulose, hemicellulose and clay or calcium carbonate.
2. **Laser printing.** Today's laser printer manufacturers each create unique toner particles through various refining chemical processes of filling and protection. The laser printer melts toner (solid powder) onto a sheet of paper.

3. **Interaction between cellulase and paper.** Cellulase is a family of enzymes that work together to break down cellulose into glucose. Three general types of enzymes, endoglucanase, exoglucanase and β-glucosidase, constitute the cellulase complex. Endoglucanases randomly destroy internal bonds along the cellulose chain, destroying the crystalline structure of cellulose. Exoglucanase cleaves the cellulose polymer from its non-reducing end to produce cellobiose, which is hydrolyzed into glucose by β-glucosidase.

4. **Interaction between xylanase and paper.** Xylanase belongs to the hemicellulase system. The principle of action is that hemicellulase acts on the xylosidic bonds of the hemicellulose backbone to randomly degrade the xylan backbone into short-chain xylo-oligosaccharides. There are also theories that hemicellulase breaks the bond between lignin and carbohydrate (LCC), so that lignin is released from the surface of cellulose. Therefore, the removal of lignin is accompanied by the removal of ink particles.

5. **The mechanism of action of lipase in deinking.** The application of lipase in waste paper deinking is that it can attack the ink and the ink binder, so that the bonding force between the ink and the fiber is weakened, and the ink and
the fiber are separated as much as possible by the method of flotation and washing.

6. The mechanism of action of laccase in deinking. Laccase (oxygen oxidoreductase, EC 1.10.3.2) is an extracellular copper enzyme, which belongs to a small class of enzymes by blue copper oxidase. Laccase can play a variety of roles in deinking: ① It degrades lignin and plays a role with small molecule mediators. Commonly used small molecule mediators are: ABTS, HBT, VIO, PTC, PT, etc., which act directly on lignin. ③ For the degradation of phenolic compounds in deinking waste liquid, laccase can perform one-electron oxidation of phenolic compounds; in addition, in the presence of electron transfer mediator molecules, laccase can oxidize non-phenolic compounds.

7. Selection of fiber bodies. This product uses fibrosomes to construct a cell surface display system, so that several enzymes we have chosen can act simultaneously. Cellosome is a multi-enzyme complex with complex structure and components produced by anaerobic bacteria such as Clostridium thermocellum. It is one of the most efficient cellulose degradation systems known in nature. The cellosome components and structure also have time and air-conditioning characteristics to adapt to the complex composition of lignocellulose, thereby ensuring its high-efficiency degradation activity. The cellulosomes also form a ternary complex with the substrate and cells through the cellulose binding module and the wall module on the tripod protein or cellulase. The synergistic effect between the cellulosomes and the cells can further improve the wood fiber. The saccharification efficiency of vegetarian.

3.2.2 Product function

Using the above product principles, combined with hardware design and mathematical modeling, this product can achieve the following functions: 1. Deinking of office waste paper. As mentioned above, this product first uses the selected chassis organism Pichia pastoris to express four modified enzymes (cellulase, xylanase, laccase, lipase), which work synergistically to maximize office waste paper On deinking. In addition, mathematical modeling is used to recognize ink dots on paper to achieve the effect of deinking with precision.

2. Recycling of paper after deinking to realize in-situ regeneration. Combined with the hardware with functions such as drying, the paper after deinking can be
remade. The degree of waste paper recycling is greatly improved, and the product is green and environmentally friendly during use, which is in line with the general trend of industrial development.

3. Future expanded functions:
(1) Establish paper sorting hardware in Deinker, return the paper that cannot be deinked by this product to the papermaking company, and improve the quality of recycled paper.
(2) Integration of printing, copying and deinking.
(3) The paper information is digitized, and the paper information is uploaded and then deinked.

3.2.3 Product application scenarios

**Scenario 1: The user wants to save resources and recycle waste paper.** Description: In the office, user Xiao Ming found that he needed to discard a large amount of printed A4 paper. Thinking of the advocacy of energy saving, emission reduction, and paper saving, Xiao Ming put these A4 papers into the deinking paper machine for automated waste paper deinking and recycling, and finally got new white paper for the next document printing.

**Scenario 2: The user wants to erase the private or confidential information on the file.** Description: When the user Xiaoming discards the documents printed with his ID number, home address or other private information, he hopes to dispose of them after processing, so as to avoid personal information security issues. The method of smearing or cutting with a pen is time-consuming and laborious, and there is still the possibility of information being restored, so Xiao Ming puts the document into the deinking paper machine, and after removing the ink, it is safe to discard or reuse.

**Scenario 3: The user urgently needs paper but there is no way to buy it temporarily.** Description: In the middle of the night, the user Xiao Ming found out that A4 paper was used up while printing urgently needed documents, and the shops were closed at this time. Because of time constraints, Xiao Ming put the previously printed A4 paper into the deinking paper machine, and after a while, he got a new A4 paper, which solved the urgent need.

3.2.4 Technical parameters

1. **Hardware parameters:** Driving voltage: 220V; operating power: 200W;
deinking time: about 1min; the number of papers that the enzyme box can support deinking: about 6250 sheets; the duration of enzyme activity: enzyme powder is inactivated at room temperature by 10%-15%/6 pieces Month, 5-10%/6 months under 0-10°C refrigeration conditions; equipment volume: 426x332x178mm.

2. **Technical parameters:**

This project selects cellulase, xylanase, lipase and laccase as enzymes for deinking, uses cellulase and xylanase to break the connection between ink and cellulose and lignin, and then uses lipase and Laccase degrades the removed ink to achieve the purpose of paper deinking and ink degradation. In the deinking process, we add cellosomes to construct a cell surface display system, which can not only realize the control of the ratio of cellulose and xylanase, but also improve the efficiency of deinking through the combination of cellulosomes and cellulose.

Due to the technical confidentiality of the design company, no specific statement is made in this part.

(1) Regarding the selection of enzymes:

Select cellulase, xylanase, lipase and laccase as enzymes for deinking.

(2) Control of enzyme ratio:

The main enzymes in deinking are cellulase and xylanase. In order to control the ratio of these two enzymes and further improve the efficiency of deinking, we introduce cellulosomes. On the one hand, the cellulosomes can be combined with the cellulose exposed in the paper, and the enzymes can better catalyze the decomposition of cellulose through the cellosomes, thereby improving the efficiency of deinking; in addition, after reviewing the literature, we have learned that cellulase and cellulose The optimal ratio of xylanase can not only achieve the effect of deinking, but also protect the paper fiber to the utmost extent.

(3) Deinking conditions:

Deinking process: temperature control, pH control;

End of deinking: drying;
3.2.5 Appearance design

The internal display of the deinking parts is shown in the figure:

Figure 3-3 Internal plan view of the deinking part
Figure 3-4 3D diagram of the inside of the deinking part. Left image: left view, middle image: right view, right image: rear view

The interior is composed of multiple parts, and the transmission of the sticky roller and the paper is controlled by the motor screw transmission system, and a heating lamp is hung on the upper part. The whole device is made of acrylic as the material of the bracket.

The external display of the deinking machine is as follows:

Figure 3-5 Outside of the deinking machine

The top is the paper input port, the front is the recycled paper outlet, the side is a touch operation screen, and the rear is a detachable paper storage bin. Paper that cannot be deinked or damaged will be stored here and collected by the staff for centralized processing.

3.3 Product innovation

In general, our company's product bio-enzyme waste paper deinking machine has the following innovations:

Revolutionary: Our company’s product is the world’s first real-time bio-enzymatic waste paper deinking technology, which completely breaks through the limitations of traditional technology. It is a disruptive technological
innovation that can achieve rapid printing paper and waste paper removal anytime, anywhere. Process recycling and produce new paper immediately, and the entire technical process is integrated and convenient.

Economical: The entire production process of the product does not require heat (steam), eliminates chemical energy (chemicals/reagents), can greatly reduce energy consumption and reduce costs.

Environmental protection: The entire process of using the products produced by our company is green and pollution-free. Due to the use of biological enzymatic deinking, it prevents the destruction of cellulose and eliminates the source of pollution from the root.

(4) Personalization: The biological enzyme waste paper deinking machine produced by our company fully meets the different personalized needs of users. Our company aims to make miniaturized, personalized, and household waste paper deinking equipment to meet different users aiming at different personalized needs such as environmental protection, privacy, security, etc.

3.4 Technical feasibility analysis

3.4.1 Required technology

1. Hardware required technology:

   1. **Embedded technology.** Deinker's entire system is built under the control of an embedded development board based on the Linux operating system. Based on this, it realizes unified scheduling of the entire device and realizes human-computer interaction.

   2. **Automation technology.** Based on this, Deinker realizes the unmanned process of the entire deinking process; the paper is shuttled between the various mechanisms through the stepper motor screw conveying mechanism, and three infrared sensors are used to detect whether the paper is in place, such as the sensor 1 of the spray mechanism. When the number detects the paper approaching, the sprinkler system will be activated.

   3. **Edge computing technology and Internet of Things technology.** Using the Deinker at the user’s place as an edge server, it can determine by itself whether each deinking operation is an effective operation, and upload its data to the main server port. The development team can analyze and optimize the program design based on this data, and distribute the optimization package
Realize real-time updates for each individual machine. At the same time, the equipment has a certain self-checking function, which can send fault information to the general server and the user’s mobile device, which is convenient for users and Maintenance personnel are aware of faults and perform maintenance, which greatly reduces the inspection time of peacekeepers and optimizes user experience.

4. **Statistical analysis techniques.** Through the improved response surface analysis method, the best ratio of enzyme solution and the best action time are obtained, and the deep learning convolutional neural network (CNN) combined with reinforcement learning and other algorithm strategies are used to realize the accuracy judgment after paper deinking, and at the same time assist Realize point-to-point deinking.

2. **Technology required for deinking:**

1. **Cell culture.** In the laboratory stage and in the early stage of large-scale fermentation, Pichia pastoris, an engineered strain that expresses the four enzymes in the product, needs to be cultivated so that it can express a large amount of the target protein. Moreover, in the laboratory stage, it is also necessary to cultivate the Escherichia coli used to clone the vector.

2. **Plasmid extraction.** In the laboratory research and development stage, it is necessary to clone the plasmids sent to the company for synthesis with E. coli to obtain a large number of required plasmids. After that, the required plasmids need to be extracted from Escherichia coli and transformed into engineered strains by electric shock after treatment.

3. **Electric shock conversion.** In the laboratory stage, the target plasmid needs to be transferred to Pichia pastoris after a certain treatment, so that the target plasmid can normally express the target protein in Pichia pastoris.

4. **Fermentation and protein extraction.** First, in the laboratory stage, the engineered strain transferred into the plasmid is fermented, and then the expressed protein is extracted to detect whether the target protein is successfully expressed. In the large-scale production stage, fermentation is an extremely important part.

5. **Protein purification and enzyme activity detection.** Perform Western blot analysis on the extracted protein to verify the successful expression of the target protein and purify it. Then, for different enzymes, specific methods are
used to determine the enzyme activity.

6. **Preparation of enzyme preparations.** Four enzymes with high enzymatic activity are prepared into enzyme preparations, which can be safely applied to hardware.

7. **Deinking and paper recycling.** After the product is formed, the enzyme preparation is added to the specially designed hardware, and the A4 paper that needs to be deinked is added. After a certain time of deinking at a certain temperature (low temperature) and other conditions, the paper is remade to achieve in-situ regeneration.

3.4.2 Whether existing personnel are competent

At present, the team members mainly have biological professional background, medical background and mechanical automation, etc., have professional theoretical knowledge, and can provide strong support for this product.

At present, this product can remove some of the ink from the office waste paper (full page A4 paper, using HP Laser 103 107 108 printing, Word default page editing), and it has proposed improved iterative methods from many aspects, including hardware, biological Experiment, modeling, etc. Although our equipment can not completely remove all the ink on a piece of paper, we have basically mastered the techniques of recombinant yeast to express the target protein, hardware construction, and modeling design, and we can complete the further iterative work of the equipment.

3.4.3 Required resources

1. **Plasmid synthesis.** In the laboratory stage, the designed gene sequence is sent to the company for synthesis, and the designed plasmid is obtained.

2. **Cell culture reagents and consumables.** Whether in the laboratory stage or the large-scale production stage, sufficient cell culture materials, such as medium materials, and equipment such as shakers, etc., are required during the culture process. In addition, some conventional consumables such as gloves and lab coats are needed during the experiment.

3. **Fermentation equipment.** In the large-scale production stage, the scale of the experiment is completely different from that of the laboratory, which requires industrial equipment for the fermentation industry, such as fermentation
3.5 Product R&D and Design

3.5.1 Selection of chassis organisms and expression vectors

The engineering bacteria commonly used in laboratories and industry are Escherichia coli. After searching a large amount of literature and making multiple comparisons, the eukaryotic Pichia pastoris was selected as the engineering bacteria. Because, compared to E. coli, Pichia pastoris, as a eukaryotic organism, can perform post-translational processing of proteins, and the expression product can be secreted and expressed, easy to purify, and the most important thing is its high expression level.

After selecting the engineering strain, the corresponding expression vector was selected for the selected strain. The reason for the selection is that it breaks away from methanol induction and reduces the risk of poisoning in future applications.

3.5.2 Selection of enzymes for deinking

**Consider the application scenarios of enzymes.** Searching the literature shows that most of the large-scale deinking equipment is carried out in a high temperature and high pressure environment. At this time, it is important to observe whether the optimum temperature of the enzyme and the temperature range of more than 75% of the activity cover the high temperature environment. In this design, according to keywords such as “domestic” and “small”, it can be known that enzymes whose optimum temperature is near room temperature and are not sensitive to temperature changes are more energy-saving and environmentally friendly.

As with temperature, the pH should be avoided as far as possible in strong acid and alkali environments, and the most suitable pH of the enzyme should be selected in the neutral range, and the enzyme activity is not sensitive to pH changes. Taking the PH in the deinking system into consideration, it is in line with the settings of small household deinking machines. Deinking is a process. It is impossible to ensure that the temperature and pH are constant at a certain value. The enzyme must have the ability to withstand environmental fluctuations, and maintain the correct protein conformation and higher enzymes when the
temperature or pH is not optimal live. This can also save the cost of temperature control devices and buffers to a certain extent.

The reusability and stability of enzymes are critical to cost. In many enzyme reaction systems, there are many solutions to improve the utilization efficiency of enzymes, such as enzyme immobilization and recovery. In addition, the stability of the enzyme itself is also very important. With reference to previous work, we found that waste paper deinking takes a long time, so when selecting enzymes, we must pay attention to how the enzyme activity decreases after a long time reaction of the enzyme.

Other factors, such as high redox potential, low Km value, insensitive to metal ion/salt stress, unpatentable gene sequence, regular expression or induced expression, etc., need to be included in the consideration of enzyme screening. And according to actual operation feedback, further adjustments are needed in the later stage.

3.5.3 Fibrosomes

Fibrosomes rely on the "anchor-adhesion" (cohesin-dockerin) mechanism to form a structured multi-enzyme complex structure that anchors it on the cell surface. At this time, the enzyme is in a closed state. When the reaction substrate is cellulose, the closed structure is opened to fix the bacteria on the substrate, and the catalytic domain is fully in contact with the cellulose, thereby efficiently degrading the cellulose. After the cellulose is degraded, the ink particles on it will fall off, so as to achieve the purpose of deinking. Through cell adhesion proteins and anchoring proteins, the structure of fibrosomes can fix many catalytic domains on the cell surface, which is similar to a surface display system.

A variety of enzymes can be used in deinking. Using the structure of cellulosomes, multiple enzymes can be immobilized on the surface of a cell at the same time, so that they can work together to better achieve the purpose of deinking. By consulting the literature, it is found that cellulase, xylanase, laccase and lipase can perform their functions well together. Therefore, the selected enzymes are assembled on the cellulosome after multiple comparisons.

Cellulase and xylanase mainly degrade cellulose and lignin, while laccase and lipase are mainly used for a treatment after deinking, so the cellulase and xylanase are combined to reduce Steric hindrance; the ratio of cellulase and
xylanase is controlled by the ratio of the attached anchor protein, which is also an advantage of cellulosome assembly.

3.5.4 Hardware design

The operation of the entire hardware system is controlled by the linux-based embedded development version. The whole system is divided into five parts, the paper transmission part, the heating and drying part, the enzyme spraying and scraping part, the intelligent recognition part, and the human-computer interaction part.

The paper transmission part is the main body of the motor screw transmission device; the paper will be fixed on a carrier board. The design of the mounting board is shown in Figure 3-6, and the physical image is shown in Figure 3-7.

Figure 3-6 Carrier board design
Figure 3-7. The physical diagram of the deinking prototype

The carrier board is divided into two layers, the upper layer is fixed with the paper, and the lower layer can be placed with a heating plate. The entire cardboard is fixed on the conveying slide rail of the guide rail by screws.

The heating and drying part is shown in Figure 3-7. It is composed of a heating lamp and a heating plate. The heating lamp is located above the transmission system, and the heating plate is located on the lower layer of the cardboard; the moisture and water vapor on the paper are evaporated by baking by raising the temperature. Will be sucked out of the device by the cooling fan.

The enzyme spraying and scraping part is composed of a small water pump with a head of 0.55 meters and a pipe, which covers the paper by spraying the enzyme solution; when the paper deinking enzyme reaction is completed, the sticky roller will drop and stick to the surface of the paper. The fiber layer removed.

The intelligent recognition part is performed by the camera, which can set the time and amount of ink removal and determine the effect of ink removal by
recognizing the paper before and after the ink removal is completed.

The human-computer interaction part is composed of a touch panel and a WIFI module. The user can control the device through the operation of the touchpad or mobile device, and can also browse the current status information of the device.

Figure 3-8 Conceptual diagram of commercial board of deinking machine

3.5.5 Modeling design

1. Modeling environment

Python 3.8.5, pytorch 1.8.0, torchvision 0.8.2, cuda 10.2, editor VScode; MATLAB R2019b.

2. Modeling description of product layout

The use of deinking machines is closely related to our daily affairs such as life, study, work, etc. We cannot do without the disposal of waste paper at home, in school, in the company, etc., so when and where we can in real life The use of deinking machines is a problem that cannot be ignored for us, so we mathematically model the location and quantity layout of deinking machines in the city in order to obtain the best product delivery method at the relatively lowest cost.

The layout of the product cannot be separated from real life, so we randomly selected the map of a certain city and abstracted it. Among them, we focused on the POI layout of 17 industries.

We use python to capture data from Baidu Map API (refer to Baidu data collection API description for the parameter settings). The 17 industry-related POIs include food, hotels, shopping, life services, beauty, tourist attractions, leisure and entertainment. , Sports and fitness, education and training, cultural
media, medical care, automobile services, transportation facilities, finance, real estate, companies, government agencies. We draw it on the coordinate map, distinguish different POIs with points of different colors, and finally get the following schematic diagram:

Figure 3-9 Schematic diagram of POI layout

In this way, we get a map of the layout of important buildings in a certain city.

We consider the seventeen types of POI separately (for large differences in the same type of POI, we use the average value), combined with our relevant research data to obtain the applicability of different industries to the deinking machine, and consider their de-inking machines. For the usage of the inking machine, we assign a relevant coefficient to each POI to measure the willingness of the POI to use the deinking machine. The larger the coefficient, the stronger the willingness of the POI to use the deinking machine. Otherwise, the willingness to use it relatively low.

Below we consider the best radiation range of a deinking machine and the
maximum use tolerance in a certain period of time, that is, we need to consider how far away we need to set up a deinking machine to allow people around to use it, and it will not be too far away. No one or very few people use the situation, and it will not happen that the setting of too few deinking machines in crowded places will cause the deinking task to be far greater than the limit that the deinking machine can withstand, resulting in damage to the machine or people for a long time. The situation where the deinking machine cannot be used in the queue.

Then we use Gaussian mixture to cluster the POI layout, and the clustering rule is the POI coefficient and relative average of each class. Without clustering, the algorithm complexity for us to directly traverse the entire city to arrange points is extremely high, so we divide the city into multiple parts, and each part is connected by the correlation of the coefficient of POI. Provide convenience for the follow-up deinking machine layout. At the same time, the mixed Gaussian algorithm that we adopt, in principle, can use the mixed Gaussian to simulate any other distribution situation, and further reduce the error of the model.

Therefore, it is easy for us to use dynamic programming and graph theory algorithms to lay out the deinking machine in the POI layout diagram after clustering, and finally we get the final deinking machine layout diagram as follows:

![Figure 3-10 Layout of Deinking Machine](image)

Therefore, in any city, we abstract the important POI, and then make good use of the relevant attributes of the POI and the deinking machine, we can easily deploy the deinking machine to the city.

3. Model description about ink dot recognition
A very important part of the deinking process of the deinking machine is to determine whether the ink dots on the original paper have been removed. If we completely follow the general law obtained by ordinary experiments, only use the input paper To measure the cleanliness of the output paper, when we encounter paper printed with special ink, under normal circumstances, the action time judgment method will be invalid, so we need to take an appropriate way to judge whether the paper has been Deinking is clean, whether it can be output normally. So we established a related mathematical model to solve this problem.

Our model uses computer vision to make judgments. Considering that the thickness of an A4 paper will become thinner after the deinking process, if only black and white recognition is used, it is difficult to distinguish the remaining ink dots on the paper. The foreign matter after the paper becomes thin, which will cause the output judgment to be seriously hindered.

So we use a convolutional neural network for paper image recognition. We use computer simulations and related experiments to get the paper changes before and after deinking. We use it as input to train the network. At the same time, we get the correlation coefficient graph of the processed ink dots as follows:

![Figure 3-11 Correlation coefficient diagram of ink dots](image)
But in the same way, we will still be disturbed by impurities in the paper. The robustness of the model is low, and it is difficult to distinguish the difference between impurities and ink dots, so we introduce a new mechanism to alleviate this phenomenon.

We introduce the "strategy-reward" mechanism of reinforcement learning, that is, set a reward value for each walk, and choose our new strategy by performing high reward behaviors. In this way, the robustness of the model is effectively improved, and at the same time we It also uses the idea of decision trees to help us choose to make decisions.

The final accuracy rate of the optimized model after 1000 iterations reached more than 90%, so it can basically be considered that the influence of impurities in the paper has been eliminated.

At the same time, we also further elaborate on the interpretability of neural networks:

Based on the existing methods, the interpretability method is divided into three parts according to the training process of the model.

**Pre-training**

\[
\text{argmax}_{E} Q(E|\text{human, task, data})
\]

In this process, what we have to do is to understand the data as much as possible, so the main task in the early stage is data analysis. The main methods are data visualization and so on.

**Training process**

\[
\text{argmax}_{E, \text{model}} Q(E|\text{model, human, task, data})
\]

This process can be understood as how to build an interpretable model. Training the model while creating interpretability during the training process is actually equivalent to the interpretable model we created.

**After training**

\[
\text{argmax}_{E} Q(E|\text{model, human, task, data})
\]

This process is to explain the black box algorithm and decision rules through the results. The main methods are sensitivity analysis and gradient-based methods. Sensitivity analysis is to analyze the model according to the performance of the model on the sensitive data. For image recognition, the gradient-based method is to change the gradient of each pixel of the image, and then analyze the judgment basis of the neural network for image recognition.
So we explained the interpretability of the network in the three parts of the model.

3.6 R&D progress

3.6.1 Completed part

1. The effects and principles of cellulase, xylanase, and lipase on the deinking of office waste paper have been preliminarily verified. Commercial enzymes have been used to complete deinking experiments and obtain a large amount of experimental data.

2. The designed plasmid has been successfully transferred into Pichia pastoris, and cellulase and lipase have been successfully expressed.

3. The modeling design of product layout and ink spot recognition has been completed.

4. Complete the design and production of two generations of deinking machines, and complete automated deinking tests on the machines, and get feedback to optimize the equipment. as the picture shows

Figure 3-12 Part of the physical map of the first generation
3.6.2 Under development

1. Introduce the combined enzyme gene into Pichia pastoris to achieve continuous production of enzyme solution.

2. Based on the previous experimental results, optimize the iterative deinking machine and approach the final commercial product.

3.6.3 Final product expectations

We will eventually be able to produce deinking enzymes by ourselves and make them into enzyme powder for sale on the market. It can be transported over
long distances and stored for a long time, and users only need to brew it by themselves and use it directly. Our equipment can finally be miniaturized, the size is the same as a general office small printer, and it also has the same operating process as a printer. The user only needs to put the paper into the paper slot, and then wait for the paper to be taken out after the deinking is completed. The deinking time is also printing speed of standard printer.

Figure 3-13 Conceptual diagram of the final product
Chapter 4 Business Model

4.1 Value proposition

Deinker is an innovative device based on a biological enzyme method that can deink and regenerate office paper in situ. In the face of today's serious paper waste and difficulty in paper recycling, this project hopes to provide more office groups with integrated office waste paper recycling and centralized recycling solutions through Deinker.

Through Deinker, office waste paper will be sieved into non-deinkable waste paper and deinkable waste paper. Non-deinkable waste paper will be recycled into the recycling network, and deinkable waste paper will be deinked. Recycled as printable paper is returned to the user. This innovative waste paper recycling program converts waste paper with little use value into recycled paper that can be reused or a variety of valuable service returns, bringing users a more environmentally friendly, low-cost and convenient waste paper utilization experience, saving paper and environmental protection costs, will profoundly affect multiple scenarios such as administrative data printing, campus education, corporate confidentiality, etc., change office paper consumption and cause huge waste, urban waste recycling efficiency and low cost, and the paper industry cause a series of environmental problems. The current situation.

4.2 Customer group

According to our team’s previous survey of various office groups (486 valid samples in total), we position government department workers, teachers, primary and secondary school students, and office staff of enterprises and institutions as the primary target group of the project, and first actively expand these customers in the group actively engage in business dealings with consumers and related groups and departments in the group, develop and iterate equipment based on the needs of the primary target group, and create office waste paper for multiple scenarios such as government, campus, and enterprise. Ink equipment and related
consumables. With the further development of the market, we will gradually provide more office groups with printing and copying and office waste paper processing services.

![Figure 4-1 Target customer groups](image)

4.3 Core resources

At present, biological enzymatic deinking has accumulated enough technology and experience, and it has been used by many factories as a substitute or supplement for traditional chemical deinking technology. On the one hand, the multi-enzyme deinking technology designed by our team integrates the functions of waste paper deinking and regeneration and wastewater treatment; on the other hand, it enters the cellosome system and has carried out a new type of transformation of the cellosome, which has not been in the same field. Competitors with similar capabilities have been discovered, and related patent applications are being prepared to obtain patent protection.

At present, the scenes that use biological enzymatic deinking are all large paper mills. There are many innovations and technical difficulties in the use of enzymatic deinking recycled paper in miniaturized machines. A series of hardware, Biology, digital simulation and other technologies are the company's core technical competitiveness.

4.4 Key business

This project is committed to providing integrated office waste paper recycling and centralized recycling solutions through Deinker for more office groups. After a certain market size, we will use our products to form waste paper recycling outlets to help customers build a solution that is both environmentally
friendly. Effective and economical office waste paper recycling system. Maintaining customer relationships by effectively meeting customer needs and spreading environmental protection concepts will ensure the normal operation of our business model. Around this service concept, our key businesses are as follows.

Table 4-1 Company key business table

<table>
<thead>
<tr>
<th>type</th>
<th>content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early stage</td>
<td>Provide equipment and products of reliable quality;</td>
</tr>
<tr>
<td></td>
<td>Provide reliable after-sales service (equipment maintenance, technical support);</td>
</tr>
<tr>
<td></td>
<td>supply chain management;</td>
</tr>
<tr>
<td>Mid-late</td>
<td>Build efficient waste paper recycling outlets based on office scenarios;</td>
</tr>
</tbody>
</table>

4.5 Channel access

This section describes how the project communicates and establishes contact with the target customer group in order to convey its value proposition to each other. The channel of this project is mainly composed of two parts: publicity channel and delivery channel.

4.5.1 Propaganda Channel

In the early stage of market development, the promotion of the environmental protection concept and product concept of this project is the top priority.

1. Target group: ordinary consumers.

2. Approach: Pay attention to online and offline interaction. Online use of our own website promotion, online community promotion, advertising and other methods to introduce our equipment products and service tenet; offline, choose a variety of activities including exhibitions, office scene product experience, etc. to display our equipment prototypes and functions Demonstration, to provide the most realistic and intuitive experience for the target customer group.

3. Purpose: To increase the recognition of ordinary consumers to the value proposition of this project, and to further increase the market's acceptance of innovative environmentally friendly products.

4.5.2 Delivery Channel
According to the actual product delivery situation, we divide the delivery channel into two channels: sales and after-sales.

1. Sales

The sales channels of this product are divided into online e-commerce network sales and offline sales.

For online sales, customers can inquire about the relevant information about the products of this project on the project's own website or major e-commerce platforms, and obtain consulting services provided by our team. At the same time, products and deinking agents supporting the products are sold on major e-commerce platforms.

For offline sales, based on the results of modeling analysis, our team will set up sales outlets in places where potential customer groups gather, carry out product experience activities, expand product awareness, cooperate with online promotion, contact possible potential customers or call contact Intended customers to introduce and explain the relevant information of the equipment of this project to the customers.

For customers who are willing to buy, our team will provide them with a set of suitable office waste paper recycling solutions. For customers who have placed orders, our team provides a series of services such as logistics and distribution, equipment installation and instructions for use to ensure the user's purchase and use experience.

2. After sale

The after-sales channels of this project are divided into equipment maintenance and additional services.

For equipment maintenance, our team will provide customers with services such as daily maintenance and troubleshooting as needed.

For additional services, we will try to add services such as printing and copying in the later stage, and provide services such as network calls for waste paper recycling, replenishment of consumables, and product upgrades according to customer needs.

4.6 Cost structure
Entrepreneurship plan-Deinker

The cost structure of this project is divided into two parts: fixed cost and variable cost. The content is shown in the table below.

Table 4-2 Cost structure

<table>
<thead>
<tr>
<th>project</th>
<th>source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed cost</td>
<td>Sales store and property expenses; Store design and decoration;</td>
</tr>
<tr>
<td></td>
<td>Store cleaning and maintenance; Office rent, design, decoration and</td>
</tr>
<tr>
<td></td>
<td>maintenance; Office equipment and tools lease and purchase; Build,</td>
</tr>
<tr>
<td></td>
<td>develop and maintain management information system and own website;</td>
</tr>
<tr>
<td></td>
<td>Employee compensation and benefits; Cost of production;</td>
</tr>
<tr>
<td>Variable costs</td>
<td>Logistics costs at the end of the supply chain; R&amp;D costs; Marketing</td>
</tr>
<tr>
<td></td>
<td>cost</td>
</tr>
</tbody>
</table>

4.7 Revenue model

The main source of income for this project comes from Deinker's two commercial models of equipment sales and equipment leasing, and a variety of profit channels are formed around these two commercial models.

The commercial model of Deinker's equipment sales means that customers purchase Deinker and obtain the ownership of Deinker. On Deinker that has the basic paper deinking function version, customers will continue to purchase deinking fluid as equipment consumable materials. After the company's development is stable, other advanced functions can be added for payment, such as paper recycling and sorting system, network waste paper recycling service function, printing function, etc.

Deinker's equipment rental business model means that our team and partners have reached a long-term cooperation agreement. We provide equipment and services, and the partners provide support such as venues and funds to provide a complete centralized recycling of office waste paper for the office crowd in the equipment placement scene. And recycling solutions. Under this model, we will
have a variety of profit channels, including one, the device provides a variety of paid value-added services, and the second, advertising on the device.

4.8 Customer Relationship

Maintaining good customer relationships is an important factor in ensuring the smooth operation of business models. Based on Deinker as a device to solve the problem of office waste paper, its customers have less social needs, using us to design the following customer relationships to more efficiently respond to customer needs.

The primary customer who purchases Deinker has obvious demand for office paper, so the paper recycled from the equipment developed by this project should have the quality that customers can use normally, and this requires our team to closely contact with customers and adjust in customer feedback our products are expected to be more highly recognized by customers. In addition, Deinker is committed to solving the problem of comprehensive utilization and recycling of office waste paper in the office scene. This requires our team to continuously optimize our product equipment and fully solve our overall office waste paper problem, thereby bringing more improvement to our customers. Good use experience.

4.9 Important cooperation

Important cooperation describes the network of suppliers and partners needed to ensure the smooth operation of the business model. Important cooperation projects include:

<table>
<thead>
<tr>
<th>Serial number</th>
<th>content</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Suppliers of raw materials</td>
</tr>
<tr>
<td>2</td>
<td>Equipment manufacturer</td>
</tr>
<tr>
<td>3</td>
<td>Cooperative distributor</td>
</tr>
<tr>
<td>4</td>
<td>Waste paper recycling companies</td>
</tr>
</tbody>
</table>
Chapter 5 Marketing Strategy

In this section, we will first use STP theory to segment the project market and determine the target market and product market positioning. Later, the 4P theory will be used to determine a marketing mix strategy suitable for the project to promote its better development.

5.1 STP analysis

5.1.1 Market Segmentation

In the waste paper recycling market, Deinker is an innovative waste paper recycling and utilization equipment. We need to identify a market segment that has huge development potential and a large market scale, and is consistent with our equipment characteristics and technical advantages as the target market. In this way is conducive to the development of this project.

Based on Deinker's design philosophy, our customers will come from office groups with huge paper consumption, and different office groups have different paper habits and environmental protection needs. Based on this hypothesis, according to the team's early market research, we found that different office groups have different paper-using habits, but from the perspective of environmental protection needs, there is not much difference between office groups.

Due to Deinker's innovation, its market segmentation is difficult to find similar finished models for analogy. Therefore, based on the preliminary research, we have determined the market segmentation rules based on the occupation of the office group, and the paper habits and some environmental protection needs as the basis for segmentation.

<table>
<thead>
<tr>
<th>Segmentation variable</th>
<th>details</th>
</tr>
</thead>
<tbody>
<tr>
<td>profession</td>
<td>College students, office staff of enterprises and institutions, government department staff, primary and secondary school students, teachers, self-employed private owners, freelance workers</td>
</tr>
<tr>
<td>Average daily paper</td>
<td>Below average, above average</td>
</tr>
</tbody>
</table>
Entrepreneurship plan-Deinker

<table>
<thead>
<tr>
<th>consumption</th>
<th>Waste paper disposal</th>
<th>Willingness to use</th>
<th>Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Throw away directly, secondary use in draft form, destroy, keep storage and idle, accumulate and sell money, and send to recycling agency</td>
<td>At a high level, at a medium level, at a low level</td>
<td>Environmental benefits, economic benefits</td>
</tr>
</tbody>
</table>

5.1.2 Target Market

A higher average daily paper consumption is a prerequisite for a higher average daily waste paper production. Based on this, this project considers first to meet the needs of the larger paper consumption groups. From the survey results, the average daily paper consumption of only the college student group is lower than the weighted average daily paper consumption of each office group, so the market segment characterized by the college student group is first excluded.

Paper use and waste paper disposal are inseparable. According to waste paper disposal habits, a certain group of paper use conditions can be judged, and the demand for waste paper disposal can be further inferred. In the habit of waste paper disposal:

① Throwing away directly indicates that the waste paper in this group has not obtained high enough direct reuse value;

② Secondary use can indicate that in this group, the residual value of waste paper as paper after use is still recognized and actively used;

③ Destruction shows that this group still has the need for security and confidentiality of waste paper;

④ Reserved storage and idleness indicate that this group has irregular waste paper reuse needs and recognizes the surplus value in waste paper, but it has adopted passive behaviors toward waste paper reuse;

⑤ Accumulating to sell money shows that the way to realize the surplus value of waste paper recognized by this group is economic gain, and economic considerations are more obvious;

⑥ Sending it to the recycling organization shows that the way to realize the residual value of waste paper recognized by this group is environmental protection gain, and environmental protection considerations are more obvious.

According to different behaviors and habits, the target market we are concerned about should be: This group first needs the residual value of waste paper or recognizes the gains brought by the reuse of waste paper, and secondly
Entrepreneurship plan - Deinker

believes that environmental protection considerations are higher than economic considerations.

Therefore, based on market segmentation and combined with the characteristics of our projects, we give priority to the groups who are accustomed to secondary use, destruction, storage and idle waste paper, and comprehensively consider their environmental protection needs.

The willingness to use is an important reference indicator that directly indicates the demand for equipment of each group in combination with their own conditions. Through this subdivision standard, we give priority to excluding groups with a lower willingness to use.

According to the product characteristics of this project, Deinker’s primary function is to complete the in-situ recycling of office waste paper and realize the environmental benefits of waste paper. The second is to form an auxiliary environmental recycling network and bring economic benefits. From this point of view, In the priority of priority, our target customers should pay more attention to environmental benefits than economic benefits.

In summary, we have determined that the target market of this project is a group with a high amount of paper, a demand for reuse or recycling of waste paper, a willingness to use equipment at a mid-to-high level, and a group that pursues environmental benefits higher than economic benefits. They are mainly distributed in Government department workers, teachers, primary and secondary school students, and office staff of enterprises and institutions.

5.1.3 Market Positioning

Through the above analysis, the target market is determined, and combined with our product characteristics and business model, the market positioning determined by this project is to provide an efficient and environmentally friendly integrated office waste paper recycling and centralized recycling solution for the target office population.

Customer groups: As the services provided by our products are relatively innovative and the products are suitable for use by a certain number of groups, our customers are mainly characterized by environmental protection needs and large paper needs, including schools, enterprises, institutions, government departments, etc. Promote our products to our user groups through sales or
cooperation.

Propaganda concept: In our conceptual positioning, we mainly promote the concept of cost reduction, environmental protection and social benefits brought by environmental protection office. Starting from our product technology and product concept, let customers intuitively understand the positive impact of waste paper recycling, so that customers can accept emerging environmental protection technologies and products, and finally form an environmental protection concept under the new system. This is our long-term and important work.

Plan: Considering factors such as high product R&D costs, our team plans to adopt a non-differentiated market strategy in specific market segments in the early stage. First, we will directly introduce successfully developed deinking products to the market, so that we can concentrate our strengths. Effective cost-saving, and can make the product and the company's popularity increase rapidly, and then gradually establish a recycling system and recycling network.

Risk: The product category developed by the company in the early stage is relatively single, and the docking is an undeveloped market. The demand forecast analysis of the user group may be inconsistent with the problems faced in the actual promotion process. If our team fails to respond in time and is If you make adjustments, you are likely to fall into development difficulties and struggle.

Coping strategies: In order to diversify risks, the company should consider gradually introducing differentiated market strategies. According to customer demand levels and differences in market segments, other products are derived on the basis of leading products, and there are more products in terms of product functions, pricing and marketing methods. Pertinence, expand the differentiated target market to meet the needs of office paper recycling in more scenarios, so as to achieve the purpose of reducing business risks.

This section uses the STP model to subdivide the office waste paper recycling market and determine the target market. Finally, the product promotion method is formulated based on its own product advantages and business model. At the same time, combined with the characteristics of the project, a staged marketing strategy was proposed, which laid the foundation for the 4P marketing strategy in the next section.

5.2 Marketing mix strategy
Marketing mix is a series of marketing decisions made by management in order to implement positioning strategies and achieve goals. These decisions are commonly referred to as 4P marketing mix strategies, including: products, promotions, channels, and prices.

5.2.1 Product Strategy

The project intends to use Deinker as the leading product and biological enzymatic deinking as the core technology, and then gradually develop the Deinker-based office waste paper recycling system to build its own recycling network; on the other hand, multi-directional research and development of office based on biological enzymatic method Waste paper deinking and recycling equipment (including but not limited to deinking pens), and also committed to the research and development of more types of paper products recycling and recycling technologies. Finally, a complete integrated solution for the recycling and centralized recycling of office waste paper for the office community will be formed.

Products include equipment and related services, with equipment sales as the core profit. At the same time, we have designed supporting sales strategies to make diversified profits exist

(1) Deinker hardware device
   a) Deinker device native;
   b) Consumables such as deinking liquid.

(2) Service
   a) After-sales service, including replacement of damaged devices, maintenance costs, product upgrades, etc.;
   b) Provide technical services for customers who need to build an office waste paper recycling network;
   c) Based on the experience accumulated in product development, provide technical services for the treatment and application of other waste paper products;
   d) A variety of paid value-added services are provided on the device, including but not limited to printing, multiplexing, etc.

(3) Commercial cooperation
   a) Advertising space: After the formation of the system network, the
company plans to put equipment in public areas for public experience, attract investment and place advertisements here;

b) Cooperate with packaging factories or paper mills in the recycling industry chain to establish centralized waste paper recycling outlets.

(4) Technical products

a) Sell products or technologies directly;

b) Targeted transfer of part of the rights, in the form of dividends, to achieve win-win cooperation;

c) Reach a service agreement with customers who have usage needs but will not choose to purchase complete sets of equipment due to special reasons, and get rewards in the form of renting products or providing technical support.

All in all, having advanced products and technical capabilities to achieve phased benefits is only a successful start. On this basis, accelerate the progress of product research and development, sell to the market as soon as possible, and achieve a steady and sustainable growth rate in order to maximize profits.

5.2.2 Price Strategy

At present, there are no competing products with the same functions as our company’s products on the market. Our company is currently in the role of market blue ocean pioneer in the industry, and the company is a technological innovation enterprise. The intangible cost of product research and development is relatively high, and pricing is required. A certain percentage of profit rate is guaranteed, so considering all aspects, our company decided to adopt the following pricing model:

\[ \text{Price} = \text{unit cost} \times (1 + \text{appropriate floating profit rate}) \]

In the early stage of market development, considering that our company needs a certain amount of capital to protect the company's operation and development, first choose a moderate profit rate.

In the mid-market development period, with the formation of the product ecosystem, we consider appropriately increasing the profitability rate so that the company can obtain more sufficient funding motivation.

In the later stage of market development, in order to fully expand the market and grasp a huge market share, our company will choose a lower profit rate and
become a leading enterprise in this field.

This pricing model has some loopholes in operation management. In order to ensure the standardization of the price strategy implementation process, cost management must be strengthened. Especially considering that the company’s products are small automated machinery and equipment, involving many parts and accessories, and using high-tech such as genetic engineering, protein expression, etc., the product pricing will be directly affected by cost control. Before the product is officially produced, the company needs specially establish the corresponding quality control department. In the process of purchasing equipment parts and strict quality control, companies also need to adopt corresponding cost management methods and pay attention to the relationship with suppliers to reduce all costs related to management, transportation, production, and procurement. In addition, it is necessary to conduct surveys on procurement costs in a certain period, form a report and submit it to the general manager's office for discussion, and complete the cost control process.

5.2.3 Channel Strategy

The equipment and related accessories of the company's leading products adopt a direct sales model. Because the direct sales model can maximize the quality of products and services, and collect customer needs and feelings in a timely manner, it is conducive to our development of emerging markets, while reducing channel costs, increasing company profits, and ensuring the company's survival and operation. Specifically, in the early stage of promotion, we mainly adopt a retail model. On the one hand, sales staff introduce and promote our products to target customer groups. On the other hand, we also implement online sales through the company’s website and major e-commerce platforms. In the later stage, we After forming a certain degree of popularity and corporate strength, we will consider discussing centralized procurement with larger units of customers, helping more and larger office scenes to achieve centralized recycling and recycling of office waste paper, and ultimately gaining larger sales and stronger stickiness Customer network.

For equipment consumables, value-added services, etc., a cooperation model is adopted. Equipment consumables are sold in a distribution mode. Because such products are standardized products with single functions, low after-sales demand,
Entrepreneurship plan-Deinker

and low unit prices, we hope to increase the company’s profits by means of small profits but quick turnover. In addition, the company’s own resources and manpower are limited. Therefore, Transferring profits to channel distributors in the channel will help promote the development and progress of the enterprise quickly. Commercial cooperation is adopted for value-added services. For example, value-added services such as printing and printing can be considered to cooperate with printer manufacturers for mutual profit.

5.2.4 Promotion Strategy

In the process of developing products for market promotion, the company must combine the characteristics of the products to plan a comprehensive product image, which has inestimable value. Clarifying the positioning of the company's product image and disseminating it in a variety of ways can enable the company to gradually cultivate a good image in the process of promoting and promoting products. Specifically:

**(1) Provide free trial products to key customers**

In the early stage, it provided free products for some government departments, campuses, and enterprises and institutions for the target user groups to experience. By personally experiencing the in-situ recycling of office waste paper, customers can better understand the environmentally friendly recycling technology of office waste paper and appreciate the advantages of this product, including the product's efficiency, practicability, and the novelty of principle and technology. Allowing customers to quickly understand and adapt to new technologies and new products will help the company gradually expand product coverage and audiences.

In addition, it is necessary to carry out technical exchanges and cooperation with paper-making enterprises and relevant universities, and actively combine theory and practice, theory and products, and finally form a virtuous circle of theory, products, and practice.

**(2) Internet promotion**

China has fully entered the era of mobile Internet. According to statistics, China's netizens have reached 800 million, while mobile phone network users have reached 780 million. Therefore, the use of online channels for promotion can quickly increase the visibility and influence of the company with the help of a
large group of online users. At present, the company is preparing to establish its own website and has entered the development stage. It has also settled in many online media communities such as WeChat public account and Weibo to promote the company and product concepts and advantages. At the same time, it also plans to organize soft and introductory articles and hard advertisements on the websites of major domestic and international scientific research institutions. With the increase in business volume, it will also carry out online consultation and other services. In addition, the company will also choose to cooperate with a professional network marketing team in the marketing process to better utilize the advantages of network platform publicity.

(3) Actively participate in the exhibition

Actively participate in domestic and international exhibitions related to the environmental protection industry, paper industry, renewable resource industry and other related industries. For example, the company currently plans to participate in Chengdu International Expo and Shanghai Paper Exhibition. Among them, "China International Expo Chengdu Exhibition" is the western China sub-exhibition of the world's largest environmental protection exhibition-Munich IFAT. The exhibitors are the strengths of the environmental protection industry. Relatively strong institutions and enterprises, the Shanghai Paper Exhibition is hosted by China Paper Association and other institutions and enterprises, representing the highest level in the highest papermaking field. Top enterprises and scientific research teams in the industry will be present. Participating in the exhibition can not only learn and exchange the latest scientific research and technological achievements, but also take this opportunity to promote the company’s brand, explain the company’s product information and display products, so that consumers can understand the company’s technology and products, and improve the company Reputation in the industry. In addition, participating in the exhibition can better grasp the needs of users in the process of communication with users, understand the competition in the industry, and provide a basis for decision-making in enterprise upgrades, research and development, etc.
Chapter VI Personnel Management

6.1 Company organizational structure

Figure 6-1. The tree diagram of the company's organizational structure

General Manager (CEO): Coordinate the company's core management team, grasp opinions and information from all aspects, formulate and adjust the company's development strategy, and establish a corporate culture.

Human Resources Manager (HRDM): Including the human resources department under its jurisdiction, which is mainly responsible for the formulation, supervision and assessment of the company's management system; understand the distribution of the company's human resources, formulate the correct way of human resource allocation; conduct professional training for staff; develop corporate culture, and unite company employees; Carry out work such as appraisal of the work situation of the project manager, attract, motivate and maintain employees, retain talents, cultivate talents, and provide support to the general manager's decision-making.

Production R&D Manager (PDM): Establish cooperative research relationships with various companies; responsible for product service development strategy discussions, responsible for product research and
Entrepreneurship plan-Deinker

development and design; responsible for the development of quantitative evaluations; coordinate production departments to assist in the debugging and production of new products; conduct requirements and functions with the person in charge of product marketing Design communication; design and improve products and services; participate in the formulation of product promotion plans. At the same time, he directly guides and is responsible for the daily management of the production department, organizes the formulation and implementation of the company's daily production plan, production organization, production management, process control and supervision to ensure the realization of the company's production goals; presides over the development of the company's technical transformation management work, Organize the establishment and improvement of the company’s production management system to improve the company’s production efficiency; participate in the business decision-making of Goss, and provide practical decision-making basis and suggestions for the company’s business decisions based on the actual production status of the company’s phased development; strict quality control, do a good job in production supervision.

Marketing Manager (ADM): Including after-sales service department, advertising department and market research department. Mainly responsible for organizing the preparation of annual marketing plans, marketing expenses, internal profit indicators and other plans; organizing research and drawing up development plans for company marketing and market development; organizing and preparing and reporting to the general manager on time: monthly marketing contract signing, performance and indicators Completion status; responsible for coordinating the collaborative relationship between the marketing department and the financial department, technical department and other departments; responsible for providing market data support for the development of new projects; organizing the collection of market sales information, new technology product development information, user feedback information, etc.; Organize and carry out market statistical analysis and forecasting.

Finance Department Manager (FDM):Organize the establishment of an effective internal control system to achieve the purpose of preventing the company’s risks, in-depth operations in all links, and intervene in the company’s major business to ensure that various processes comply with regulations and
avoid risks. To implement the effective management of the company's cash flow, to fully express the company's strategy through the financial model, and to effectively realize the financial model through some specific measures and means is to realize the company's value management.

**Legal Counsel (CLO):** Participate in the business decision-making of the company to ensure that the company’s production, operation and management activities do not violate national laws and regulations; participate in the negotiation of major economic contracts or related projects that involve large objects or complex terms or are closely related to the company’s rights and interests; Provide consulting opinions, suggestions and legal basis for professional legal issues in management; participate in the drafting, review and negotiation of major economic contracts of enterprises to ensure the legitimacy of the contracts; manage the contracts of enterprises; issue special legal opinions for major issues in business operations Assist enterprises in formulating modern company and enterprise management systems in accordance with the law; safeguard the intellectual property rights of enterprises in accordance with the law, and promote the innovation and development of companies and enterprises; conduct legal training; handle other legal affairs of the enterprise.

**Chief Technical Counsel (CTO):** First of all, technical consultants have professional knowledge of related technologies, intellectual property rights, policy analysis, market analysis, etc., and have high comprehensive knowledge literacy. Secondly, technical innovation consultants have abundant resource reserves to help companies solve actual technical, talent, and capital problems. Provide enterprises with a full range of services such as intellectual property services, gratuitous fund declaration services, enterprise qualification certification services, technology docking services, project docking services, investment and financing services, product promotion services, etc. The service content penetrates into all aspects of the company's technological innovation and development corner.

**Project Manager (PM):** Responsible for formulating the overall project goals, phased goals and schedule; once the goals are determined, they are reasonably decomposed and assigned to the staff. Responsible for formulating a sound and scientific work system and workflow to ensure the implementation of goals; responsible for timely communication with relevant departments;
responsible for organizing, coordinating, and mobilizing staff to complete work tasks quickly and efficiently; responsible for discovering and solving problems in a timely manner.

The initial organizational structure of the company was linear, simple to set up, but with clear rights and responsibilities, and convenient information communication. The department responsibility system under the leadership of the general manager is divided into production department, research and development department, finance department, marketing department, and personnel department. Each department has a department manager.

There is also a legal adviser, who mainly provides legal protection for the company's daily work and various types of protection involving intellectual property rights.

6.2 Company Organization and Structure Arrangement

6.2.1 Analysis of Team Advantages

Our team’s project is to use the biological enzyme method to achieve in-situ recycling of office waste paper Deinker, and based on this to provide customers with comprehensive office waste paper treatment solutions, and to achieve this vision requires biotechnology, electronic design, mathematical modeling, Division and cooperation of different outstanding personnel in various fields such as finance. Judging from the current composition of the team, our team members come from different colleges, majors and grades, covering excellent students from many colleges of life, medicine, physics, and computer science. This kind of member composition makes it possible to build interdisciplinary projects with different thinking. The collision produced a more constructive plan. Each member of the team has their own obvious advantages. They are outstanding abilities, solid software and hardware foundations, outstanding professional qualities, and team members have good communication and collaboration skills, and can effectively cooperate to complete projects. Task; In addition, the project itself has the support of the invention patent application, the technology is mature, the development is fast, and it has a strong advantage compared with other teams.

6.3 Analysis of company departments
The personnel department is mainly responsible for the construction of the company’s organizational structure, the establishment and improvement of the company’s personnel system, the management of personnel in various departments, and the mobilization, increase or reduction of personnel in various departments according to the needs of the company at different stages of development, and formulate a suitable Our company's relatively complete personnel management system. Understand the distribution of the company's human resources, formulate the correct allocation of human resources; conduct professional training for staff; develop corporate culture, unite company employees; perform work such as appraisal of the work of project managers, attract, motivate and maintain employees, and retain Talents, cultivate talents, and provide support to the general manager's decision-making at the same time.

The main responsibility of the Production R&D Department is to provide the company with strong technical support and assurance. The R&D department is specially equipped with technical personnel who are engaged in technology research and development. The performance and competitiveness of the product are constantly improved. Establish cooperative research relationships with various companies; be responsible for product and service development strategy discussions, be responsible for product development and design; be responsible for the development of quantitative evaluation; communicate with the person in charge of product marketing on demand and functional design; conduct product and service design and Improvement: Participate in the formulation of product promotion plans, and be responsible for the production management of the company's products, as well as the analysis and resolution of major technical and quality problems in the production process. Reasonably organize the scheduling of personnel and materials, complete the production tasks issued by the company on time, and do a good job in the summary analysis of various reports in the production workshop; in addition, the production department is also responsible for the purchase application, equipment acceptance and daily maintenance of the production workshop equipment And maintenance work to ensure that the production workshop can continuously and stably produce products for the company.

The Finance Department is mainly responsible for drawing up budgets and final accounts for the company's revenue and expenditure at each stage, managing
the company's current assets, and issuing salaries, bonuses and dividends based on employees' positions and performance. Formulate a more detailed company financial system to detail the company's accounts.

The marketing department is mainly responsible for market research and analysis, grasping the latest market trends and consumer demand changes, updating market development strategies, and updating various services and functions for the company; timely submission of market analysis reports to the shareholders meeting and board of directors for shareholders. The meeting and the board of directors can be aware of the latest changes in the market and can update the company's development strategy according to the changes. At the same time, the market part manages the company's advertising business, and when conditions are ripe, a special advertising department can be established under the marketing department. At the same time, the marketing department also has a customer service department, a public relations department, and a market research department.
Chapter 7 Financial Analysis

7.1 Financing demand and investment direction

The project plans to establish Zhiyuan Environmental Technology Co., Ltd., with a planned registered capital of 1 million yuan. See Table 7-1 for the share capital structure and share structure.

<table>
<thead>
<tr>
<th>Investor</th>
<th>Capital contribution (ten thousand yuan)</th>
<th>Asset type</th>
<th>Share of total equity</th>
<th>Actual share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Founding team</td>
<td>50</td>
<td>Technology + cash</td>
<td>50%</td>
<td>80%</td>
</tr>
<tr>
<td>External investment</td>
<td>50</td>
<td>cash</td>
<td>50%</td>
<td>20%</td>
</tr>
</tbody>
</table>

7.1.1 Financing plan

In the design of the company’s shareholder structure, my entrepreneurial team controls 80% of the shares. The total investment is the molding technology formed by 300,000 yuan from the preliminary technology research and development funds and shares in the form of technology. The remaining 200,000 yuan is subscribed by the founding team members in accordance with the team captain’s 60%. %, the team members subscribe for the remaining 40% on average to invest in capital. This proportion is also used as the share arrangement for the members of the founding team; in order to attract capital to protect the company’s operations, we attract venture investors to join, and the estimated proportion of shares allocated is 20%, the investment amount is 500,000 yuan.

7.1.2 Direction of Fund Use

The products of this project are high-tech products and innovative equipment. Its technology research and development expenses and marketing expenses account for a large proportion. Therefore, the direction of the use of funds is roughly as follows:

1. Increase research and development efforts

The company's products combine various cutting-edge technologies such as
biology, artificial intelligence, embedded, automation, edge computing and the Internet of Things, and finally create innovative product equipment and open up emerging markets. Re-development will be able to effectively consolidate our market position and expand market share.

2. Product market development

At present, the equipment for instant deinking treatment of office waste paper is extremely rare in the office scene in China. This type of product is in the preparatory period in the market, and there are no actual cases for the promotion and sales of office waste paper in-situ recycling equipment for reference. Its application and ecological aspects are still in a state of development. Therefore, in order to make the product healthy and long-term development after entering the market, a long-term plan needs to be laid out. Guide and cultivate the consumption habits of the company, create an efficient brand effect, occupy the initiative in the market, and give play to the company’s first-mover advantage.

3. The company's daily operating capital guarantee

The stability of daily operation activities of an enterprise is a prerequisite for the healthy development of the enterprise. Therefore, a considerable part of the funds raised will be used in the daily operation activities of the enterprise to ensure the orderly conduct of various business activities of the enterprise and form a good foundation for enterprise development.

The specific use of funds will be introduced in the subsequent financial analysis.

7.2 Ways to withdraw capital

The launch methods of venture capital applicable to this project are as follows:

1. The company goes public

The way to achieve capital withdrawal through the company's listing means that the company is expected to be listed in 5-6 years. Investors can use the stocks held on the stock exchange market to achieve capital withdrawal, thereby achieving the purpose of capital withdrawal.

2. The company is acquired

For many reasons, if a company is acquired by another company or organization, investors can obtain capital and exit by selling the stocks they hold
while the company is being acquired. The amount of funds received and the company’s operating conditions It has a lot to do.

3. Equity transfer

Investors can receive orders through other investors, investment institutions, and consortia, and transfer investors’ shares to the other party by way of transfer, so that investors can obtain capital and achieve the purpose of capital withdrawal. However, the transfer of shares must be evaluated and approved by the board of directors. The purpose is to protect the normal operation of the company and prevent malicious commercial competition.

4. Share repurchase

After the expiration of the investment period, when the project is unable to provide investors with the expected benefits and returns, investors have the right to require the company to repurchase the shares held by investors, but the method and price of the repurchase must be shared by the company and investors in advance Negotiate and develop.

7.3 Financial analysis

7.3.1 Basic assumptions of finance

In order to make a better analysis of the company's finances, in this section, this article puts forward the following hypotheses based on the specific conditions of the project:

1. In the next five years, China's political and legal environment will be safe, the economy will develop steadily, and the country's internal and external environments will maintain stable development.

2. In the process of implementing the project, based on the principle of prudence and thoroughness, the existing data of related industries and the company's research data are used as references, and combined with the characteristics of the project itself, there is a reasonable plan and health for the operation of the project. Development plan, so there will be no major incidents during this period that will cause the project to run poorly

3. In order to maintain the competitiveness of the product, the sales price of the product remains unchanged

4. The funds obtained from the project financing are only used to support the
construction and operation of the project, and do not make cross-border investment

5. The company’s strategic goal is to go public. In order to maintain the rapid growth of the company’s operations, it is stipulated that no dividends will be distributed in the first five years.

6. Assuming 100% growth in operating business

7. The depreciation period of the project's fixed assets is 5 years

7.3.2 Principles of Cost Estimation

The cost estimation principle refers to the forecasts and estimates of various expenditures and incomes in the process of implementing the project, and they are presented in the form of statements, and the size of the statement forecast errors involved in the project is also related to the cost estimation principles. Having an important connection can also enhance the reliability of project report analysis. It involves the following contents:

1. Marketing expenses

Marketing is the best way to build a brand. Its expenses include travel expenses, advertising expenses, industry exhibitions, product launches, market development, etc., and 10% of sales revenue is used as the marketing expense.

2. Office expenses

Office expenses include labor and miscellaneous expenses, daily office expenses, office supplies, daily necessities, utilities, etc., excluding valuables such as computers and servers, and are calculated at 4% of sales revenue.

3. Salary forecast

Calculated according to the local general salary, the salary of the marketing staff is 3000 yuan per person per month; the department manager is 1000 yuan per person per month for the previous two years.

4. Venue fees

In accordance with the preferential policies of Chengdu's local high-tech business incubators, a 150-square-meter office space is leased at a price of 40 yuan per square meter per month based on the company’s situation. In the next few years, there will be no need to upgrade or renovate the plant, and no other costs. First, the annual subsidy is 100%, the second year is 70%, and the third year is 50%. In the following years, the company will bear all the costs.
5. Tax and other policies

According to the national taxation policy, the company’s annual value-added tax payable for 5 years is less than 5 million yuan. It is a small-scale taxpayer and can reduce resource tax, urban maintenance and construction tax, real estate tax, and urban land use tax within 50% of the tax rate. Stamp tax (excluding securities transaction stamp tax), farmland occupation tax, education surcharge, local education surcharge, and the monthly sales in the first year do not exceed 100,000 yuan, and the quarterly sales do not exceed 300,000 yuan, exempt from value-added tax; corporate income tax It is estimated based on 15% tax of high-tech enterprises.

7.3.3 Forecast of operating income

Combined with the specific operation plan of the company's project, the company's revenue in the next 7 years will mainly come from the sales of two types of leading products, which are:

- Biological enzyme deinking and drying integrated system (Deinker)
- Dehydration biological deinking combined enzyme

At present, the prototype of this type of product has been basically completed. It is planned to finalize Deinker and put it on the market together with the biodeinking enzyme composition in 2022. Based on market research data, it is estimated that the sales volume of the equipment in the first year is 120 units, and the annual index growth rate is 100%.

Based on the feedback data obtained from the questionnaire issued by the company to the society, the enzyme sales are conservatively estimated. Each person deinks 2 sheets of paper per day, and each device uses 20-40 people. It is assumed that each device processes 60 sheets of paper per day on average. Each piece of paper needs 0.006g enzyme to complete deinking. For 360 days in the whole year, the market enzyme sales volume should be the total amount of equipment sold in the market (equipment sales volume of the current year + equipment sales volume of previous years) multiplied by 60*0.006*360.

<table>
<thead>
<tr>
<th>项目</th>
<th>第一年</th>
<th>第二年</th>
<th>第三年</th>
<th>第四年</th>
<th>第五年</th>
</tr>
</thead>
<tbody>
<tr>
<td>设备/套</td>
<td>200</td>
<td>400</td>
<td>800</td>
<td>1,600</td>
<td>3,200</td>
</tr>
<tr>
<td>酶液/千克</td>
<td>25,920</td>
<td>77,760</td>
<td>181,440</td>
<td>388,800</td>
<td>803,520</td>
</tr>
</tbody>
</table>
Figure 7-1 Four-year product sales volume of the company (rounded up)

Assuming that the pricing of the product remains the same for five years

<table>
<thead>
<tr>
<th>项目</th>
<th>单价</th>
</tr>
</thead>
<tbody>
<tr>
<td>设备/套</td>
<td>1,399</td>
</tr>
<tr>
<td>酶液/克</td>
<td>5</td>
</tr>
</tbody>
</table>

Figure 7-2 Product pricing (unit: yuan)

From the above planned sales volume and product unit price, the company’s main operating income can be estimated for the next five years

<table>
<thead>
<tr>
<th>项目</th>
<th>第一年</th>
<th>第二年</th>
<th>第三年</th>
<th>第四年</th>
<th>第五年</th>
</tr>
</thead>
<tbody>
<tr>
<td>设备</td>
<td>279,800</td>
<td>559,600</td>
<td>1,119,200</td>
<td>2,238,400</td>
<td>4,476,800</td>
</tr>
<tr>
<td>酶液</td>
<td>129,600</td>
<td>388,800</td>
<td>907,200</td>
<td>1,944,000</td>
<td>4,017,600</td>
</tr>
<tr>
<td>合计</td>
<td>383,480</td>
<td>878,400</td>
<td>2,026,400</td>
<td>4,182,400</td>
<td>8,502,400</td>
</tr>
</tbody>
</table>

Figure 7-3 Four-year product sales of the company (unit: yuan, rounded in whole numbers)

According to the estimation results, the annual sales of the project will reach a sales scale of more than one million yuan in the first year, and the total sales will exceed ten million yuan in 2026.

7.3.4 Cost and Expense Forecast

Combining the company's product characteristics and operating plan, the cost of the project mainly includes production costs, management costs, sales costs and financial costs, each of which is predicted as follows

(1) Production cost

determine the inventory quantity according to the company's product characteristics and the estimate of customer purchases. The equipment inventory is reserved at 10% of the sales volume, and the enzyme is reserved at 20% of the sales volume. The predicted parameters are as follows
The equipment is an electromechanical product, and the estimated material cost is about 1065 yuan (RMB); the enzyme solution is a biological product, and the raw material cost for cell culture is about 100 yuan (RMB), and the raw material cost for protein extraction is about 400 yuan (RMB). The raw material cost for enzyme preparation equipment is about 200 yuan (RMB), and the total enzyme raw material cost is about 700 yuan (RMB). Each time it can produce 500g, the cost per kilogram of enzyme is about 0.7 yuan (RMB). According to the parameters, the direct material cost of the product is estimated as shown in the figure.

<table>
<thead>
<tr>
<th>项目</th>
<th>产品类型</th>
<th>第一年</th>
<th>第二年</th>
<th>第三年</th>
<th>第四年</th>
<th>第五年</th>
</tr>
</thead>
<tbody>
<tr>
<td>预算销售数量</td>
<td>设备</td>
<td>200</td>
<td>400</td>
<td>800</td>
<td>1,600</td>
<td>3,200</td>
</tr>
<tr>
<td></td>
<td>酶液</td>
<td>25,920</td>
<td>77,760</td>
<td>181,440</td>
<td>388,800</td>
<td>803,520</td>
</tr>
<tr>
<td>加：期末存货</td>
<td>设备</td>
<td>20</td>
<td>40</td>
<td>80</td>
<td>160</td>
<td>320</td>
</tr>
<tr>
<td></td>
<td>酶液</td>
<td>5,184</td>
<td>15,552</td>
<td>36,288</td>
<td>77,760</td>
<td>160,704</td>
</tr>
<tr>
<td>减：期初存货</td>
<td>设备</td>
<td>0</td>
<td>20</td>
<td>40</td>
<td>80</td>
<td>160</td>
</tr>
<tr>
<td></td>
<td>酶液</td>
<td>0</td>
<td>5,184</td>
<td>15,552</td>
<td>36,288</td>
<td>77,760</td>
</tr>
<tr>
<td>总产量</td>
<td>设备</td>
<td>220</td>
<td>420</td>
<td>840</td>
<td>1,680</td>
<td>3,360</td>
</tr>
<tr>
<td></td>
<td>酶液</td>
<td>31,104</td>
<td>88,128</td>
<td>202,176</td>
<td>430,272</td>
<td>886,464</td>
</tr>
</tbody>
</table>

Figure 7-4 Deinker production (unit: set)

Further, consider other costs involved in the production process, including energy costs.

Based on product characteristics and output estimates, energy costs and other costs can be used to estimate the company's production costs in the next
Entrepreneurship plan-Deinker

five years

<table>
<thead>
<tr>
<th>项目</th>
<th>第一年</th>
<th>第二年</th>
<th>第三年</th>
<th>第四年</th>
<th>第五年</th>
</tr>
</thead>
<tbody>
<tr>
<td>直接材料费</td>
<td>103,173</td>
<td>217,090</td>
<td>452,323</td>
<td>922,790</td>
<td>1,863,725</td>
</tr>
<tr>
<td>场地租金</td>
<td>0</td>
<td>21,600</td>
<td>36,000</td>
<td>72,000</td>
<td>72,000</td>
</tr>
<tr>
<td>能源费</td>
<td>6,000</td>
<td>6,000</td>
<td>6,000</td>
<td>6,000</td>
<td>6,000</td>
</tr>
<tr>
<td>合计</td>
<td>109,173</td>
<td>244,690</td>
<td>494,323</td>
<td>1,000,790</td>
<td>1,941,725</td>
</tr>
</tbody>
</table>

Figure 7-6 The company's five-year production cost (unit: yuan)

(2) Management expenses

Management expenses include management staff salaries and benefits, office expenses, research and development expenses, etc. The office expenses are 4% of the current year's turnover, and the research and development expenses are 100,000 yuan in the first year, which will increase by 8% of the year's net operating income each year.

In the next five years, the management expects that the general manager, R&D department, production department, finance department, personnel department, and marketing department will each have one person. Combined with the company's future business scale, the management expenses can be estimated as shown in the figure:

<table>
<thead>
<tr>
<th>项目</th>
<th>2022年</th>
<th>2023年</th>
<th>2024年</th>
<th>2025年</th>
<th>2026年</th>
</tr>
</thead>
<tbody>
<tr>
<td>工资及福利</td>
<td>72,000</td>
<td>72,000</td>
<td>72,000</td>
<td>72,000</td>
<td>72,000</td>
</tr>
<tr>
<td>办公费</td>
<td>16,376</td>
<td>37,936</td>
<td>81,056</td>
<td>167,296</td>
<td>339,776</td>
</tr>
<tr>
<td>研发费</td>
<td>10,000</td>
<td>34,018</td>
<td>66,297</td>
<td>132,566</td>
<td>264,529</td>
</tr>
<tr>
<td>合计</td>
<td>98,376</td>
<td>143,954</td>
<td>219,353</td>
<td>371,862</td>
<td>676,305</td>
</tr>
</tbody>
</table>

Figure 7-7 The company's five-year management expenses (unit: yuan)

(3) Sales expenses

Sales expenses include sales staff salaries and benefits, market and customer development expenses, etc. The marketing expenses are 10% of the current year's turnover. The sales expenses can be estimated as shown in the figure:
7.3.5 Income statement, cash flow statement

Based on the above forecast of operating income and costs, the five-year profit statement can be obtained as shown in the figure.

<table>
<thead>
<tr>
<th>项目</th>
<th>第一年</th>
<th>第二年</th>
<th>第三年</th>
<th>第四年</th>
<th>第五年</th>
</tr>
</thead>
<tbody>
<tr>
<td>主营业务收入</td>
<td>409,400</td>
<td>948,400</td>
<td>2,026,400</td>
<td>4,182,400</td>
<td>8,494,400</td>
</tr>
<tr>
<td>减：主营业务成本</td>
<td>109,173</td>
<td>244,690</td>
<td>494,323</td>
<td>1,000,790</td>
<td>1,941,725</td>
</tr>
<tr>
<td>主营业务税金及附加</td>
<td>1,456</td>
<td>49,154</td>
<td>107,016</td>
<td>237,666</td>
<td>489,485</td>
</tr>
<tr>
<td>主营业务利润</td>
<td>298,771</td>
<td>654,556</td>
<td>1,425,061</td>
<td>2,943,943</td>
<td>6,063,190</td>
</tr>
<tr>
<td>减：销售费用</td>
<td>136,940</td>
<td>286,840</td>
<td>586,640</td>
<td>1,186,240</td>
<td>2,385,440</td>
</tr>
<tr>
<td>管理费用</td>
<td>98,376</td>
<td>143,954</td>
<td>219,353</td>
<td>371,862</td>
<td>676,305</td>
</tr>
<tr>
<td>利润总额</td>
<td>63,455</td>
<td>223,762</td>
<td>619,068</td>
<td>1,385,841</td>
<td>3,001,446</td>
</tr>
<tr>
<td>减：所得税</td>
<td>0</td>
<td>0</td>
<td>92,860</td>
<td>207,876</td>
<td>450,217</td>
</tr>
<tr>
<td>净利润</td>
<td>63,455</td>
<td>223,762</td>
<td>526,208</td>
<td>1,177,965</td>
<td>2,551,229</td>
</tr>
</tbody>
</table>

According to the company’s sales strategy, the investment in fixed assets in five years is shown in the figure.
Entrepreneurship plan

Combining the above analysis, we can get the table:

<table>
<thead>
<tr>
<th>项目</th>
<th>第一年</th>
<th>第二年</th>
<th>第三年</th>
<th>第四年</th>
<th>第五年</th>
</tr>
</thead>
<tbody>
<tr>
<td>办公电脑</td>
<td>3,000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>服务器及相关网络设备</td>
<td>20,000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>合计</td>
<td>23,000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Figure 7-10 Fixed assets investment (unit: yuan)

Figure 7-11 The company's five-year cash flow statement (unit: yuan, rounded)

7.4 Analysis of return on investment

7.4.1 Net present value method (NPV)

Project investment net present value calculation $NPV = \sum (CI - CO)(1+i)^{-t}$, $NPV = 1,594,018.39$ (yuan), where NPV refers to net present value, CI refers to capital income, CO refers to capital expenditure, T refers to the cycle, I is the benchmark income, and CI-CO is the net flow. According to the survey, the value of i in the NPV calculation is 12% as a reference. Calculated at this time:
NPV=1,594,018.39>0, the profitability during the calculation period is good, and the investment plan is feasible.

7.4.2 Internal rate of return

The internal rate of return (IRR) is a commonly used method for capital budgeting decisions. It is a discount rate that generates zero present value, or a discount rate that makes the present value of costs (investment or cash outflow) equal to the present value of future earnings (cash injection).

\[ NPV=CF_0+\frac{CF_1}{(1+IRR)^1}+\frac{CF_2}{(1+IRR)^2}+\frac{CF_3}{(1+IRR)^3}+\frac{CF_4}{(1+IRR)^4}+\frac{CF_5}{(1+IRR)^5}, \]

let NPV=0, substituting cash flow into the formula, you can get: IRR=43.93%>12%, indicating that the project has good investment value.
Chapter 8 Risk Analysis and Countermeasures

8.1 Market risks and countermeasures

Entering the market is the ultimate goal of our product bio-enzyme waste paper deinking machine. Although our company has done a full range of market research before entering the market, if the new products or services produced by our company do not match the market, it cannot adapt to the market. The demand for this may bring huge risks to our company. Therefore, the specific manifestations of market risk are:

(1) Market entry is restricted by its bio-safety: Since the deinking agent used by our company is a modified enzyme produced by genetically engineered bacteria, genetically engineered products need to strictly control the leakage of bacteria in the laboratory and production stage. Environment, so the products need to be strictly and regulated by the relevant national agencies before entering the market.

(2) The acceptance of the market is difficult to determine: Because the actual market demand is difficult to determine or the market forecast is wrong, when our company launches the bio-enzyme waste paper deinking machine product, the product may be affected by the market due to various reasons. Refuse. For example, there are products on the market that are similar to our new products, or our products cannot meet the actual needs of consumers, or the nature and style of the products do not conform to user habits.

(3) The time for market acceptance is difficult to determine. The bio-enzyme waste paper deinking machine product produced by our company is brand new. Once the product is launched, customers may not be able to understand its performance in time, and may be on the sidelines and skepticism of our new product, or even make wrong judgments. Therefore, there is a time lag between the launch of our new product and the complete acceptance by customers. If this time lag is too long, it will be difficult for the company to recover its development funds, leading to difficulties in capital turnover for future production.

(4) Competitiveness is difficult to determine. The products produced by the company are facing fierce market competition. This competition not only
involves competition among existing companies, but also threatens potential entrants such as biological deinking.

(5) Due to the gradual opening and growth of the market economy and rapid changes in the market, the company urgently needs to increase its grasp of market information, and our products are facing a perfectly competitive market, and the company's profits are facing the risk of declining.

Therefore, based on the above situation, our countermeasures are:

(1) From the perspective of market customers, to reduce their market risks, it is necessary to develop and tap potential customer groups. Because of the outstanding "environmental and green" advantages of biological enzymatic deinking, we will launch pilot projects in some communities and make improvements based on user feedback. When the pilot market is well received, we will use free experience, discount sales, door-to-door promotion, etc. Ways to expand the popularity of our bio-enzyme waste paper deinking machine products. In addition, our company will actively communicate with our target market groups such as some enterprises, institutions, schools, government departments, etc., and use this as a breakthrough point to find potential customers. In order to fully realize its product value and reduce the market risk of product sales.

(2) From a product perspective, if our company wants to reduce market risks and maximize long-term benefits, it must continue to eliminate old products and develop new products to achieve the optimal product mix. Our company produces products that can be easily accepted by the market in the initial stage of production, and gradually withdraws from the production and sales of old products when the products occupy a large market share. With the expansion of corporate influence and scale, we will invest in new products in new markets and gradually add new products. The functions such as multi-threaded batch deinking function, partial deinking function, etc., and at the same time increase management and management to adapt to our company’s product concentric and diversified business development strategy.

(3) From the perspective of the effective life cycle of the product, improving product quality and technical level is the primary move. Quality is the life of a product. For consumers, as long as they meet their own needs and have good quality, they are good products. Focus on quality is to enhance the competitiveness of products. Technology is the soul of a product, and it is also the
focus of enhancing competitiveness with other similar products. Therefore, our company will continue to iterate and update our core technology, strive for better paper quality, lower energy consumption, and focus on business Put it on product quality inspection and monitoring and technology development and application.

(4) From the company's internal market sales management, our company will establish an after-sales service system. If consumers have problems, they can be solved in a timely manner. This can increase consumers’ reputation for the company, give consumers a good impression, and strive for More "repeat customers". In addition, our company will recruit special information collection and analysis personnel, and set up a special information processing department to make timely and correct responses according to market changes; do a good job of market segmentation and select the company's most favorable target customers, Maintain customer loyalty through various channels; In addition, we must always pay attention to market changes, randomly adjust product structure, develop appropriate new products, and cultivate new growth points.

8.2 Technical risks and countermeasures

As our company's product bio-enzyme waste paper deinking machine has obvious environmental protection, economic and performance advantages compared to existing products in the market, in the professional field due to its unique technology, it faces lower competition risks. The biological enzymatic deinking process guarantees pollution-free emissions and no environmental risks.

However, with the progress of society and the continuous update of technology, the deinking technology is also constantly being updated, and there are already large-scale deinking pulp and paper equipment that rely on its brand advantages and research and development capabilities to accurately manufacture large-scale deinking pulp and paper making equipment. The company's technology poses certain threats, so the specific manifestations of technical risks are:

(1) Uncertainty in core technology research and development: Our company's product core technology has a relatively large research and development cost, and the core technology is highly innovative. The initial stage of research and development requires large financing funds and a large demand for talents. In addition, there may be a risk of leakage of core technologies.
(2) Uncertainty in product production and after-sales service: After the development of our product bio-enzyme waste paper deinking machine, if the deinking effect or the processed paper effect cannot meet the needs of users, the risk may stop the whole process of investment from being completed.

(3) Uncertainty of technology lifespan: Due to the acceleration of modern knowledge update and the rapid development of science and technology, the life cycle of new technologies is shortened. Compared with the biological enzyme method at the core of our technology, some companies have turned to research on biological bacteria method. The trend of deinking and environmentally friendly pulping, so our technology or products may be replaced by this newer technology or product. When newer technologies appear earlier than expected, our technologies and products may suffer the loss of being eliminated early.

(4) Uncertainty of supporting technology: After the invention of our technology, biological enzymatic deinking, we still need the support of some special supporting technologies such as wastewater treatment technology to transform this technology into commercial production operations. The immature supporting technology of the company may also bring risks.

Therefore, based on the above situation, our countermeasures are:

(1) In terms of core technology, on the one hand, our company needs to thoroughly evaluate the feasibility before the company develops products, and conduct a period of technical trials before establishing research and development to reduce research and development costs, and at the same time recruit talents and strive for various funds. Support; on the other hand, ensure the confidentiality and non-disclosure of core technologies, and expand our company's applications for related patents.

(2) In terms of technology update, our company must continue to increase research efforts. Every year, we must introduce a group of technical talents from various universities, maintain close contact with the research institutes of various universities, and keep abreast of current new technologies and existing technologies. The new trend of potential technology accelerates the pace of research and development of our scientific research department. On the basis of ensuring that our products can meet the basic needs of users, we try to shorten the update cycle of new products.

(3) In terms of supporting technology, our company will speed up the pace
of research and development, create good conditions for research and development, attract foreign high-tech personnel and "returnees" to our company, and develop mature products that are compatible with our products in the shortest possible time. Technologies such as deinking wastewater treatment technology.

(4) In terms of technology application, our company must closely contact the market demand. While doing market research to understand user needs, we must also predict some potential user needs, strive to give priority to business opportunities, consolidate market position to improve competitiveness, and keep up with the country. Policy guidance, formulate reasonable technical plans based on actual conditions, achieve comprehensive dynamic evaluation to select the best and eliminate the inferior, and strive for the maximum and reasonable use of resources.

8.3 Product quality risks and countermeasures

Due to the complexity of high-tech development and research, it is difficult to predict the probability of our research results being transformed into industrial production and new products. The quality and performance of the first-generation bio-enzyme deinking paper machine products may be unstable. As a result, the products sold by the company to customers fail to meet the standards promised by the company in some respects, and cannot meet the needs of users well, which will have a negative impact and joint liability for our company. At the same time, in the transition from small batch production to mass production, there may be problems that cannot guarantee product quality.

Therefore, based on the above situation, our countermeasures are:

(1) Establish a complete quality assurance system and supervision mechanism to strictly control the production process of the bio-enzyme deinking paper machine, and strictly review the products of raw materials.

(2) Continuously improve and perfect the related production and processing technology of bio-enzyme deinking paper machine products, so that the quality of the company's bio-enzyme deinking paper machine products is continuously improved.

8.4 Operational risks and countermeasures

The company's operations may be affected mainly from two aspects. On the
one hand, similar product manufacturers and suppliers from the same industry. On the other hand, the newly established team of the company is relatively young, lacks actual operation experience, and may make decisions that misjudge the situation, and there are operational management risks.

Therefore, based on the above situation, our countermeasures are:

(1) Aiming at the former, we give full play to our outstanding "environmental protection and green" advantages compared with similar products in the same industry. In addition, we guarantee the company's R&D capital investment and research and development efforts, improve production technology and processes, continuously reduce production costs, and improve products Quality makes our company in a leading position among products in the same industry.

(2) For the latter, our company will hire third-party consultants, and at the same time give full play to the innovative ability of the young team, reduce the possibility of decision-making mistakes, and attract experienced management, marketing, and financial experts to join the company with high salaries to reduce risks to the lowest. Sign contracts with suppliers and construction units to effectively transfer some risks. In addition, do a good job in the construction of corporate culture and employee incentive mechanisms to give employees a high sense of identity and belonging.

8.5 Financial risks and countermeasures

For the current domestic companies that produce related deinked pulp and paper products, the initial investment in infrastructure and production equipment is quite large. It is precisely because of the large initial investment scale that puts considerable pressure on the operation of the enterprise. Many companies even operate at a loss in the beginning. Similarly, the company’s products also require high and continuous investment in the process of transforming laboratory results to industrialization, especially as a biological deinking equipment, which usually requires multiple rounds of complex experimental verification. A lot of financial support. However, the company's own funds at the current stage are limited, which makes it difficult to maintain the company's continuous high-investment operations. Therefore, if the cost of our products cannot be reduced under the premise of ensuring the quality and profitability, and the promotion of the market
can be accelerated, so that the scale can reach the break-even point as soon as possible, then the impact on the company will be very serious.

In addition, in view of the production characteristics of bio-enzymatic deinking paper machines and the impact of domestic and foreign market changes, stagnant production, rising raw material prices, and expensive production equipment upgrades and maintenance costs and internal management costs will affect the company.

An unreasonable capital structure and an excessively high debt-to-asset ratio will lead to low solvency, a decline in corporate financing credibility, failure to pay off due debts, and a serious debt crisis, which may easily lead to corporate bankruptcy risks. Moreover, because of the large scale of the company and the relatively large expenditures on product production and sales, debt-based operations must face greater financial risks.

Therefore, based on the above situation, our countermeasures are:

(1) Strive for government support and control initial investment: In the early days of our company’s establishment, because our company’s bio-enzymatic deinking process was the country’s first environmental protection process, on the one hand, our company will actively strive for high-tech innovation from governments at all levels. The support policy of large-scale entrepreneurial enterprises, we strive to apply for various support funds. On the other hand, our company will actively seek partners and obtain financial support in an appropriate period. And because our company’s pilot promotion strategy for our products will also help reduce the financial pressure before large-scale promotion, and achieve a certain degree of autonomous hematopoiesis. In addition, our company must also design reasonable financing channels to make full use of its own funds. Blindly pursue enterprise scale and strive to reduce capital operating costs under the best and reasonable use of resources.

(2) Pay attention to financial indicators and maintain a reasonable debt ratio of the company: Our company needs to pay attention to core financial indicators. Keep the asset-liability ratio, equity multiplier, etc. within a reasonable range, not only to ensure that the company has a certain leveraged interest, but also to ensure that the company's risk for obtaining leveraged benefits is not too high. The solvency is closely related to the risk. Our company must accurately grasp the company’s current environment, accurately predict profits, and reasonably
control the risks brought by liabilities.

(3) Expand production and actively explore the market: Our company needs to ensure that the production capacity of bio-enzyme waste paper deinking machine is large in the shortest time, because only when the production capacity is large can we minimize purchases Cost, expanding and consolidating the company’s business scale and economic strength can effectively reduce financial risks. The company will further increase scientific research on the basis of existing business, increase scientific and technological investment, increase product technology content, form scale benefits, and actively develop Market and expand market share.

8.6 User risks and countermeasures

The intended users of our company are mainly those corporate departments, schools and government departments that have transformed into environmentally-friendly companies in response to national policies. People working in these places are generally well educated and possess certain scientific and cultural knowledge, but consider users may still be some operational difficulties at the beginning of using our products. In addition, considering the user’s security and privacy requirements, some malicious users may use the partial fixed-point deinking function of the product, tampering with legal documents and contract documents, in addition. There may also be risks of uncontrollable software and hardware security.

Therefore, based on the above situation, our countermeasures are:

(1) In response to product operability issues that users care about, our company will continue to optimize the user's human-computer interaction experience for our bio-enzyme waste paper deinking machine products, strive for simple and clear product operations, and will send users matching product instructions And product demonstration videos for users to learn and use.

(2) In response to product safety and privacy issues that users care about. Our company will add ingredients that can identify the printing time of the ink and perform ink time identification experiments when preparing matching inks, and then develop relevant special identification software to facilitate easy identification by users and legal institutions. Our company will also ensure that the core components of our products have independent intellectual property rights,
and the entire process will be independently developed, produced and manufactured by our company to ensure the safety and control of the bio-enzyme deinking paper machine. In addition, our product-related I/O software and management system and driver are also independently developed by our company to ensure the safety and control of the bio-enzyme deinking paper machine software.