

# RESEARCH OF INCENTIVE MECHANISM FOR ACTUALIZING GREEN REMANUFACTURING ENGINEERING

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**Abstract:** The paper proposed a ethic about the sustainable use of resource and environment ,namely disposing the problem of resource and environment with justice view between the generation and next in the non-awareness generations screen. It dissertated the troubles the enterprises barge up against during implementing the green remanufacturing engineering, namely lacking market motivities. In conclusion, it expatiated the inspiring mechanism that the enterprises implementing the green remanufacturing engineering, including the market inspiring , government inspiring and industry inspiring.

**Keywords:** green remanufacturing engineering; inspiring mechanism; environment protection; resource use.

## 1.Introduction

Green remanufacturing engineering is a new industry which is developed from United States of America last century. It is huge for resource potentiality ,economic effectiveness, environment protection and society employment, and includes repairing and rebuilding old and antiquated products.<sup>[1]</sup> Green remanufacturing engineering can make machine ,electrical and electronic products get technical improvement, reduce the afterlife expense of product total life cycle and create more job opportunities and profits, achieving cycle economy The best mode of economic development and technical means to solve the environment, resources, employment and social issues, such as one of the most effective measure <sup>[2]</sup>.However, this kind of manufacture pattern actually develops in our manufacture great nation slowly, is profound with our country reality development's request, comparing with the developed country differs at least for 20 years, this kind of phenomenon deeply is worth thinking.

## 2.resources, environment sustainable use ethics

In order to survive with the development, the present generation or the future people all needs to use the resources and the environment. The population unceasing

increase and people greed inflation can urge the present generation to use the resources environment excessively, along with the human productive forces level fast growing, so environment resources reproductive property is unable to counterbalance the humanity to the environment resources use and the destruction and has broken the resources environment original dynamical equilibrium, then forms the huge natural disaster, like the tsunami, the snow disaster, the earthquake and so on, also will simultaneously harm the future people's benefit, even the surviving foundation. The contemporary and the future people's benefit will have the conflict. Because the future human will incapably stop the present generation behavior to harm their benefit , bordering process contemporary and the future person benefit fairly becomes one question how to limit the contemporary morals duty, here "fair between generations is fair" ,"fair" the concept is our tradition "fair" the concept extension, but not our individual thought sedulously constructing.

Sustainable use of the resources and environment is the long-term capacity of renewable resources to maintain a satisfactory quality of the environment and the use of resources. Sustainable use as a philosophy, it

contains some ethical and economic value of the human society continuing with the development. From the ethical values, it reflects that the generations of people have the right to make full use of existing resources and environment for the benefit of the community concept in intergenerational equity way. Today, when the applications of new technologies, resources and environment obtain the enormous interest, we ,first of all, thank the our ancestors who preserved them, so that when in the " inter-generational veil of ignorance " <sup>[3]</sup> ,we could choose the sustainable principle of the use of resources and the environment. The so-called "inter-generational veil of ignorance" is such a state: the assumption that people do not know where generations of resources in the inter-generational distribution, as well as their own applications, such as the ability of the special circumstances, but clearly know the use of human resources and the environment to impact welfare and progress of science and technology ,so that resources can be developed to keep the potential value of the general rules <sup>[4]</sup>. In this kind of condition, all person situation is similar, any generation of people has not been able to design a advantageous condition to oneself peculiar circumstance resources environment use principle, and in this condition ,the principle can certainly manifest a generation of border to be fair, because it may guarantee any generation of people in the generation of border different such fortuitous factor not to profit or to suffer injury, so this kind of generation of border fair view expanded the resources for the humanity to provide ethics restraint foundation unceasingly using the scope.

Looking from the economic value, it had reflected the resources environment existence itself had the huge potential value fact, along with advance in technology, the people might

anticipate that the similar quantity and the quality resources definitely will obtain in the future compare now more effective use <sup>[4]</sup>. Namely with the similar quantity and the quality resources, the anticipated future can produce more and better the final goods and the service than the present, this kind of anticipated future resources are called using the value and the reality disparity of the potential value, some resources will exterminate and cause the humanity to lose this kind of potential value in the future, for instance, some kind of the thing or plants exterminating, its genetic resources' potential value will lose along with it. As human rationality is limited, it is impossible to accurately predict the future of the potential value of resources at different times, the potential value of resources may significantly be underestimated. The optimization of the private use of the resources and the environment (or social) may produce too many "best of extinction" <sup>[3]</sup>. This will give "the future people" to bring the inestimable user cost(that is the loss of non-sustainable way of resources and environmental extinction), in order to avoid and reduce the cost of the user risks, we need the ethical constraints of sustainable use to make up humanity's rationality insufficient.

### **3.difficult position of implementing green remanufacturing**

3.1 because the future person's vacancy, manufacture pattern's choice will lack the right balance

The green remanufacturing is effective, and is already confirmed by the developed country, has the broad application prospects ,and is the pattern to realize green manufacture in our country. When the present generation chooses the manufacture pattern, as the future person vacancy, no one can balance the present generation to choose advantageous

own manufacture pattern. inter-generational veil of ignorance

And the present generation is not in “inter-generational veil of ignorance”, and knows own self special position in the manufacture pattern choice, When the pattern of the green remanufacturing and the contemporary economic interest conflict, they lost benefit incentive that choose green remanufacturing pattern<sup>[5]</sup>. If you want Contemporary people to choose green model, you have to rely on ethical constraints, in particular generational perspective bound. When the majority of contemporary people in inter-generational perspective is the lack of ethical constraint, contemporary people can choose in accordance with contemporary people profit to maximize social welfare in favor of contemporary traditional manufacturing models, and not conducive to the future of the people green model.

3.2 There are "Prisoner's Dilemma" in manufacture pattern's choice

As the existence of the self-interest and competition in the market, there is "Prisoner's Dilemma" In manufacturing of choice. Assuming the existence of A, B of the two manufacturers in a market, there are two kinds of the manufacturing model: the green remanufacturing model, G and the traditional remanufacturing model, T. Their payment matrix shows in Table 1. if A, B, both select green models, they all obtain the interests of the  $1 + m$ , of which 1 for the current interests,  $m$  as a result of the implementation of the green model the future were brought about by For the interests of contemporary people discounted value; If the A, B all choose the traditional remanufacturing model, they get two units of the current interest, respectively; If A chooses model of green manufacturing and B chooses the traditional manufacturing model, A gets  $(-1 + m)$  units in the current interest, and B gets 2 units of the current

interest, and vice versa. Generally  $m \in [0,1]$ , as contemporary people is not bound to ethics, in the future, people will not fully consider the interests, in majority situations  $m \rightarrow 0$ . In more one games, the game is a Nash equilibrium (T, T), namely A, B had all optioned the traditional mode of remanufacturing. From the above analysis, we can see that as a result of self-existence and competition, manufacturing model of choice is often the result of traditional mode of manufacturing.

Table 1 Game of the Nash equilibrium

manufacturers	B		
	models	G	T
A	G	$1+m, 1+m$	$-1+m, 2$
	T	$2, -1+m$	$1, 1$

#### 4.Green remanufacturing industry incentive mechanism

So-called incentive mechanism is that the agents who pursue the personal interest maximization can be induced and urged to investment enough vigor method and measure for the trustee goal<sup>[6]</sup>.

Looking from the difficult position implementating the green remanufacturing, the first kind of situation is not only with ethics restraint, but also concerns with the incentive mechanism. One kind of manufacture pattern existence's basic premise is that the manufacturer has the motive to choose this kind of pattern, according to economic man's rational hypothesis, enterprise's elementary object gains biggest profit. In enterprise's management effective supposition, enterprise's profit have relations with the market, government's policy its faces and other external factors.

##### 4.1 market incentives

The market incentive is refers to the market strength makes manufacturers to unceasingly innovate, implementat green remanufacturing in order to obtain own survival and the development. The green product demand's development from the consumer is one of

direct propelling forces developing the green remanufacturing, such as the green product's demand from the consumer is the immediate cause which the electric refrigerator manufacturer implement green remanufacturing. With market economy's gradual consummation, the full competition as well as buyers' market's formation, the manufacturer is getting more and more sensitive to the market response, therefore the correct market direction and the attitude toward consumption are the market effective drive premise which makes the manufacturer implement green remanufacturing. what kind of market incentives can make manufacturers choose green remanufacturing model as own manufacturing model? what kind of market incentives can make manufacturers choose green remanufacturing model as own manufacturing model?

There are the low green products in market, while products consumers do not have the ability to fully identify them, and the asymmetry of information is between manufacturers and consumers, so there is "bad money driving out good money" phenomenon, and the green Product lost its market position. Therefore, we must introduce the certification system in green remanufacturing industries, some institutions approved by qualified institutions create green products, while other institutions approved by qualified institutions will carry out a test to these products, and timely and accurately publicize the testing results to public so that consumers easily have access to green product information, in this regard consumers must cost a little or no any. Nevertheless, consumers will actively purchasing green products, Enterprises further expand the size of the green remanufacturing.

#### 4.2 Government incentives

With the above-mentioned combination of market incentives, the Government should

strengthen the market environment, a specific strategy includes the following two aspects: On the one hand, the market environment to strengthen the Government in building the role of government regulation of the market environment and the normal order of the establishment of regulations to guide the production and use In order to let the market share of green products, the Government should, through market access system to regulate the construction market, product quality, established in the market access system on the basis of the need to strengthen the supervision of the market; As a publisher and information disseminator, the information will have economies of scale and therefore we recognize the need for public information, such as product identification information, product quality, market supervision and punishment of relevant information to consumers through a variety of media to disseminate. On the other hand, green product manufacturers need to upgrade its information dissemination capabilities, the procurement of green products to consumers, provided that he be able to identify green products, due to the limited knowledge of consumers and the cost of learning of the existence, which requires Consumers to identify products that reduce the learning capacity of the cost. Accordingly upgrade the manufacturer's ability to disseminate information of great significance. Manufacturers have complete knowledge of the product to manufacturers or trade associations in the form of the dissemination of information, its low-cost consumer access to relevant information at the same time also increased the ability to identify products for the consumer to provide a prerequisite for green products. Re-emphasized social benefits of green manufacturing enterprises with effective coordination and optimization, in a sense that Green is no longer manufactured goods in the public areas. The provision of

public goods alone to participate in the market is clearly not enough. The Government is encouraging the implementation of the green and then made an important incentive in the "market failure" of the government interest of the public, to promote the implementation of the green and then create a positive and practical significance and long-term strategic significance. Rational government should be able to fully understand the green and then to create economic value, and the manufacturer may also recognize the green and then to create economic value, but because of its external competitive environment so that the implementation of the green and then create the motivation to weaken, only the government can create Green business to create a level playing field. From the ethical values, the only rational person in the future on behalf of the Government in order to ensure that resources allocated in the inter-generational equity, the realization of human survival and sustainable development. Government incentives could include specific measures for tax incentives, the patent system to promote green and then made direct investment in key technologies such as research, government incentives to the fundamental goal is to re-create the green to provide a fair market environment for enterprises to choose green again Manufacturing more competitive. In the green remanufacturing and incentives for the same time, the Government should seriously weaken environmental pollution, waste resources and create a great model of the competitive market, do not even make it competitive. In this self-serving mechanism under the traditional mode of manufacturing will gradually withdraw from the market, to create a green model to enter the market slowly, gradually become the main market.

#### 4.3 team to create internal incentives

In order to smoothly implement Green remanufacturing model, we have to request following "environmentally compatible" principle in the various segments of the entire product life cycle, its manufacturing philosophy exists in the manufacture, supply and consumption of various systems. Above, we have been in the market for the remanufacturer's incentive to carry out the analysis, in its analysis of the process is to manufacturers as a whole analysis, in-house team to create the incentive problem is not analysis. "Team" refers to a group of agents, independently of their choice, but the level of effort to create a common output, the output of each agent on the marginal contribution depends on the efforts of other agents, you can not be independent observation. This article is referred to the production of green products to create targeted by the suppliers and manufacturers to manufacture components of the system. From the team's motivation theory and the relevant theoretical analysis of the green manufacturing, manufacturing in-house team, other than a member of the team are more motivated "lazy"; green remanufacturing pattern of the cost of private or personal income and social benefits or social costs are sometimes expressed as Different team members to create easily because the distribution of benefits can lead to inappropriate "environmentally compatible" ,this will not be followed or its manufacturing system instability, the in-house team to manufacture the incentive or not related to the smooth implementation of the green remanufacturing the model. On the contrary, if the manufacture team interior can realize the drive to be accommodating, then the manufacture team interior easy to form the common strategic target (implementation green manufacture, the system to have the stability again), thus forms the regeneration. In the green makes in again the pattern, has

the key technologies for to become the surplus requester on behalf of the core competitiveness manufacturer. In general, the industry has a strong influence on the continued and effective product development capabilities, product mix and good business reputation of the manufacturer can be manufactured in the remainder of the team were obtained. The core business in the form of contracts select the appropriate members of the co-operation, the core business, after the enactment of a contract must give full consideration to the partners of the green incentives.

### **5.case analyses**

Shandong Jinan Zhongqi group is a strong momentum Limited specializes in heavy-duty vehicle engines remanufactured by another specialist, since the company started in 1994, officially put into operation in 1998, it has more than 10 years. At present, the company faced problems: engine remanufacturing raw materials needed to rough (used engine), the source of production can not meet the needs; the tax burden in the process of running is too high, more than the general machinery manufacturing enterprises; countries do not have to create products that regulate the laws and regulations so that the flow of products into the market without legal basis; Users to create confidence in the lower engine at the same time using Remanufacturing engine, for the existence of the problem; on the re-manufacturing products not enough publicity, the community as a whole has not recognized the use of recycled products to create economic and social value.

According to the front of the incentives proposed to take the following measures: as soon as possible auto parts manufacturing industry regulations and technical standards; on the auto parts manufacturing industry actively promote the certification system with the rules of the market incentives to guide the

healthy development of the industry; The future of automotive components manufacturing industry to implement re-entry system to encourage the formal re-development of manufacturing enterprises, to crack down on fake and shoddy re-create for businesses and individuals; open up the flow of pieces of the old market, the development of policies to encourage auto dismantling of the old plant And then the flow of parts manufacturers; The abolition of import restrictions on the old machine, to encourage manufacturers to take part in international competition in the waste of resources; manufacturer another country into the list of renewable resources, so that manufacturers no longer enjoy preferential policies should be true; Vehicle management sector for the green light to remanufacture the engine, to encourage users Another engine manufacturer; remanufacturing products to increase publicity efforts to remanufacturing the product name, the state should be in government procurement projects in priority in the use of remanufactured products.

### **6.Conclusion**

This article discusses the problems that our country will face , the connotations of the green remanufacturing and the superiority ,then we analyzed the value and difficulties of implementing the green remanufacturing, pointing out that the concept of intergenerational equity is the basis ethics of the implementation of the green remanufacturing, and that the market Incentive, the government incentive and encouragement of in-house team is to implement the green remanufacturing fundamental driving force. Ethical constraints on the green manufacturing is important to use a variety of measures to foster the public's concept of intergenerational equity, the basis the ethics of the implementation of the green remanufacturing. Green remanufacturing

engineering in resource conservation, environmental protection, increasing employment has obvious advantages, in line with the path of sustainable development of China's national conditions, in line with national advocacy of the "recycling economy" in promoting national economic development, environmental protection, Address the re-employment, machinery and electronic products to enhance our international competitiveness is of great significance. Although Green remanufacturing Engineering is maturing, it not only is a sunrise industry, but also a potential giant, improving performance and product quality, reducing material consumption, as well as energy conservation, environmental protection have to do with reality. China's remanufacturing industry is the key to the establishment of appropriate legal system, to standardize enterprise behavior ,to create another market, and to encourage and motivate qualified companies to enter the area as soon as possible, so that the development of a country's economy influences this industry.

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