



Study on the Intensive Production Pattern of Equipment Manufacturing Based on Cycling Economy

Hua Zou & Zhongping Cui

School of Management

Shenyang University of Technology

Shenyang 110178, China

E-mail: suo-2001@163.com

Abstract

With the development of cycling economy, it is a new requirement to the production pattern of equipment manufacturing. How to implement the sustainable development of manufacturing has become the hot concerned research realm. By elaboration of cycling economy, equipment manufacturing, intensive production pattern, and according to 3R principle of conserving production pattern based on cycling economy, this article revises the traditional production pattern, establishes equipment manufacturing conserving production pattern and its support system.

Keywords: Cyclical economy, Equipment manufacturing, Intensive production patterns

To develop the equipment manufacturing, it is significant for implementing the scientific concept of development, adjusting the industrial structure, accelerating socialist modernization, enhancing the comprehensive national power, protecting the national economic and national defense security. However, because of the shortage of global resources, there is a grim challenge to the development of equipment manufacturing. Improving the comprehensive development of equipment manufacturing capacity, responding to the call of national energy saving and emission reduction, achieving the sustainable development is an urgently problem to be solved.

1. Concept and characteristics of cycling economy and equipment manufacturing

1.1 Content and characteristics of cycling economy

1.1.1 Content of cycling economy

Cycling economy is short title of closed-loop flow of material-based economy. Its meaning is based on ecological laws, using the natural resources and environmental capacity in an environment-friendly way, protecting the environment and developing economy with the minimum cost and higher efficiency and effectiveness to implement the ecological transformation of economic activities. The efficient use of resources and recycle is the core, integrating the cleaner production and comprehensive utilization of waste to resolve the industrial crisis, within the ecological environment carrying capacity to promote economic growth and improve the quality of the economy; it is an inevitable choice to realize the harmony between human and nature.

1.1.2 Characteristics of cycling economy

The characteristics of cycling economy are low consumption, low emission and high efficiency; these features are the objective requirement for the development of equipment manufacturing. Low consumption means less consumption of resources use to achieve the decided production target, that is to say pursuit the least inputs under a certain output. Low emission is in the process of production or consumption, as much as possible to reduce the emissions of waste and reduce pollution sources. High efficiency means that at the certain circumstances of raw materials and energy inputs to achieve the maximum outputs. They are mutual related and constraint; finally promote the whole economy rationalization and efficient development.

1.2 Content and characteristics of equipment manufacturing

1.2.1 Content of equipment manufacturing

Equipment manufacturing is a manufacturing that provides a wide range of technologies and equipments to the national economy and defense building. It is the mark of national and regional industrialization level and economic science strength. Relating to the country and the national long-term interests and strategic industry, it is also the tie and vector of advanced science technology in transforming traditional industries, and the basis of high-tech industries and information industry, the important safeguards development of national economic security and military security.

1.2.2 Characteristics of equipment manufacturing

The equipment manufacturing is strong foundation, high technological content, difficult development, broad association and strong completed integration. It involves almost every respect of the national economy; the main service area is the important sector of national economy, including machine tool, tool, measuring tool, mold, instrumentation, basic materials industry are the backbone of national economic development, nevertheless the basic equipment type is the core of the equipment manufacturing, which can only be achieved by devoting a lot of manpower, materials and financial resources.

2. Status quo and major problems of china's equipment manufacturing

At present, the industrial added value of our country equipment manufacturing in the world is No.4, lower than the United States, Japan and Germany. The problem represents that the overall level is not high.

2.1 Low utilization of resource during the production process

Although China became the world's third largest trade nation, the extensive mode of economic growth has not been fundamentally changed. Such an economic growth mode characterizes by high consumption, high emission and low efficiency, resulting in a massive waste of resources and serious environmental pollution. Information shows that the consumption of one dollar GDP that Chinese creating resources needed is about four times than United States, seven times than Germany, 11 times than Japan. Resources utilization is poorly low.

2.2 Old and low utilization equipments

Equipment includes both hardware and software. Software refers to technology. There are many core technologies still in the appearance relying on foreign imports, weak in independent development, less original technologies and products, forming a vicious cycle of usher in-fall behind-usher in again. Hardware refers to equipments, many old types of equipment because of high construction and replacement cost, can not satisfy the requirements of technological progress, resulting in some idle equipment, not taking full advantage.

2.3 Poor resilience

It performances a long time of Business-to-market response, long new product development cycle and delivery of China-made equipment, failing to keep pace with the speed of product updates both domestic and international market need. Economic efficiency is low, sales profit margins and labor productivity is lower than the entire manufacturing value, in a low-level status.

3. Analysis of conserving production pattern

3.1 Traditional manufacturing production pattern

The manufacturing is an industry that transforms the available resources (including energy) through the manufacturing process into industrial products or consumer goods for people to use. In the view of resource flow and material form, the traditional production pattern is a "resources-products-pollution emissions" one-way flow pattern. In essence, it is a movement of inefficient use of resources, constantly making a lot of resources into to spam, promoting the number growth of economy by reversing the growth at the cost of natural resources. Traditional manufacturing is a kind of "pollution first, treatment later" pattern of economic growth, including the waste coming from the products production; use and governance become the major source of environmental pollution (Gu, 2007, pp. 65-68). As shown in Figure 1.

3.2 Connotation of conserving production pattern

Conserving production pattern is a new mode of production, it abandons the defects of traditional production seriously wasting of resources and pollution, pursuits low consumption, low emission and high efficiency during the whole production process. From the beginning of product design until the end of product life cycle, always in conserving green design, green manufacturing, green flow, green consumption concept, upholds the 3R principle of the cycling economy to organize, produce, circulate, consume, and other activities, thus forms a healthy dynamic development pattern.

3.3 Relations between cycling economy and intensive production pattern

Intensive production pattern is an essential requirement for the development of cycling economy and a means of achieving cyclical economy. Carrying out cycling economy is an important way to change the mode of economic development, taking new road to industrialization, realizing energy-saving emission reduction, and fully putting into practice a well-off society. Right now, China is in the process of new industrialization's important stage, cycling economy has become a broad process of society and economic system. During this period, demanding for energy and heavy polluted equipment manufacturing has entered a rapid growth stage. In order to avoid following the developed countries' old mode of "Resources-Products-Waste" in the production process of industrialization, equipment manufacturing must persist in absorbing cycling economy to the development process of new industrialization and establishing a scientific development strategy of cyclical economy, must construct a complete cycling economy system,

and establish a "Resources-Products-Waste-Renewable Resources-Recycle Products" conserving production pattern based on the cycling ecological form.

4. Constructing equipment manufacturing production pattern based on cycling economy

4.1 Necessity of equipment manufacturing's conserving production pattern

Global economic integration has created new opportunities for the development of manufacturing. However, the development of equipment manufacturing faces constraints such as shortage of resources, seriously waste pollution, the traditional pattern of production can not meet even restrict the development of equipment manufacturing. It is imminent that how can we achieve the vision of a big manufacturing equipment country, construct equipment manufacturing's conserving production pattern, and create core competitiveness.

4.2 Principle of intensive conserving production pattern

Intensive production pattern is essentially an ecological economy under the cyclical economy, it follows the development of cyclical economy's "reduce, reuse, recycle" principle (3R principle).

Reduce requires less use of raw materials and energy to achieve the decided production or consumption purposes, from the source of economic activities (not through the end of compulsory treatments) to save resources and to reduce pollution. Reuse requires products less replacements, as long as possible extending the use of the product cycles, the maximum possible to increase the ways and frequencies of products on many occasions, effectively extending the time for strength of products to enhance the utilization efficiency. Recycle is that after products completed the use of functions can become available resources, reducing waste emissions to the maximum, making effort to make the emissions of resourced and healthy, implementing the recycle of resources.

3R principle constitutes the basic ideas of constructing conserving production pattern under cyclical economy. Reduce is the first principle of cyclical economy (Wang, 2006, pp. 60-62).

4.3 Basic constitutes of equipment manufacturing's intensive production pattern

Intensive production pattern will overcome the seriously waste energy, mass of pollution and outputs of the traditional mode of production, from every possible aspect to scoop out the greatest efficiency of resources, reduce wastes, achieve sustainable development. Here basic constitutes of conserving production pattern are divided into macro view and tiny view.

Macro view is from the industry environment of the manufacturing, it is mainly relying on the government; the tiny view is from the manufacturing itself angle, in all aspects setting up idea to format an essential element system of conserving production pattern. Conserving production pattern promotes the government and manufacturing business enterprises, even the whole process in circulation and consumption of the supply chain downstream. It takes conserving green designing, manufacturing, circulating and consumption as principle, measures with more conserving standards, enlarges the support strength to conserving production pattern from government, improves the winning factors of enterprises themselves, takes in the whole process with high quality and conserving as target everywhere, pursues and realizes conserving producing. As shown in Figure 2.

4.4 Support system of the equipment manufacturing's conserving production pattern

Reflections on a range of issues emerging in the process of the development, China's equipment manufacturing should learn advanced results from abroad manufacturing in the cycling economy's development, follow the requirements of cyclical economy's development principle, and achieve conserving production pattern of sustainable economy development.

4.4.1 Build a social environment for intensive production pattern

To apply and extend conserving production pattern, it must fuse country's economic development strategy together. On the one hand, it is the content of the national economic development; on the other hand the country's economic development strategy guides can promotes and supports the enforcing of conserving production pattern. The government is shouldering a leading role to construct the required environment of cyclical economy's development, its policy-oriented will emollient promote enterprises constructing the circling economy. Government can guide from the economy policy, industry policy, technology policy, tax policy, management policy, finance policy, consumer policy, education policy, and so on, make support policy to conserving production of enterprises; integrate the production pattern and industrial structure of equipment manufacturing, and then format the good social environment to adapt to the development of cyclical economy.

4.4.2 Perfect the legal system

It should strengthen legislation and law enforcement, establish binding standards and assessment system, take conserving production pattern as the equipment manufacturing's production constraints. Only by establishing a sound laws and regulations can make the conserving production pattern into legal track. State should make greater efforts to

encourage, support the expansion of conserving production, cleaner production, comprehensive efficient use of resources, reducing waste generating, recovering and making use of waste in various sectors fully, and more effective legislation to ensure that the concrete executing behaviors of cycling economy to implement.

4.4.3 Promote construction of demonstration zone

China has positively at three levels practiced and investigated the enterprise clean production, eco-industrial parks, cities and regions, in the whole country setting up ecological provinces, ecological city at the core of cyclical economy. Demonstration area is still in the early stages of the cyclical economy, still needing strengthened in its theoretical foundation, major enterprises and important position. Especially the regions which the specific gravity is heavy and relatively concentrated areas of equipment manufacturing, should learn experience and lessons from others, progressively organize promoting work and open an exhibition of conserving production in the demonstration zone.

4.4.4 Streamline redundant links

In view of the status quo of China's equipment manufacturing, there are many organizational structure, production processes bloated state in enterprises. This organization and production structure to a certain extent makes companies come with impeded the flow of information, products and market demand out of line, high cost of management in the production process. Restructuring or streamlining agencies and links to a large extent can save unnecessary expense, shorten the production cycle, establish rapid reaction market system, and produce marketable products.

4.4.5 Promoting clean production

Clean production means continuing use improved design, clean energy and raw materials, taking measures such as advanced technology and equipment, improved management, comprehensive utilization, from the source to reduce pollution and increase the utilization of resources; reduces or avoids the pollutants generated in the course of production, reduces or eliminates hazards during services and products to the human health and environment (Liu, 2006).

It is the micro-economic basis of cyclical economy, manufacturing enterprises as a large body of the use of resources and waste emissions, must implement the national cleaner production laws and cleaner production industry standards, adjust and control the production chain from inputs and outputs of the entire environment, strictly produce according to law organizations, increase technological innovations inputting, and take effective measures to achieve the efficient use of resources, low-emission requirements as much as possible.

4.4.6 Taking technological innovation as the guarantee

The realization of the cycling economy can not be separated from technological innovation; technological innovation is the basic conditions for the development of cyclical economy. Energy saving, cleaner production, recycle and the use of resources largely depends on technological innovation. The equipment manufacturing in order to fundamentally realize cycling economy development must increase investment in science and technology, train technology and management personnel actively, improve the system of flexible production, and provide software and hardware two-way platform's conserving production pattern.

4.4.7 Taking new technology as the means

New technology is the most effective means to achieve conserving production pattern, which will fundamentally solve the conservation, emission reduction, reuse and other issue in the production processes of resources, products, consumption. For the inputs of conserving production pattern uses conserving green design, takes technologies such as reduction of resources, renewable resources, alternative resources, the maximum to reduce the consumption of resources, develops new, clean, green and pollution-free or low-pollution energy, improves the utilization of resources. For the part of conserving production pattern's process takes the process quality controlling and technologies with pollution reduce, pollution treatment, resources reuse, product life extension, diversification, and others to minimize the volume of waste generated as far as possible, makes full use of the inevitable pollution, uses the secondary resources during the production process, and reduces the supply chain. For the outputs inculcates the concept of green consumption, reduces waste rate, recycles of products, and scoops out the residual value of products as much as possible.

4.4.8 People-oriented to exertive people's initiative and creativity

Conserving production pattern requires the talent should not only have a solid foundation, broad range of knowledge, rational knowledge structure, but also should have many non-technical skills such as economic analysis, interpersonal relationships, particularly the collective collaboration capabilities. The nation and region should construct training centre, conduct the business existing engineering technology and management personnel a comprehensive system of training, so that they can adapt to face the coming technological advances and organizational innovation, and establish the conserving production idea as the behavior standard.

4.4.9 Excellent production management system

It takes system theory, information theory and control theory as a guide to be institutionalized, standardized and procedures. It reflects in the management business, management method, production operations, production process, statements documents, data, and other aspects. Production management of institutionalization, standardization and procedures is the foundation of scientific management. Modern production management requirements scientific management, in the management, it should enforce accordance with all rules and regulations, operating standards; all done are evidence-based, rule-based, operating standards, procedures management, realizing quality management objectives transferred into the management process itself, making quality as an assurance to achieve savings.

5. Conclusions

From the new requirements coming of cyclical economy's development on the equipment manufacturing, this article aims at China's equipment manufacturing's existing problems, researches and constructs a conserving production patterns of equipment manufacturing, and on this basis puts forward the support system for the construction of equipment manufacturing.

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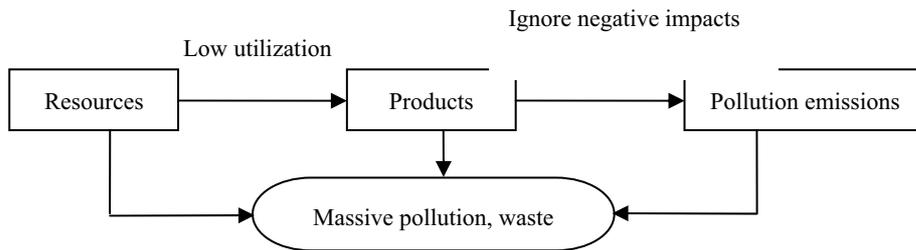


Figure 1. Traditional Production Pattern

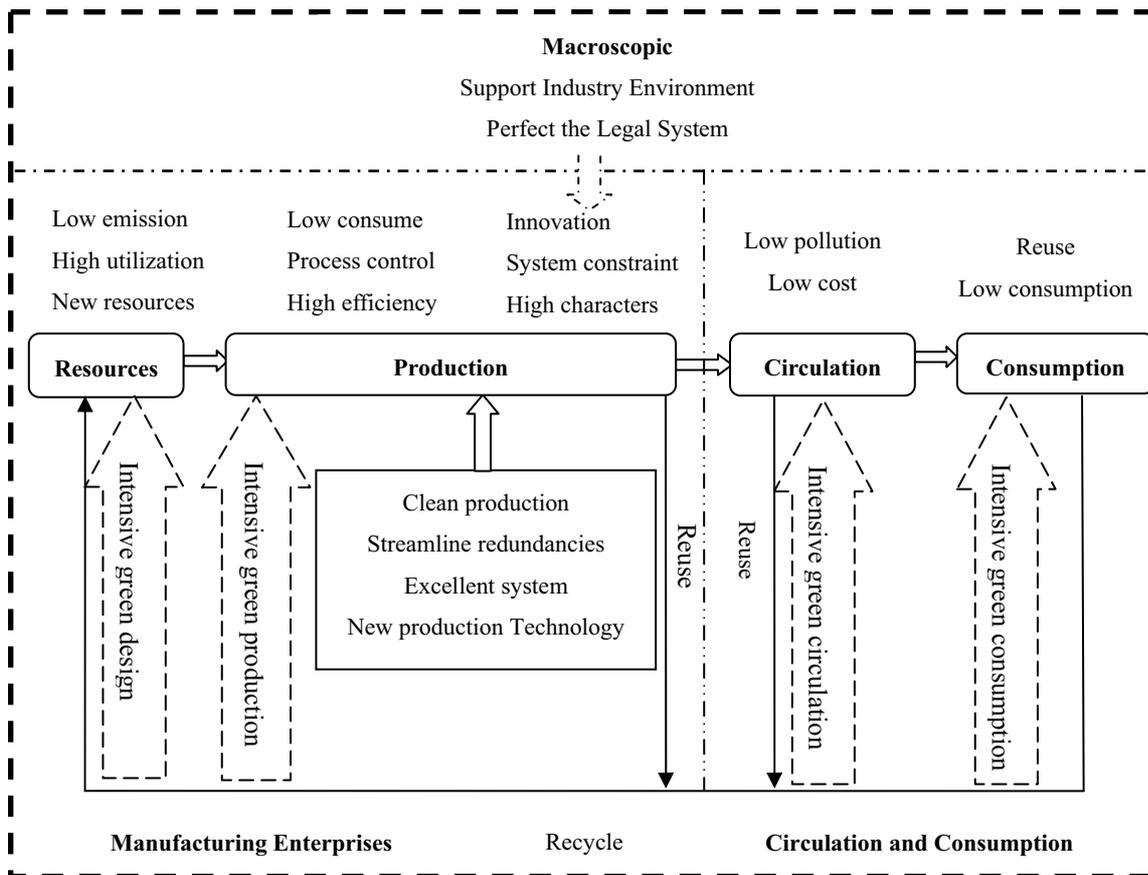


Figure 2. Basic Constitutes of equipment manufacturing's intensive production pattern