



Research on Evolving of Green Products' Attribute for Manufacturing Industry

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Abstract

Green manufacturing is a key technology to realize eco-industry and sustainable development, it is causing people's great attention. The implementation of green manufacturing has produced revolutionary influence on the products of the manufacturing industry and manufacturing industry. Through analyzing and researching historical evolvement of product attribute, this thesis summarizes the evolving law of product attribute, and indicates developing trends of manufacturing industry green products.

Keywords: Green manufacturing, Green products, Product attribute, Evolvement

1. Introduction

Manufacturing industry, on one hand, it is the main industry to create the mankind wealth, on the other hand it brings very serious problems on the resource waste and the effect to the environment. In 1992, the environment of United Nations and the development meeting (UNCED) makes a worldwide plan on realizing the development of the mankind society economic and the resource environment, and proposes a new method of continuing development. In order to adapt to the demand of the continuing development of the mankind society, how to use the resource as much as possible and produce waste as little as possible will become the problem that is concerned by the government, manufacturing enterprise and the academe. Thus, a complete new concept—Green Manufacturing, GM generates. And it will soon be researched around the world, especially in some developed countries.

The influence to the product exploitation in the manufacturing enterprise by implementing the Green Manufacturing is essential and evolutionary, it demands the enterprise to consider not only the economic profit, but the profit to the society (including the environmental profit, the continuing developmental profit, etc). While the product in the manufacturing industry appears the friendship to the environment, and generates the active effect, we calls it green products. The attribute of the product changes a lot from the traditional industrial product to the green product in the manufacturing industry. The attribute of the product in different periods can reflect the characteristic and the function of the product in the manufacturing industry, find out the different regulate during the evolutionary process of the product attribute, it is meaningful to the evaluation of the green product. This paper mainly does some research on the evolvement process of the green product attribute, finds out the evolutionary regulate of the product attribute, and makes the prediction on the evolutionary trend of the product attribute.

2. Historical Evolvement of Product Attribute

Product attribute is a characteristic that product can satisfy buyers' requirement. The good and bad of a product attribute is a key factors of attracting buyer and occupying market. Product attribute mainly incarnate on the requirement and the interrelated outside environment of products, the change of requirement and environment will lead to the change of product characteristic, the product characteristic direct correlation to main competition factors of markets, and the change of the main competition factors will lead to the change of manufacturing methods. Therefore, this thesis mainly does some research on the evolvement of product attribute by the time order and on the clue of changing of requirement and environment, product characteristic, typical manufacturing mode and main competition factors.

Product attribute begins to changing about the entrance of twenty century, and its evolvement process mainly includes six stages, see Table 1.

From Tab.1, we can conclude that the products' typical manufacturing mode is mass production before the fifties of the 20th century, at the time, products' demanding exceeds supplying, the market belongs to sellers', products incarnate economy attribute. From the fifties of the 20th century, the products' typical manufacturing mode has experienced the first transition, until the mid-term of nineties, it has experienced Lean Production, Agile Manufacturing and Mass Customization. In this stage, products' supplying exceeds demanding, the market belongs to buyers', products incarnate economy and technology attribute. From the mid-term of nineties of the 20th century, the products' typical manufacturing mode is experiencing the second transition, this is a new overfly, in this stage, the requirement of the buyers are more rational, and demand that the products' manufacturing, using and recycling obtain harmonious developing of human and nature.

Green manufacturing demands green products. Green products of manufacturing industry are differ from traditional products, see table.2. From sustainable development, environmental ethic, environmental consciousness design and technology mode, the exploitation of green products should bring environmental protection and 'environmental problem' into all aspects of products and their exploitation manufacturing, then make them into interior and core, in other words, products not only demand anciently stressed the attribute of economy and technology, but green nature (Table 2).

3. The Evolving Law of Product Attribute

3.1 From the chronological order, the change of the product attribute in the manufacturing industry becomes faster and faster.

The 1st evolution takes about 50 years, the 2nd takes about 20 years, while the 4th and the 5th take only about 4-5 years. The speed of evolution of the product attribute accelerates mainly because the development of the science improvement, the complex of the producing process, and the information technology becomes an important factor of the productivity.

3.2 From the production mode, the production of the manufacturing industry mainly trend to the production based on the technology.

From handwork to mass production, there are the division the work of physical work and brainwork during the labourers. In the LP, the labourer require many skills. In the CIM, there are come forth the sciential workers, the workers mainly depend on knowledge and handle skills, their physical force is subordination. In the AM, Mass Customization and GM, the sciential workers gradually increasing and become main body, the division gradually disappearing, every people will deal with brainwork, let roboticized machine to deal with physical work.

3.3 From the main competitive factor, at different times, the extent of influence that they demand the product and service is different, and changes with the increasing of the consumer's consumption level.

From the Fig.1, we can get the idea: at first, the price is the main competitive factor, and then to the quality, kinds, time, credit, environmental protection in the end, and we can get from Tab.1 and Fig.1, under different competitive factor, the product's attribute is different, from the economic attribute to both economic attribute and technologic attribute, and even more, including the environmental attribute, resource attribute, energy attribute and social attribute.

3.4 From the product characteristic, products first are from singleness, reiteration to diversification, then trend to individuation, their parts' modularization.

From no serving to beginning to emphasize serving, then trend to Characteristic serving including no-used and treated. Therefore, now manufacturing enterprise not only pay attention to the course of products' manufacture, but to the course of products' rejection, recycling, disposing and reuse, this is also nowadays what we called 'product life-cycle' and 'product multi-life-cycle'.

3.5 From the requirement of products, the consumers' requirement is from the basic 'have' to 'have', then to various requirement, in time and exact and cleanness, low pollution.

This show the consumers' requirement more sense, and products' manufacturing and use not only satisfy consumer and enterprise, but society, environment and sustainable development.

In a word, the development and evolvement of manufacturing and its products attribute have strong disciplinarian, the content of products attribute are also gradually enrichment and plenary. On the base of above, we can conclude that the evolving trend of green product attribute.

4. Developing Trends of Green Products Attribute

The evolving of products attribute is more close relation to the change of manufacturing mode. The mode experienced a series of development and change, become GM. GM is differ from traditional mode, it is a sustainable development mode of modern manufacturing, and it is a modern manufacturing mode considering synthetically the effect to the environment and the efficiency of the resource, and its goal is to make the smallest bad effect to the environment, the highest efficiency of the resource. GM is more important to intending manufacturing, many scholars at home and abroad have researched on GM in recent years, summarizing current researching, we can conclude the developing

trends of GM, it is globalization, socialization, integration, parallelization, intelligence, informatization.

To sum up the historical evolvement and evolving law of products attribute, and the development trend of GM, we can conclude the development trend of products attribute:

4.1 The manufacturing technology of products will become more advanced.

Green products emphasize on analyzing problem from entire life circulation, therefore, its advanced technology mainly incarnate on the progress of every technology, the progress of function and using nature, the technology's progress of recycling and reusing.

4.2 The range of green will become more extensive.

The green is the base of carrying out correspond sustainable development of economy, environment and society. Therefore, the green nature of intending product not only incarnate on the last product, but every stage of manufacturing course, use, recycling and reusing.

4.3 The range of economy will become more wide.

From the view of life circulation, the economy not only can reflect all characteristic of product life circulation, it mainly include the cost of product life circulation, benefit from life circulation. The cost of green products is charged with enterprise, user and society, its benefits is also shared by this three aspects.

4.4 The life-cycle and multi-life-cycle nature of product will gradually become strengthen.

Because the 'green' of green products incarnate on every stage of life-cycle, green products life-cycle is differ from anciently descriptive, it is refer to all time from requirement identifying, exploitation design to recycling. But products multi-life-cycle include the time of current life-cycle, and also include the time of its parts' disusing and rebirth using after current product discarding or no-using. Therefore, green products demand synthesize considering environmental effect, synthesize utilizing resource, product life-cycle and recycling time.

5. Conclusion

The view of continuing development and green manufacturing mode has been accepted by many governments and the society widely, and the research and the implementation appears the trend of more and more international and law, it has formed a irreversible social power which challenges to the traditional manufacturing industry, it now affects and change the trend of the market. Currently, a coherent prospect at home and abroad is that the manufacturing industry in the future should be the one that could protect the environment; green manufacturing is the choice to implement the manufacturing mold of continuing development, the development and design of the green product should be the regulation in the enterprise, the coming product should all come into the green series.

References

- Chen Rongqiu, Zhou Shuiyin. The theoretic and practice of manufacture management[M]. Beijing: Renmin university of China press, 2002.
- David F, Criambrone, Boca R. Environment life cycle analysis[M]. New York: Lewis Publishers, 1997.
- F Liu, X H Chen, J Liang. The Materials and Energy Flowing Model of Manufacturing Systems[J]. China Mechanical Engineering, 1997, 8(4): 78-80.
- F Liu, Z J Xu, B Dan, etal. The Implement and Characteristics of the Energy in Manufacturing Systems[M]. Beijing: China Machine Press, 1995.
- Henrik W, Micheal H, Leo A. Environment assessment of products[M]. London: Chapman Hall, 1998.
- Lars Hvam. A procedure for building product models[J]. Robotics and Computer-Integrated Manufacturing 1999(15): 77-87.
- Melnik S A, Smith R T. Green Manufacturing. Society of Manufacturing Engineers[R], USA, 1996:1-25.
- Veikko J., Pohjola, Paivi Rousou. Using holistic product models to describe industrial production[J]. Resources. Conservation and Recycling, 2002(35): 31-43.
- X.Y. Xu, Y.Y. Wang. Multi-model technology and its application in the integration of CAD/CAM/CAE J]. Journal of Materials Processing Technology, 2002(129): 563-567.

Table 1. Historical Evolvement of Product Attribute

No	Time	Requirement and Environment	Product Characteristic	Typical Manufacturing Mode	Main Competition Factors
1	From the beginning of the 20 th century	Mass Requirement, Solving the problem of 'have'	Singleness, reiteration	Mass Production	Price
2	From the fifties of the 20 th century	Solving the problem of 'good'	Many models Standard, beginning to stress serving	Lean Production(LP)	Quality
3	From the seventies of the 20 th century	Various requirement	Many varieties small batch products and serving, low repetition	Computer Integrated Manufacturing(CI M)	Variety
4	From the mid-term of eighties of the 20 th century	The requirement of in time, nicety	Manufacturing each model, no repetition	Agile Manufacturing(A M)	Time
5	From the beginning of the nineties of the 20 th century	Characteristic requirement	Characteristic manufacturing and serving, standard module	Mass Customization	Credit
6	From the mid-term of nineties of the 20 th century	Cleanness, low pollution	Characteristic manufacturing and serving including rejection and treated	Green Manufacturing(G M)	Environmental protection

Table 2. The Difference of Traditional and Green Products

Traditional Products	Green Products
Possess the attribute of basic and economy	Possess the attribute of basic, economy, technology, environment, resource, energy and society
Competitive advantage from Time, Quality, Cost, Serving	Competitive advantage from green nature advantage on the base of TQCS
The nature of economy and technology	The nature of economy, technology, green, life-cycle
A 'solution' of including physical products and serving	An integrated 'solution' of including physical products, serving and recycling
Satisfy buyers	Satisfy all aspects of buyers, environment and society
Meet current requirement	Meet current and coming requirement

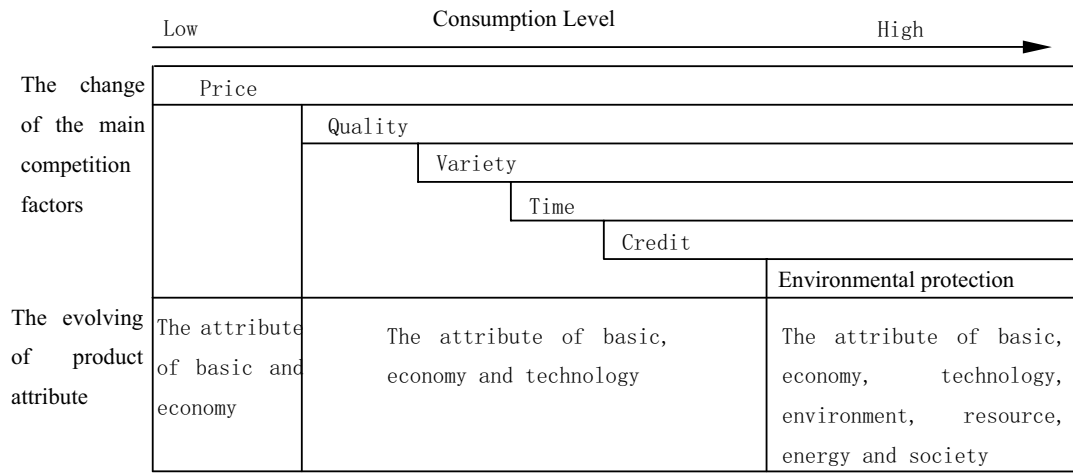


Figure 1. The relation to the change of the main competition factors
and the evolving of product attribute