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The Connotation, Characteristics and Evaluation Index of advanced manufacturing technology

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Abstract

Advanced manufacturing technology (AMT for short) is a general term for the technology, equipment and system produced by integrating mechanical engineering technology, electronic technology, automation technology, information technology and other technologies.AMT relies on the organization and management of technological advantages, and also on the organic coordination and integration of technology, management and human resources.It aims to improve the comprehensive economic and social benefits of the manufacturing industry and is a technology for industrial application.Its competition has changed from the improvement of labor productivity to the competition of time, cost and quality.With the structural adjustment and technological upgrading of manufacturing industry, China has formed a relatively perfect evaluation system for advanced manufacturing industry.At the same time, the production application of advanced manufacturing technology and the evaluation of economic and social benefits are summarized.

Keywords

Advanced manufacturing technology; Connotation; Characteristics; Evaluation index system; Manufacturing industry structure adjustment;Technology upgrading.

1. Connotation of advanced manufacturing technology

AMT is the whole process of manufacturing industry that continuously absorbs information technology and modern management technology ,and then applies them to product design, manufacturing, testing, management, sales, use and service， in order to realize high quality, high change, low consumption, clean and flexible production, improve the product's ability of adapting to the market and competition ability. In terms of structure, advanced manufacturing technology is mainly divided into main body technology group, support technology group and management technology solution. The main technology group mainly includes product, process design and rapid prototyping design, parallel design and other design concepts, as well as material production technology, processing technology, assembly and maintenance technology and other manufacturing technology. Support technology group mainly includes digital library, communication equipment support technology and control technology such as sensors. Management technology mainly includes product quality management, supplier management, customer management and other advanced management concepts, among which the important supporting technology includes computer technology and information technology.[1]

2. Features of advanced manufacturing technology

In general, advanced manufacturing technology is based on the traditional manufacturing technology, the use of computer technology, network technology, control technology, sensing technology and

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integration of machine, light, electricity technology and other continuous development and improvement. The goal of advanced manufacturing technology is to improve the adaptability and competitiveness of the manufacturing industry to the market. Its core is the organic combination of information technology, modern management technology and manufacturing technology. Advanced manufacturing technology lays special emphasis on the comprehensive application of information technology and modern management technology in the whole manufacturing process, striving to achieve comprehensive automation, in order to achieve high quality, high efficiency, low consumption, clean, flexible production, and obtain ideal technical and economic results.

Modern advanced manufacturing technology requires the world's advanced level. Its competition has changed from improving labor productivity to the competition of time, cost and quality. [2]However, the latest development stage of advanced manufacturing technology also maintains the effective elements of the past manufacturing technology, at the same time, absorbs all kinds of high-tech achievements, penetrates into all fields and all processes of product production, thus forming a complete technology group.

Its characteristics are shown in the following aspects: 1. advanced: it developed from the traditional manufacturing process, and with the new technology to achieve local or system integration.2. Universality: Its comprehensive application in the whole process of manufacturing, it covers the product design, production equipment, processing and manufacturing, sales and use, maintenance services, and even the whole process of recycling.3. Practicality: The aim of advanced manufacturing technology is not to pursue the high degree of technology, but to produce the best practical effect, and to improve the competitiveness of enterprises and promote the national economic growth and comprehensive strength.4. Systematic: Advanced manufacturing technology is a system engineering that can control the material flow, energy flow and information flow in the production process.6. Integration:Advanced manufacturing technology tends to be systematized and integrated, and has developed into an emerging discipline integrating machinery, electronics, information, materials and management technologies.[3]

3. Evaluation index of advanced manufacturing technology and its system construction

3.1 Status of evaluation index of advanced manufacturing technology

With the rapid development of science and technology and the increasingly fierce market competition, more and more enterprises begin to invest a lot of manpower, material resources and financial resources in the research and application of advanced manufacturing technology (AMT). It can bring economic benefits and competitive advantages, but it can also make enterprises into a serious economic crisis, and even threaten the existence of enterprises. Thus, the correct evaluation index and scientific evaluation system are particularly important.

It is a trend to learn to imitate the evaluation methods and systems of large American enterprises. [4]Nowadays, scholars and business leaders doubt but still use the traditional economic evaluation method, which uses a variety of methods. Intangible benefit quantification methods including value analysis, analytic hierarchy process, random mathematical programming method. In addition to the economic evaluation method, after the 1980s, American large enterprises still adopted the multi-objective decision method, expert system method and compound evaluation method etc. when evaluating AMT projects. But few companies currently use expert systems. As for the most classical method of technical and economic evaluation, that is, static evaluation method (such as investment payback period, investment recovery rate, etc.), since the early 1980s, has been used as an auxiliary method.

3.2 The system construction of evaluation index and its significance

In the construction of the evaluation index system of advanced manufacturing industry, the following principles should be followed :(1) the principle of comprehensiveness. In evaluating the index system

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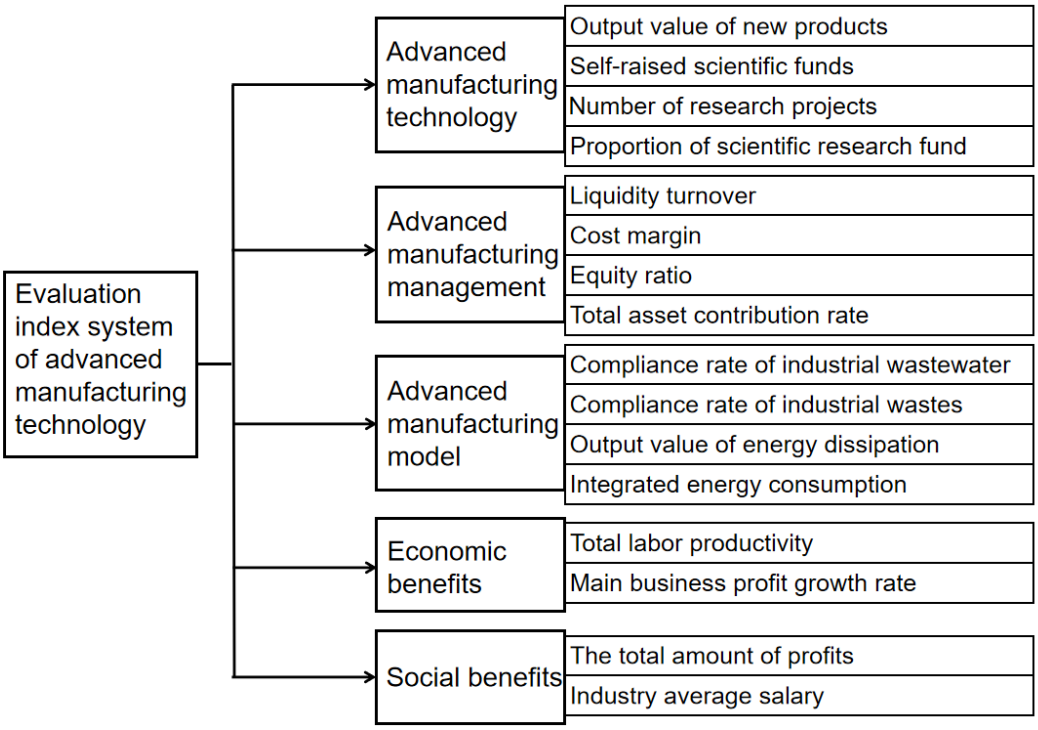
of advanced manufacturing industry, we should first pay attention to the comprehensiveness of the index selection.(2) the principle of comparability. The indicator system will be used as a comprehensive evaluation indicator system to achieve time and comparability between different industry regions.(3) the feasibility principle. It is the basic requirement of a gold absorbing manufacturing technology evaluation system that can be applied to the evaluation of advanced manufacturing technology.[5]The framework of evaluation system of advanced manufacturing technology can be constructed as follows:



Using the scientific method to a technology to make the right assessment, it is not only beneficial to promote enterprise from the previous product competition to quality competition, improve enterprise quickly seize the unstable market opportunities, also exercise their ability to develop and produce new products. This is the enterprise to keep advantage in the era of knowledge economy and new economy essential conditions.

3.3 Production application of advanced manufacturing technology and evaluation of economic and social benefits

For evaluation of advanced technology in production systems, the specific purpose of the evaluation is:(1) to ensure the consistency and contribution of the functional objectives of the production system to the business strategy and production strategy of the enterprise;(2) ensure that the products produced by the production system meet the demand of the target market and obtain competitive advantages;(3) to ensure that production system technology, management methods and operation mechanism to produce a predetermined products of reliable and economy. The evaluation of advanced manufacturing technology generally adopts the "multi-factor" theory, that is, the common evaluation from multiple levels. The evaluation scope is divided into vertical evaluation of a single advanced manufacturing technology and horizontal evaluation of multiple advanced manufacturing technologies. Vertical evaluation includes economic evaluation of advanced manufacturing technology and functional objective evaluation, while horizontal evaluation focuses on the comparative and selective evaluation of multiple advanced manufacturing technologies. Main evaluation indexes of each evaluation are as follows: (1) economic evaluation items of advanced manufacturing technology: payback period, net present value, and internal rate of return (2) the evaluation index of whether the advanced manufacturing technology meets the functional requirements of the production system: innovation and flexibility, quality assurance, production cost,

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production elasticity, and timely delivery. The evaluation index of green manufacturing should also be considered in this part of the evaluation (3) selective evaluation method among advanced manufacturing technologies: weighted scoring method. [6]

In addition, the economic benefit is the enterprise production must place the first consideration of the problem, the purpose of enterprise survival is to maximize the benefits of the product. Total labor productivity is an important index to investigate the production efficiency of enterprise workers.

Industrial added value is the newly added value in the production process of enterprises, and the rate of industrial added value reflects the rate of return on input and output, which is directly related to profitability and development level. Using the development of economic benefits in this period, the corresponding evaluation results can be obtained so that the enterprise can adjust the production capacity accordingly. At the same time, no matter when and where enterprises should bear the corresponding social responsibility. With the acceleration of urbanization and industrialization, the development of industry, especially manufacturing industry, a large number of absorbing labor force has become an important way for manufacturing enterprises to share social concerns. So here we can say that the comprehensive evaluation of the impact of advanced production technology in social benefits is also an important measure related to the development of society and country.

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