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**Green manufacturing - Green supply chain management in
manufacturing enterprises - Implementation guide**

绿色制造 制造企业绿色供应链管理实施指南

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3 Terms and definitions

3.1 Green manufacturing attribute: the resource and energy, ecological environment and health and safety characteristics of an organization, a process, a product or a material. Taken from GB/T 28612-2023, 3.4.

3.2 Life cycle: the consecutive and interlinked stages of a product system, from raw material acquisition or generation from natural resources to final disposal. Taken from GB/T 24040-2008, 3.1.

3.3 Material: the collective name for the substances and articles used in the product life cycle. Taken from GB/T 28612-2023, 4.1.11. 3.4 Reverse logistics: the process of planning, implementing and controlling the effective flow of raw materials, intermediate stock, final products and the related information from the manufacturing, distribution or consumption node to the recovery node, the disposal node or an upstream node of the supply chain, for the purpose of value recovery or proper disposal. Taken from GB/T 28612-2023, 4.4.1.

3.5 Green attribute information, also called green information: data and knowledge relating to green attributes. Taken from GB/T 39256-2020, 3.2. The printed English term for the entry is given as reverse logistics, the spelling shown on the page.

4 General

4.1 Green supply chain management reaches across the enterprise product and its whole life cycle and across the upstream and downstream parties of the supply chain; the basic framework is shown in Figure 1.

4.2 Before implementing green supply chain management the enterprise is advised to understand the domestic and foreign laws, regulations, policies and standards on green, low-carbon and sustainable development and the requirements of interested parties; the basic knowledge and requirements of green manufacturing and green supply chain management; the basic features of green supply chain management, namely that it rests on the product life cycle and the circular economy, that it weighs the economic, technical and sustainability aspects of the product and its life cycle, that its content covers the green manufacturing attributes of the product and of key materials together with the green information of the life-cycle processes, that the policies, standards and stakeholder requirements are dynamic and need periodic identification and updating, that it involves suppliers, logistics providers, distributors, end users and the recycling, dismantling, reuse and waste disposal enterprises, that reverse logistics is managed alongside forward logistics where applicable, and that green information is managed and disclosed as necessary; and the opportunities and risks that implementation may bring.

4.3 The priority content and stages are set according to the purpose of implementation, the industry and product type, the position of the enterprise in the supply chain, the important management content, the requirements of interested parties, and the green design, production, supply chain and inspection or testing capability and management level of the enterprise.

4.4 Green supply chain management is merged with the existing business processes, management systems and information systems of the enterprise, the green manufacturing attributes being managed as part of product quality characteristics; separate procedures and documents may be established, or the requirements may be folded into the existing supply chain, quality, environment and energy management systems. 4.5 Performance evaluation and continual improvement may be carried out together with the other management systems of the enterprise.

5 Content of green supply chain management

5.1 Before implementation the enterprise needs to know what green supply chain management covers and to select the priority content for its own situation. The content covers the green manufacturing attributes of the products and materials across their life cycle, the green information the enterprise manages, and the supporting content, and the enterprise defines the scope and priorities from the whole product life cycle.

5.2 The green manufacturing attributes of an end product include the type, total quantity and efficiency of resource and energy use and the environmental impact of a unit of product over its life cycle, such as carbon footprint and water footprint; the service life, durability and

recyclability of the product and its health hazards and safety; the technical advancement of the product functions and performance and the energy consumption, pollutant emission and carbon emission during distribution and consumption; and the pollutant emission, carbon emission and resource recovery efficiency at the scrapping and recovery stage. For materials the attributes include supplier compliance and emissions, the sustainability and stability of the material source, the life-cycle environmental impact and resource and energy use, and the scarcity, degradability, hazardous substance content and toxicity of the material.

5.3 Internal green information includes information from product design and development such as green indicators, green design schemes, the list of key controlled materials and the standards for prohibited, restricted and controlled substances; green procurement information; green information from the production process, covering energy and resource use, hazardous substance storage and use, pollutant emission and control and waste disposal; green logistics information including reverse logistics; basic information and databases such as laws, technical standards, green materials, green processes and life-cycle environmental impact data; and management and organizational information. External information comes from suppliers and service providers, from recycling and disposal enterprises, and from what the enterprise itself discloses to recyclers, consumers, regulators and other interested parties, such as sustainability or environmental, social and governance reports, dismantling information, product carbon and water footprint data, hazardous substance content data and statements on recyclability, reuse, remanufacture and recycled material content.

5.4 The supporting content covers green design tools and databases, green manufacturing technologies, processes and equipment, the necessary inspection, testing and measuring instruments, and the matching human resources, production environment and information management systems.

6 Investigation, analysis and decision-making

6.1 Before implementation the enterprise gathers information, investigates its internal and external context and analyses the necessity, the feasibility and the possible opportunities and risks, so that top management has a basis for deciding on the policy and the plan. The policy and the objectives are the key link, the objectives being quantifiable, measurable and assessable, and the enterprise then plans the system, draws up the implementation scheme and plan, and fixes the scope, content, requirements, priorities, workflow and timetable together with long-term and short-term plans.

6.2 The needs analysis looks at the legal, policy and market context and collects national and local government policies, the regional, industry and product requirements for green manufacturing, the green manufacturing attribute requirements of users and purchasers, a market analysis of supply and demand for green products, knowledge, technology and

standards on green manufacturing, corporate social responsibility, low carbon and sustainable development, and the green manufacturing level and supply chain management practice of enterprises in the same and neighbouring industries. The feasibility analysis looks at the enterprise's own products, production processes and upstream and downstream organizations, the management level of the enterprise and of its supply chain, the priorities and difficulties of implementation, the objectives, costs, risks and opportunities, and the problems and shortfalls found by earlier performance evaluations.

6.2 (continued) The opportunity and risk analysis identifies, analyses, evaluates and determines the risks to be addressed and sets out measures to reduce them. The opportunities listed are raising the green manufacturing attributes of the products, lowering costs and increasing returns, becoming a qualified green supplier, improving environmental performance and green sustainable development. The risks listed are production stoppage or supply interruption caused by environmental non-compliance or other reasons at suppliers and service providers, suppliers and service providers unable to meet green procurement requirements, and over-dependence on a core supplier.

6.3 On the strength of the investigation, top management decides whether to implement green supply chain management, then sets the policy according to GB/T 33635-2017, 6.2.1, taking account of the sustainable development objectives and social responsibility of the enterprise, the green manufacturing attributes of its products, activities and supply chain, and its green development direction. The objectives take account of consistency with the policy, the risks and opportunities for the business and the supply chain, compliance with regulations, policies, standards and stakeholder needs, the fit with the internal and external context, measurability against the green manufacturing evaluation indicators and the green supply chain evaluation standards, and staged targets such as a yearly increase in the proportion of green suppliers.

6.4 The implementation scheme and plan are drawn up so as to make green supply chain management run efficiently while disturbing the existing organizational levels and business processes as little as possible, and they take account of the operating scope, tasks, objectives and implementation steps of the green supply chain, the reorganization of the business processes of the node enterprises, the adjustment of the internal organizational structure and the design of coordination mechanisms with the node enterprises.

7 Implementation preparation

7.1 Preparation covers securing leadership and support, adjusting business processes and organization, completing the documented information, raising software and hardware capability and raising staff capability.

7.2 The coordinating and supporting role of top management may include deciding, after investigation and analysis, to implement green supply chain management and to set the objectives, content and policy; coordinating the relations and resources of the internal