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Furniture Design, Recycling Concept and Connotation

TranLamTra¹, Liu ShengQuan², AbdulRehman³

1. PhD Candidate School of Forestry, Anhui Agricultural University Hefei, China

2. Dean School of Forestry, Anhui Agricultural University Hefei, China

3. PhD Candidate College of Economics and Management Anhui Agricultural University Hefei, China

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*Corresponding Author

TranLamTra

Abstract

This paper formulates and reviews the furniture design, recycling concept and connotation. Recycling is an old topic, this traditional meaning or recycling in a narrow sense only on limited material recycling, product benefits, which is put forward as the main objective and the process of implementing recovery strategies. Design for recycle ability of waste material, which is designed and targeted to take advantage of the economic benefits of waste recovery process planning and design.

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INTRODUCTION

The traditional meaning of recycling in a narrow sense only on limited material recycling, product benefits, which is put forward as the main objective and the process of implementing recovery strategies. Design for recycle ability of waste material, which is designed and targeted to take advantage of the economic benefits of waste recovery process planning and design. Despite such of design on save resources and environmental protection of thing also has must degree of role and meaning, but it also didn't mentioned in design development products how design only conducive to recycling process, and conducive to environmental protection of problem, in products design no considered its abandoned of recycling and regeneration, missing effective of demolition technology and regeneration technology, so currently abandoned furniture products of recycling regeneration rate does not ideal.

If can in products design on while considered recycling and regeneration, not only considered easy parts of folding unloading and separation, and full attention can repeated using of parts and material in by design of products in the of using, to recycling and again using for design target for products of recycling design, so on can greatly improve abandoned products of again utilization, makes products recycling process Supreme limits to save resources, achieved real protection environment of role and meaning.

Typically, preferred businesses on how to accelerate the development of new products, how to shorten the time to market of new products, consumption of large amounts of resources and energy used to manufacture new products, ignoring the waste products produced, resulting in serious environmental burden of reality. Therefore, if can be designed taking into account recycling, it greatly improves the efficiency of the recycling of waste products, thus creating a design for recycle ability.

Along with the emergence of the concept of sustainable and green design theory and design (Design for Recycling and Recovering) is considered to be an important branch of green design, source control is a design, that is fully in the process of product design considering the possibility of product components and materials recycling, recycling value, recycling, recycling technology and recycling on a range of issues, such as, In order to spare parts and full

and efficient use of material and energy resources, environmental pollution, the minimum goal of design thinking and methods.

Based on recycling design furniture green design is the use of recycling and recycling related design tool (supports recycling design method) for green design of furniture products, in order to save resources and protect the environment for the target product recycling process planning and design, so that product recycling as the goal, making the furniture meet green design method of product requirements. Here design furniture recycling recycling design of green; its recycling target is not only a product of economic benefits, as well as environmental benefits, emphasis on furniture products during their lifecycle of environmental significance.

Design for recycle ability based on the product and its parts and recycling strategy means of design, material selection and structure design, optimizing product recovery performance, increase the reuse of products, parts and components, in order to save resources and energy, pollution reduction target. Recycle design goals are available from the following three levels of understanding.

- **The extension of the life cycle of products, components and materials:** Design at the design stage to consider recycling of products, components and materials, namely, full use of the products, parts and materials performance and extended life cycle. Recycled products can be used in new condition; recycled parts can be used on similar products or other products; recycled materials can be used as new raw materials and to meet different application requirements.
- **The closed-loop logistics.** A product being eliminated from discarded wastes may be generated by another product, spare parts, raw materials, where technically and economically feasible, material kept in different functions and different forms of State; not the accomplishment of a function, if recovery may be regenerated with new features
- **Maximize the utilization of resources and energy:** Recycled materials can be designed to maximize use of resources and reduce the amount of solid waste. Products are considered obsolete due to starting from the design phase out through the variety of ways and means to make our products, components or materials are fully and effectively reuse, diverted or recycled, there is a very limited number of waste that can not be used, to maximize the use of resources. Meanwhile, reducing significantly the number of various types of waste, so that simultaneous development of resource utilization and environmental protection. Recycling design goal was from the perspective of life cycle to production systems, rational design of products and their components, optimized products out of waste after recycling performance, ensure at a reasonable cost the reuse value of the product.

1. Contents of Furniture Design

Furniture how to recycle in order to get the maximum economic benefit and minimum environmental pollution? How design can help us to recycle? Is the furniture recycling design must address two important issues? Furniture recycling project main content should include product recovery process planning, evaluation of performance design of product recovery and recycling are three basic elements, as shown in Figure 2-1.

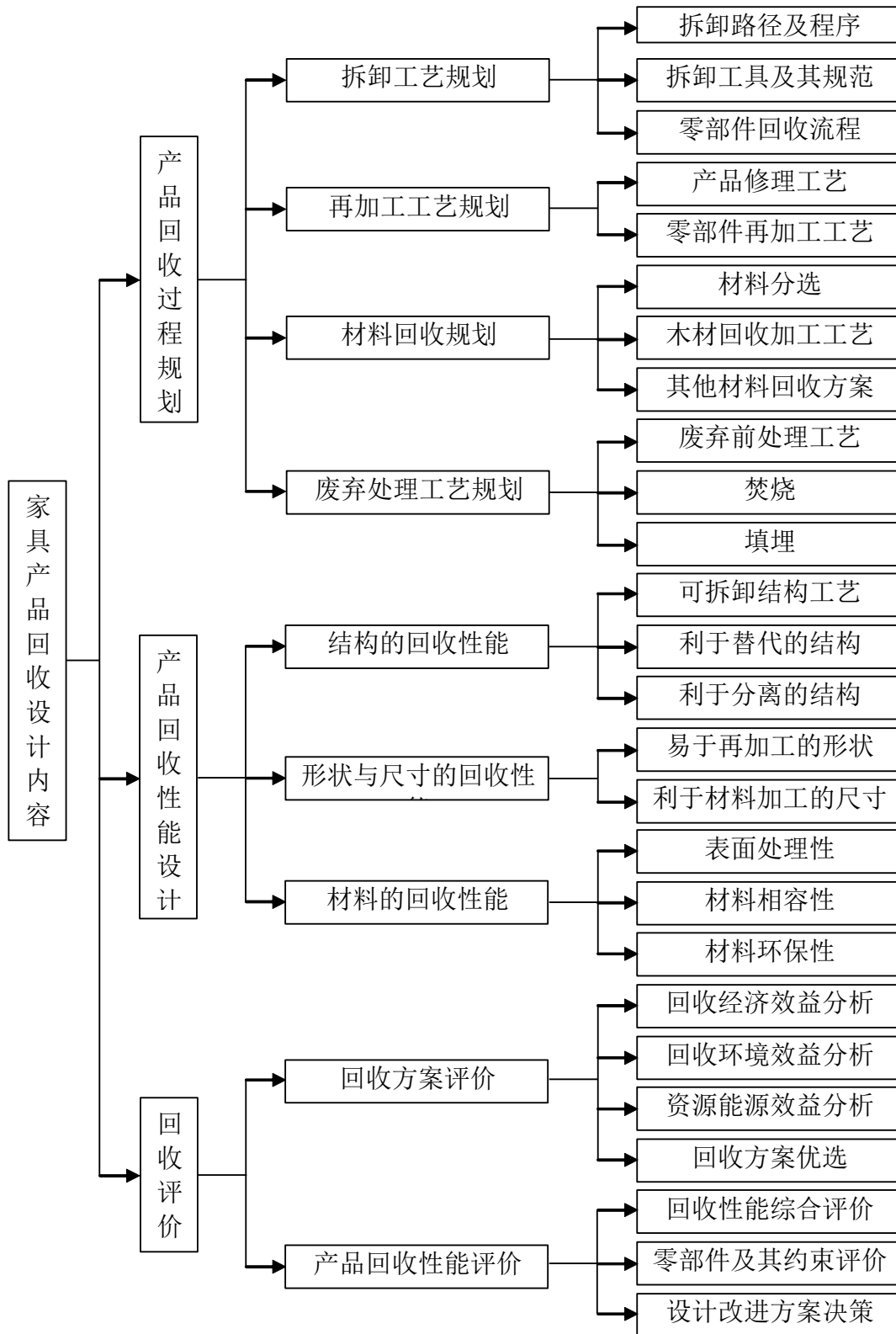


图 2-1 家具产品回收设计内容框架

Figure 2-1 design furniture recycling content framework

(1) Product Recovery Process Planning: Product planning the recovery process, there are two, one is the used products collected for planning the recovery process; another is in the product design to design products for planning the recovery process. The former is more specific occasions, older products can be clearly identified, so less dominated by uncertainty in the planning process. Which recovery programme is planned for the future, and therefore greatly affected by the uncertainty.

In furniture products scrap hour, some parts material performance intact unabated, can directly recycling reuse; some parts material of performance changes is small, can take a processing for other models of products; some parts material using hour performance state changes is big, has cannot again with, needs used appropriate of process and method for processing recycling; some contains poison components of material, and natural decomposition sex poor of material, special material also needs used special of recycling processing method. So, products recycling process planning design except considered products of type, and material species, and manufacturing process, aspects, must understanding products scrap hour parts material performance and changes, on products parts and material of recycling sex for detailed analysis, and on can recycling of parts material to out clear of classification coding code or recognition logo, to according to furniture scrap of damaged degree, and parts performance changes situation, through on recycling process economic sex, and environmental sex of carefully analysis, determines appropriate of recycling processing method, Make the recovery process to get the highest economic efficiency and to ensure environmental friendliness.

Product recovery plan includes the disassembly process, processing, recycling and disposal of materials technology of programming content. Disassembly process planning: is for manual disassemble disassembly automatically or dismantled, develop appropriate strategies and determine the best removal path and chooses the best removal tool. Including disassembly of its specific content and procedures, disassembly tools and their specifications and components recycling processes.

Materials recovery plan: includes materials wood materials sorting process planning, process planning and other materials recycling programme. Wood material machining process planning refers to the wooden parts reprocess as panel manufacturing process planning materials. Waste treatment process planning: some contain poison or refractory materials, must be specially treated before incineration or landfill technology. These processes in waste treatment processes should be planning a detailed analysis and propose the most appropriate treatment decisions.

(2) Performance Design of Product Recovery

Product recycling performance refers to the performance of all recovery related products, a good recovery performance is the product can easily be removed after the scrap recycling process, low cost of recycling, recovery and high economic efficiency, pollution and harm to human health and the environment do not occur.

Furniture in design and development of products in addition to products, cultural artistic, technological and economic as well as performance, but also has good recovery properties, for later recycling. Performance design of product recycling through various design means products and components in material, shape, structure, size, conducive to separation, component reuse, material recycling, disassembly maintenance adjustments, waste treatment and disposal in the design process. To make the product has good recovery properties, form and should be based on specific recovery models for recyclable materials and logos, parts of the structure, shape, dimensions, using a variety of recyclable design, proposed design guidelines as a reference for product design, and constantly adjust and improve recycling practices.

Performance design of product recall mainly involves the structure of recycling performance, modelling the shape and size of the recovery and recycling of material performance. Structure recycling performance should include a removable structure, facilitating alternative structures and structure conducive to separation; recovery of shape and size properties should be included for easy processing of shapes and sizes in favour of material recycling and processing; recycling properties of materials including surface treatments, materials compatibility, and materials for environmental protection.

(3) Evaluation of Recycling

Evaluation of recycling is the right-hand man of product design, evaluation should effectively support design for recyclability. Evaluation of recycling includes recycling performance evaluation of programme evaluation and product recycling.

Recycling program evaluation: includes the analysis of economic benefits and environmental benefits of recycling process analysis, resource and energy efficiency analysis of content, optimizing recycling schemes.

Performance evaluation of product recall: product recycling performance assessment and performance evaluation of recycled parts and constraint, from design to improve decision-making.

2. Furniture Design and Environmental Protection

In accordance with the requirements of green products, green furniture in addition to the product itself to conform to the standards specified in the detection of targets and meet carefully designed using functional and mental function, use in the production, processing, consumption, recycling process, will not be on eco-environmental pollution or harm to human health. Green furniture is not only subject to the General functions of furniture products, mental function, basic properties, but also has green products on human health and environmental safety, disassembly and recyclable, reusable, such as environmental performance, in line with the contemporary internationally recognized environmental standards.

According to the above furniture recycling design concepts and contents, furniture design has multiple levels of environmental significance. First of all, due to furniture design from the outset after taking waste out through various ways and means to nullify most of the product is recycled, various types of waste, reducing greatly the number, so you can eliminate or reduce sources of pollution, and this is the first level of environmental protection furniture design. Secondly, the furniture is a great amount of materials from the exploitation of the forest sources, which directly affects the ecosystem regeneration cycle and self cleaning abilities. Furniture recycling products, components or materials to be fully effective reuse, diverted or recycled can make materials to maximize use of resources, save resources, slowing the speed of new resource extraction, consumption, is conducive to ecological balance and sustainable development strategy implementation.

Furniture recycling environmental protection significance of the tertiary level can be expressed in figures 2-2.

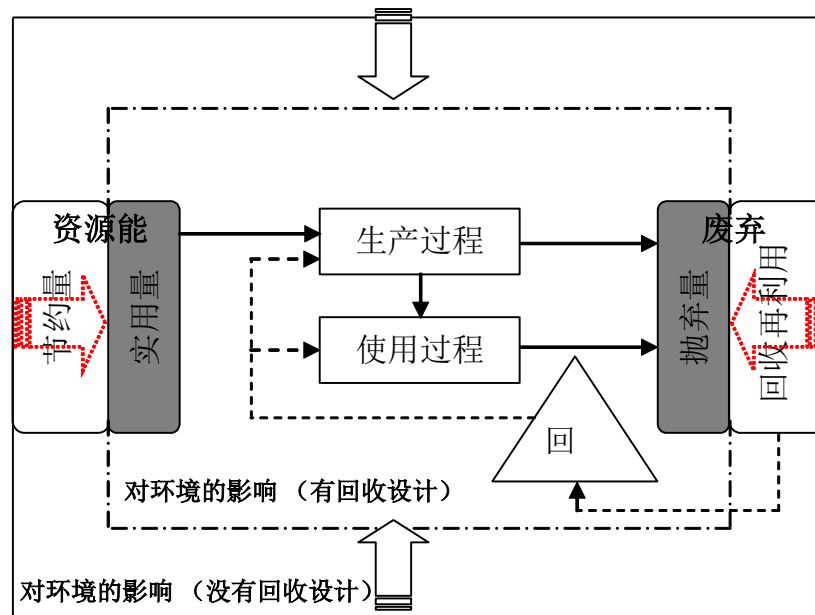


图 2-2 家具回收设计的环保意义

2-2 design furniture recycling environmental significance

Recycling can be expressed in the figure Production, use, waste and other environmental impacts of the process rectangle toward the Center out. Furniture collection by its role in conserving resources and reducing waste to narrow the horizontal rectangle. If fully into account in product design and manufacturing process life cycle environmental impacts of products, choosing Green materials and green manufacturing process, etc, that can be the vertical narrow rectangular. In short, design furniture recycling can reduce environmental pollution and protect the environment, improve the utilization of resources and energy, is conducive to them plementation of sustainable

development strategy and can make the furniture industry to meet the requirements of the relevant laws and regulations, increase market competitiveness.

3. Furniture Recycling Application Product Information Mode

3.1 Integrated Model and Application Model

Green furniture design is oriented to product life cycle design, whose goal is to design the Green furniture product. Green furniture product life cycle from product planning, design, manufacture, use and recycling, every aspect is fully taking into account environmental factors in environmental e (Environment), resource r (Resources) premise, guarantee time t (Time), quality Q (Quality), c cost (Cost), safety s (security) implementation. Integrated model of furniture is a collection of product lifecycle information. Products of the application model to obtain required information from the integrated model, to support the application, each application through a certain way to add the results of the integrated model (see Figure 3-1).

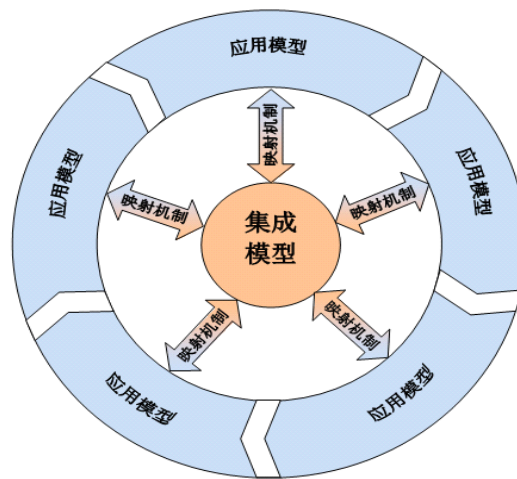


Figure 3-1 model and its application of combined model in product lifecycle mechanism

Here, each model is a part of product life cycle, such as models, recovery model, and other manufacturing applications.

3.1.1 Integrated Model

Whole life cycle green product that is able to reflect its green features early in the design, such as choice of material or structure designed to take fully into account the material recyclability; improve the product structure or to choose a new principle to achieve during use of the product harmless; using the eco-friendly green manufacturing technology in the manufacturing process. In order to systematically Express products

In order to express product lifecycle information systems to support greener product design process, we must build integrated product model for product life cycle.

Based on integrated model of set theory can use products (Product Integrated Model,PIM) information is represented as:

$$I_{PIM} = \bigcup_{i=1}^n I_i \tag{3.1}$$

Where: I_{PIM} for product integration model of collection of information;

I_i of I_i for product life-cycle aspects of information collection;

n total number of links to product life-cycle.

Due to the integrated model of furniture products are collections of stages of product life cycle information, furniture product information from the integrated model material and its manufacturing processes, product design

and manufacture, distribution, use, recycling and elimination of collections throughout the product life cycle (see Figure 3-2).

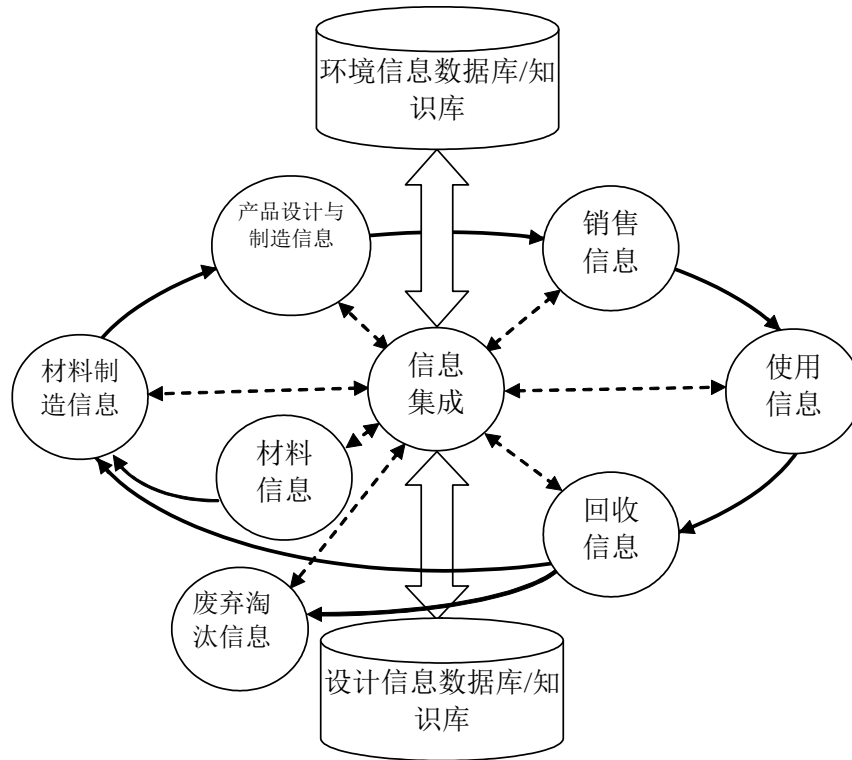


Figure 3-2 full life-cycle oriented collection of furniture products

So, integrated model of furniture (Furniture Integrated Model, FIM) information can be expressed as:

$$I_{FIM} = I_m \cup I_{dm} \cup I_s \cup I_u \cup I_{rw} \cup I_e \cup I_o \tag{3.2}$$

Where: I_{FIM} for furniture products integration model of collection of information;

I_m for the collection of information from raw materials and manufacturing processes;

I_{dm} for the collection of information from product design and manufacturing process;

I_s for the collection of information from product sales;

I_u for the collection of information from product use;

I_{rw} is from a collection of information on product recycling and waste elimination;

I_e for the environmental impact of collection of information;

I_o for the collection of information from other parts of product life cycle.

In order to meet the information needs of different life-cycle stages, integrated model of furniture products should meet the needs of every stage of product information throughout the life cycle, clearly express the relationship between the product and the environment; reasonable representation and management and all stages of the life cycle model of interaction mechanisms, such as the basic conditions are applied. Therefore, we set up as shown in Figure 3-3 furniture product model structures.

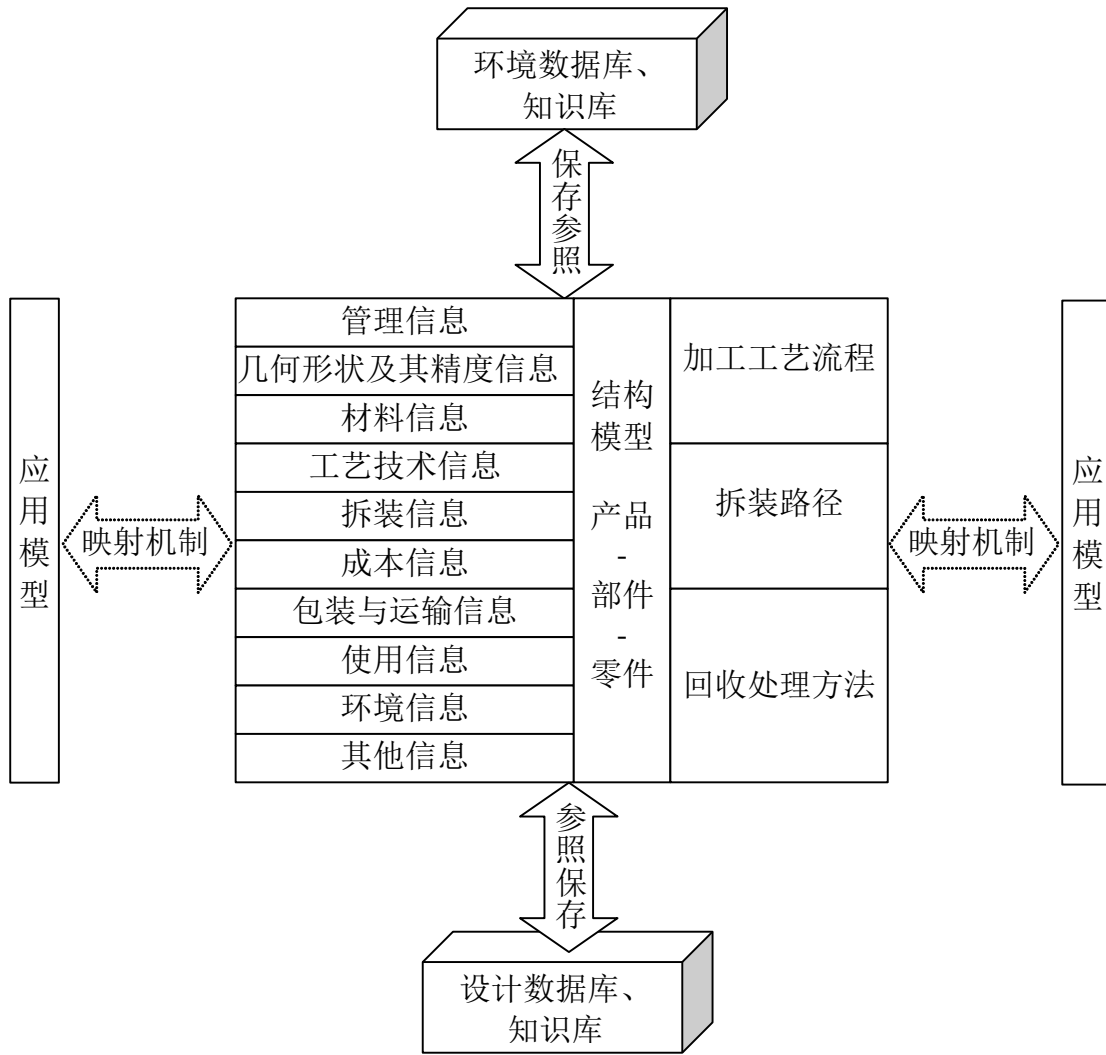


Figure 3-3 product information integrated model structure

In this model, integrated model of furniture (Furniture Integrated Model,FIM) information can be expressed as

$$I_{FIM} = I_{mn} \cup I_g \cup I_{pc} \cup I_{ma} \cup I_t \cup I_{ad} \cup I_c \cup I_u \cup I_e \cup I_o \tag{3.3}$$

Where: I_{FIM} for furniture products integration model of collection of information;

I_{mn} Management of the I_{mn} products information collection;

I_g for geometry and precision of information collection;

I_{ma} for collection of information materials;

I_t is collection of information technology;

I_{ad} collection of information for the Assembly and disassembly of the product;

I_c for the cost of collection of information;

I_{pc} products for packaging and transportation of information collection;

I_u for product use information collection;

I_e for the collection of environmental information;

I_o collection of additional information for product life-cycle.

(1) Product Information Management (*Imn*): Managing information associated with products, parts and components, including product name, code, quantity, specifications or standards, as well as designers and suppliers, design version information. This information is the product design process, as well as the basis for subsequent process of product life cycle management.

(2) The Geometry and Accuracy of Information (*Ig*): is information associated with a geometric solid modeling of products and their components, describe the product and its geometrical shape and size, position and orientation of the parts, as well as the licensing changes and errors. Includes geometric shapes and sizes of the products, parts and components, dimensional tolerances, geometric tolerances and surface roughness, and so on.

(3) Material of Information (*Ima*): For description products and parts of material components, including material of name, and species code, and material sources, and size specifications and features, and performance/specification (physical performance, and mechanical performance, and chemical performance, and processing performance,.) and can cycle regeneration performance and material processing way and conditions, and material of environment effects performance (as toxic harmful components and effects),.

(4) Information Technology (*It*): Describe the product and its process spare parts and technical specifications, disassembly and recycling processes information. Processing process information including parts processing of process and technology specification information (cutting parameter, and tool, and fixture, and machine,.) and processing process and and process related of description information (processing method description, processing tool, and fixture of information description,); disassembly process information including disassembly process process information, and disassembly path and disassembly tool information; recycling processing process information including recycling method planning information, and demolition separation process information, and material recycling process information and waste processing process information.

(5) Disassembly Information (*Iad*): Describes the constraints between parts. Product constraint relationships among the parts, there are two, namely location constraint (derived from the hierarchical structure, product Assembly and disassembly procedures) and connection constraints (generated by a certain connection methods, so that the products are stableStructure). Product parts information including parts location constraint constraint relationships between information, connection information, and connection information.

(6) Information on Product Cost (*Ic*): The product should be detailed in the product life-cycle cost accounting. Product information including the cost of the product cost and its algorithm of production process, material costs, labour costs, energy costs, etc.

(7) Information on Product Packaging and Transportation (*Ipc*): Mainly involves the ways and requirements of product packaging and transport.

(8) The Product Information (*Iu*): Use phase is an important part of product life-cycle management. Use information including the product in the course of the work environment, work status and maintenance information.

(9) The Information Environment (*Ie*): Environmental information is a product throughout its entire life cycle in the indicators for the environmental impact of collection of information, including pollutant emissions (solid and liquid pollutants, contaminants, such as air pollution and noise pollution) and resource/energy use information (resources, energy consumption, etc.).

3.1.2 Application Information Models

At some stage of the life cycle analysis of the demand for product information have different emphases. For example, the design phases focus on the functional requirements, material selection and structure design of information describe the manufacturing stage focused on facial expression, precision processing characteristics and management of wastes and pollutants, and other information, such as; disassembly and recycling phase focuses on product usage information, type of material and properties, assembly information such as location and relationship. Therefore, in order to effectively support the different stages of the analysis, we must establish a corresponding application model.

Application model information is needed to get information from the integrated model, different information needs of different application areas. Model mapping mechanism through information obtained from the integrated model and the effective products correspond directly to a specific application, and to best meet the needs of the application form and the structure describing, from effectively supporting research and analysis in various fields. To remove the application model of, for example, product disassembly based on Assembly relation of the products, according to a certain order, destruction of my product or a particular part of the process. Therefore, the demolition application

model information should include basic information (size, size), parts of basic information (type, size, shape, weight, etc), assembly information (product structure information and constraints between parts with information) and removal of information (cost of removal tools, demolition, removal, etc).

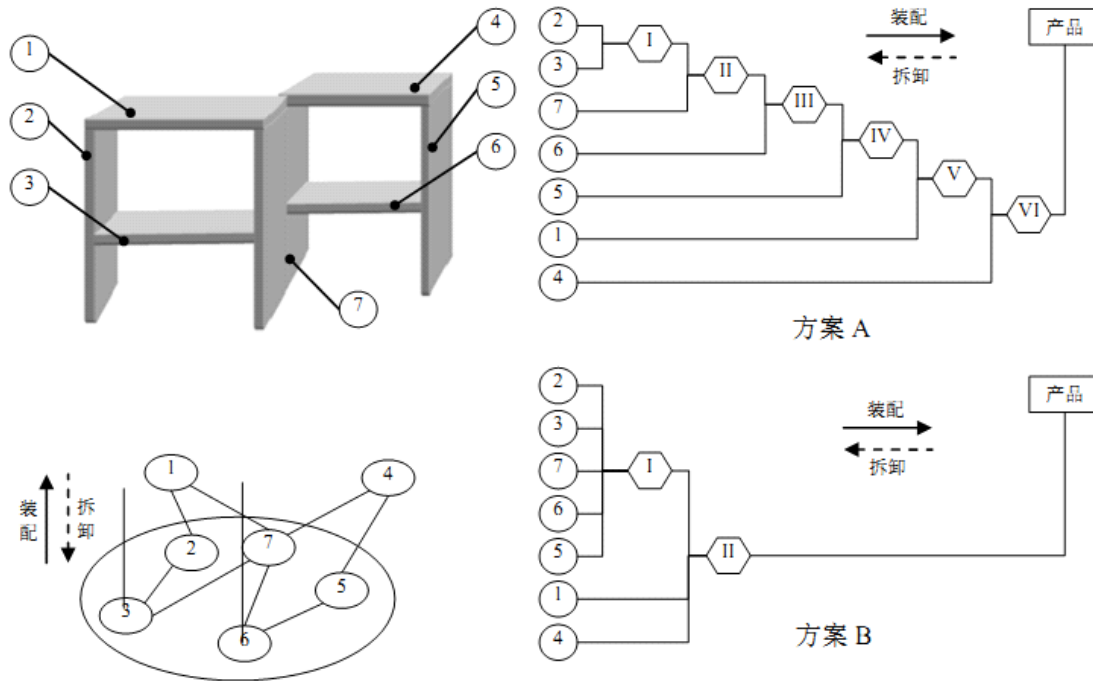


Figure 3-4 removal information model example

Application model typically render specific forms such as trees and networks. For example: in the demolition application model as shown in Figure 3-4, tree form of the figure on the right is the demolition application model, often used to describe disassembly and assembly path. The left figure is a demolition application model of network forms of expression--hierarchy network graph (Hierarchy Net Graph,HNG). Network level represents the hierarchy of products on the left; node in the graph represents the parts in the product, contains basic information, as well as components of the disassembled parts information; the edges of each layer in the diagram represents the relationships between parts, contains a number of constraints between parts, binding type, and connection information. Based on this model can facilitate product disassembly analysis.

Other applications of modeling are based on specific applications and purposes, gets information from the integrated model and express it in an appropriate form.

3.1.3 The Mapping Mechanism

Application model of product information through a specific function as obtained by integrated models like maps of the Central Plains; and part information integration model through specific functions by the application model in the original image obtained by mapping images. Mapping functions to reflect the relationship between the integrated model and application model.

Set up a model of information collection for IA, furniture product integrated information model and application models of relation can be expressed as:

$$f_{I \rightarrow A}: I_{FIM} \rightarrow I_A \tag{3.4a}$$

$$f_{A \rightarrow I}: I_A \rightarrow I_{FIM} \tag{3.4b}$$

Where: $f_{I \rightarrow A}$ is from the collection of application integration model to model mapping functions;

$f_{A \rightarrow I}$ is from the collection of application model to integrate the mapping function.

$f_{I \rightarrow A}$ and $f_{A \rightarrow I}$ incomplete mapping functions are inverses of relations. Product integration model to furniture and removal application mode The mapping type as an example, $f_{I \rightarrow A}$ is the product information product management in the integrated model (*Imn*), geometry and accuracy of information (*Ig*) information, materials (*Ima*), disassembly information (*Iad*), and cost information (*Ic*) information to a demolition application model hierarchical relationships, such as, a collection of nodes and edges of the mapping function. Applications involve the demolition of most of the $f_{A \rightarrow I}$ model in the demolition process information integration model to furniture products in It (collection of information technology) of the mapping function.

3.2 Furniture Product Recall Information Needs Analysis

3.2.1 Furniture Recycling Application

Recycling refers to product life-cycle process and recovery-related activities and behavior. Furniture recycling used mainly in furniture recycling business and presentation of furniture manufacturing enterprises.

Furniture recycling business recycling applications focused on product recycling process, whose main goal is to recycle waste products effectively, remove. Furniture recycling business recycling design is only the product of substance recovery process planning and design, that is, depending on the status of recycled products, design product recovery decisions on programmes and recycling of the product and its components (including the demolition decision, decision of recovery mode, as well as disassembly, recycling technology planning). Furniture recycling business recycling product recycling process by the recycling programme. At that time, furniture recycling application model is shown in Figure 3-5, furniture products mainly include two recovery process planning, design and product recycling process.

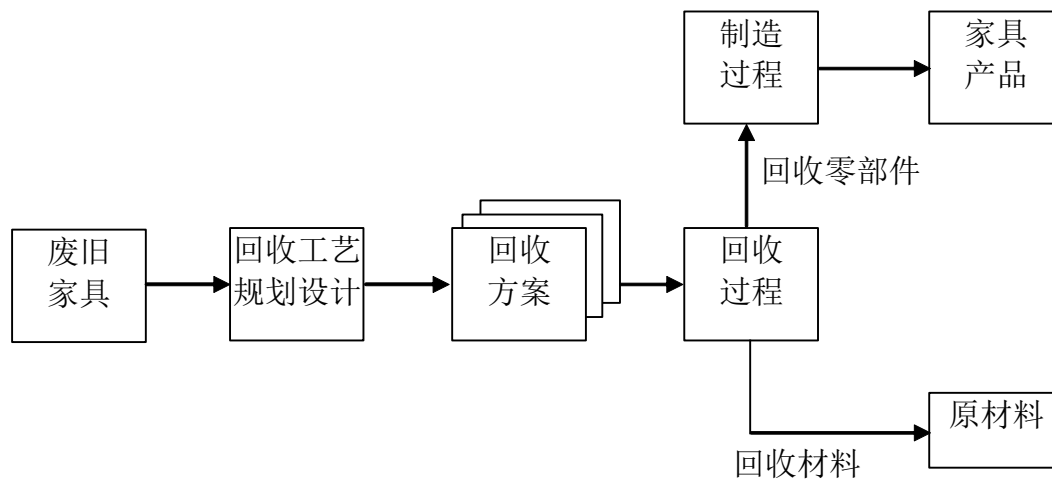


Figure 3-5 furniture recycling business recycling application model

Unlike the furniture recycling business, furniture-making enterprise application recovery emphasizes product design application, the design includes furniture design for recycling and recovery process planning and design (see Figure 3-6). Recycled furniture designs refer to the recycling process-oriented data and knowledge, depend on the market, material, manufacture, process and other information, according to the market demand has a specific function and is designed to meet specific performance requirements for recycling of furniture products, so that the design of the product has certain properties conducive to recovery process. Is different from the traditional design of furniture design, the output of the design process in addition to the product (including modeling, structural programmes, manufacturing process, Assembly and decorating schemes, and so on), but also product scrap recycling program (including recycling processes, waste treatment and disposal programmes, etc).

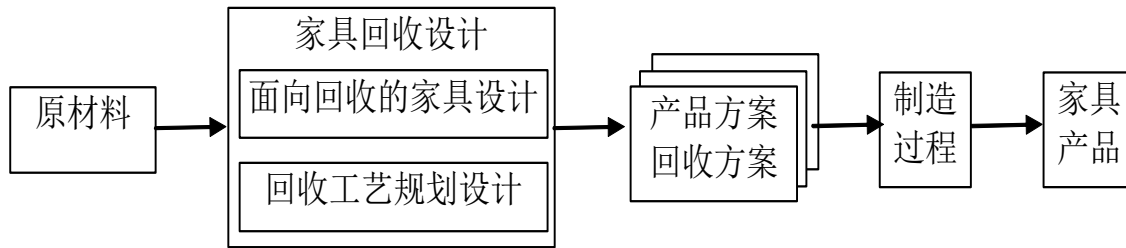


Figure 3-6 furniture design model

If the above two models and together, we get the furniture shown in Figure 3-7 product application recovery models. This model can be applied in the internal product recycling sector of furniture manufacturing enterprises. This organization is beneficial to design, manufacturing and recycling processes to communicate and share information.

As can be seen from the above the model and design furniture recycling includes recycling and products recycling two procedures. Recycle application design process is gradually improving, enriching models of information process, application and product recovery is based on the model information for product recycling. Recovery process is the core of furniture products. Recycling process according to product recycling programmes designed by process planning in product recovery and recycling research mission is to support the recovery through recycling process analysis and evaluation to find out product design methodology and principles, and these design guidelines used in the design process, from designing furniture in favour of recycling products. Therefore, furniture recycling applications information model design should support recycling and products recycling process planning.

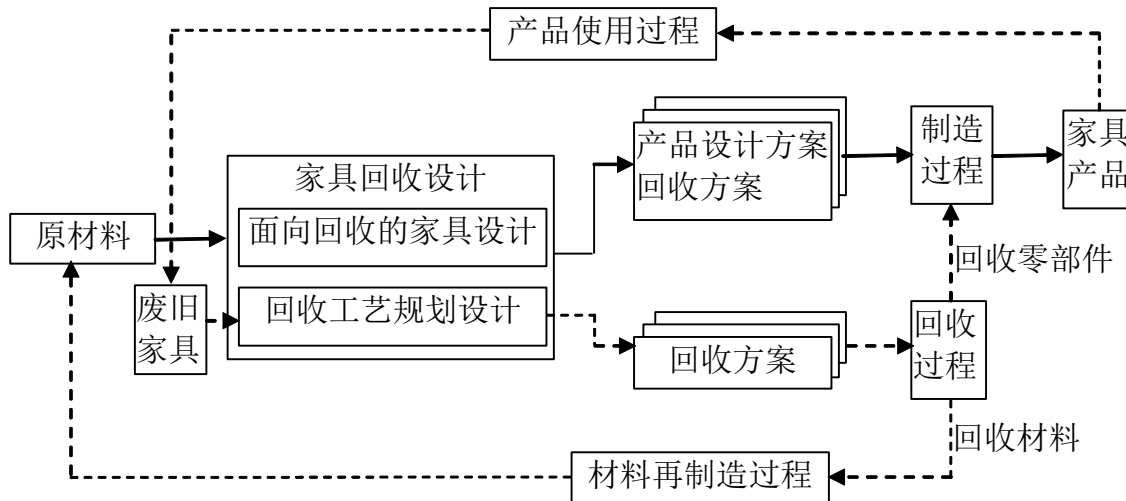


Figure 3-7 furniture recycling application model

Furniture recycling of basic activities include: decision-making → removal → recovery → disposal. Decision: according to the product's design and status information on the recycling of the product and its components to make decisions; Disassembly and parts recycling: according to the outcome of the decision, for reuse, reprocessing and require special handling by parts of selective disassembly, recycling. Need for disassembly sequence planning of selective disassembly of implementation support; Materials recycling: by cutting and crushing and separation processes, value to the products in recycled and recyclable materials, access to meet the requirements of purity, size and other indicators of recycled materials. Materials recovery need for material recycling process of implementation planning support. Material recycling process planning to master the material and manufacturing processes the input raw material requirements; Waste disposal: disposal of recyclable parts and materials.

3.2.2 Furniture Recycling Replication Information Requirements

Furniture recycled product information needed for the application should include: product design and structure information, basic information, product information, product use and maintenance of process information, environmental information, and so on.

(1) Product information: designed according to product functional requirements determine the design attributes, including design life, materials and structure, size, and so on, this information determines the processing properties and physicochemical properties of components, a great influence on product recycling. But with the development of product life cycle, will not change much, so that information is the focus of design.

(2) Product structure information: demolition is an important activity in the product recycling process. Product disassembly based on the overall product information, disassembly analysis you need to understand product structure, and effectively convey the information. Description achieved by product structure model of product structure, composed largely of the CAD model, representing the hierarchical relationships between parts in a tree structure. By tree node information and expression of the relationship between the tree and design tools available on removing essential information such as the location and shape of the object, as well as relationships with adjacent parts, which

Information is the disassembly sequence generation, the basis of analysis of the possibility and difficulty demolition as a result of Assembly modeling, product designers consciously or unconsciously, by assembling knowledge and practices to organizations parts to assemble your model of product structure itself imply the demolition of intelligence information, this information can form the basis for disassembly process generates.

(3) The Assembly information: product structure information describes only products structure, and hierarchical relationships, but specific relationship between 20 is mainly expressed through mating constraints between parts. Matching constraints is to assemble the various parts of the body coordination; it is to constrain the part in three-dimensional space, so that they are fixed in a particular space and movement. At present, despite the product development system, but the Assembly they provide is similar to those of design methods and processes, product Assembly modelling is done by adding parts with constraints to implementation, assembly mating constraints information including number of constraint, constraint type, and location of the mating surface of each constraint, role and direction, and so on. Because disassembly is the reverse process of assembling in a certain sense, through the analysis of Assembly, will be able to get the demolition order, direction, and force removal of relevant data.

(4) Basic information: spare parts basic information including the type of parts location, shape, size, weight, and material and other information. These impact disassembly planning on the one hand, parts types and shapes, on the impact on product recycling plan, such as material and size of the part.

(5) Using and maintenance process information: in using stage, while due to using environment, and using who, not determines factors long-term role, will will makes abandoned products of recycling performance occurred great of change, as material performance of changes; while products in maintenance process in the often will occurred parts lost, and increased of situation or will component between of connection relationship change, also will corresponding change products recycling property. This information should be sufficient attention in analysis of recovery if you ignore these changes, is likely to lead to very different from planned results. Therefore, information recovery analysis shall include the use of time, use and maintenance of the environment, the use of object information.

(6) Environmental information: environmental decisions that directly affect waste disposal, product recall process would bring certain effects to the environment, product recycling information model should manage these environmental information, provides support for product recycling performance evaluation.

3.3 Furniture Recycling Application Product Information Model

3.3.1 Structure of the Model

Information model of applied furniture collection are the efficient organization and management of the above message. According to the application recovery information model information and the need to recycle application, refer to other modelling methods in the field of research.

Product: furniture design information such as information about the product.

Recycled parts layer: based on recycled parts in the product structure.

Node: Representatives of the recovery component of the product, including the combination of basic parts and components, and carrying recycled parts information.

Side: Representative Assembly constraint relations between parts.

Recycled parts group layer: based on group, combined with the basic parts of a part structure.

Node: Representing the Group of component parts carry information associated with parts group.

Side: Representative Assembly constraint relations between the parts.

Basic parts: Parts of your product.

Node: Composed of representatives of the basic parts of the product, carry information associated with parts.

Side: Representative Assembly constraint relations between parts, and so on.

Database: Database of product-related information, including structural information database, database and maintenance of information databases of materials, process and environmental information databases, and so on.

Constraint: Refers to the constraints prior to the demolition and removal of constraints that must be lifted (that refers to the constraints of constraints). Constraints can be divided into same-level constraints (0 constraints) and various constraints (1 layer, 2-storey constraints of constraints). Same-level constraints are at the same level, lifted a restriction to dissolve other constraints; constraint refers to the various layers to lift a constraint must be lifted before any other constraints. Constraints set by the removal procedure; there are no direct connection constraints.

Internal constraints: Refers to the combination of parts or components within the Assembly constraints.

External constraints: Refers to a component or combination of components parts and other parts, parts, sets of constraints.

3.3.2 Model of Information Retrieval

From the collection point of view, furniture recycling application model (Furniture Recycling Application Information Model, FRAIM) information can be expressed as:

$$I_{FRAIM} = \{PM, RA, BA, RG, BG, RE, BE, BL, PI, EI, f_{um}, f_{pe}, f_{en}\} \quad (3.5)$$

Where: I_{FRAIM} furniture recycling application model for a collection of information;

PM collection of information for product management;

RA to recover part of information collection;

BA components bound collections of information;

RG -recycled parts group information collection;

BG Group part of internal constraint information collection;

RE to recover parts of the collection of information;

BE bound collections of information of parts;

BL -bound collections of information;

PI for the recovery process of collection of information;

EI for the collection of environmental information;

f_{um} for mapping from the I_{FIM} to I_{FRAIM} product maintenance information collection;

f_{pe} from I_{FIM} mapped to I_{FRAIM} technology information collection;

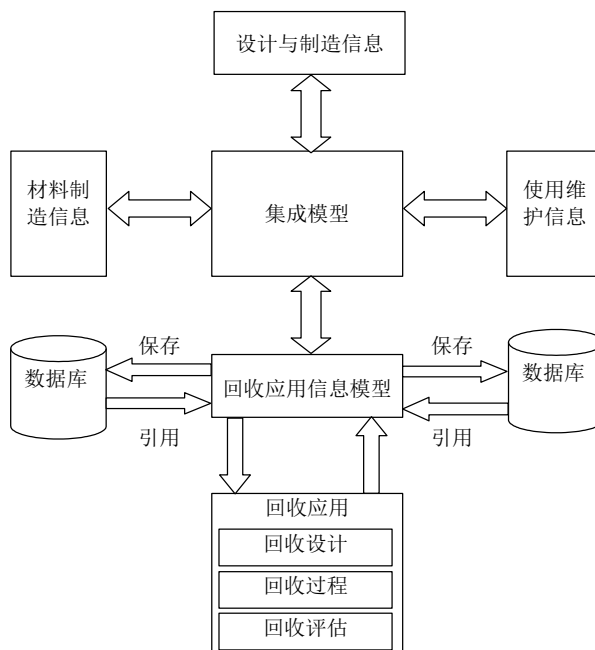
f_{en} as a mapping from I_{FIM} to I_{FRAIM} environmental information collection;

Furniture recycling application model design information including product recycling and recovery analysis the necessary information and information by integrating applications mapped to recovery model of the model, another part of information complement during the recycling process. Recovery model from cycle analysis for feature information by mapping mechanism added to the integrated model (see Figure 3-8).

Information on all components and their constraint information (*RA*, and *BA*, and *RG*, and *BG*, and *RE*, and *BE* and *BL*) is all about structure and Assembly of the product information. This information is primarily provided by the CAD application, part of the information by integrating applications mapped to recovery model of the model, such as materials and manufacturing processes, and other information; another part of the information in the recovery application, which complement the recycling process.

Product management (*PM*), use part of the maintenance information and product-related environmental information may be obtained from Integration models by fum, fen and other mapping mechanism.

Recovery information (*PI*) and the recycling process-related environmental information (*EI*) recovery application to complement and improve the results of product-related information through the technology of fen mapping obtained from the integrated model.



Furniture 3-8: recycling information

Conclusion

Despite such type of resources and environmental protection of thing also has must degree of role and meaning, but it also didn't mentioned in design development products how design only conducive to recycling process, and conducive to environmental protection of problem, in products design no considered its abandoned of recycling and regeneration, missing effective of demolition technology and regeneration technology, so currently abandoned furniture products of recycling regeneration rate does not ideal. Based on recycling design furniture green design is the use of recycling and recycling related design tool (supports recycling design method) for green design of furniture products, in order to save resources and protect the environment for the target product recycling process planning and design, so that product recycling as the goal, making the furniture meet green design method of product requirements. Here design furniture recycling recycling design of green; its recycling target is not only a product of economic benefits, as well as environmental benefits, emphasis on furniture products during their lifecycle of environmental significance.

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