

Green Product Design and LCA

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Who is Herman Miller?



Green Products are Hot



Design for the Environment

- Initiatives are increasing
- DfE Stages
 - Recyclability
 - Recycled Content
 - Design for Disassembly
 - Material Chemistry
 - Bio-based content
 - Low Energy Use
 - Alternative Energy Models
- What's Next?

What are Customers Asking?

- What is the recycled content?
- Does this product contain _____?
- How much CO₂ is in _____ product?
- Do we have a carbon strategy?
- How do the recycled soda-pop bottles used in Aeron Chair reduce its environment impacts?
- Will you take back my old furniture?

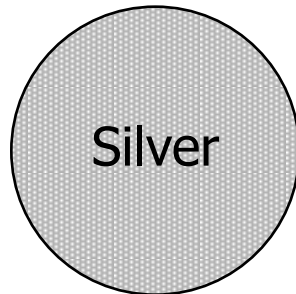
What's Next

- Carbon Footprint
- Life Cycle product impacts
- Life Cycle raw material impacts

- LCA!!

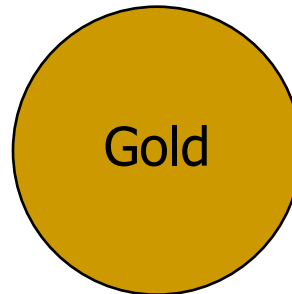
BIFMA Sustainability Standard

- Point based system 100 point scale
- Mandatory prerequisites
- Categories
 - **Materials (LCA)**
 - **Energy (Primary Energy Demand)**
 - Human and Ecosystem Health
 - Social Responsibility



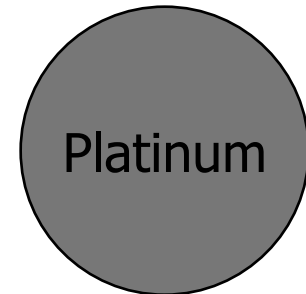
Silver

35-50



Gold

51-65



Platinum

>65

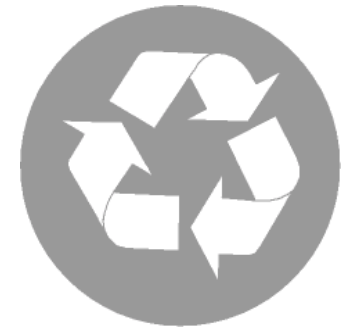
Herman Miller Product Assessment Process



Chemistry



Disassembly



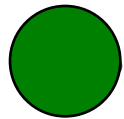
Recyclability

Herman Miller Perfect Vision - by 2020

- Zero landfill
- Zero hazardous waste generation
- Zero air and water emissions from manufacturing
- 100 percent green energy
- All buildings constructed to a minimum LEED Silver certification
- **Generate 100% of revenue from DfE approved products**

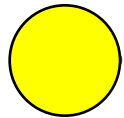


Material Chemistry Assessment –



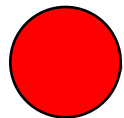
Green

- ***Little or no hazard.*** This chemical is acceptable for use under the Cradle to Cradle Design Protocol.



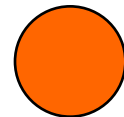
Yellow

- ***Low to moderate hazard.*** This chemical is acceptable for use until a green alternative is found.



Red

- ***High hazard.*** This chemical should be phased out as soon as possible.



Orange

- ***Incomplete HH or ER data.*** There is no indication that this is a problematic chemical (i.e., Red) but a complete assessment is not possible due to lack of information.



Design for Disassembly



"Can we take apart our products?"



Recyclability

Herman Miller Recyclability Hierarchy

1. Material is a **technical** or **biological** nutrient and a commercial infrastructure exists.
2. Material can be down-cycled and a commercial infrastructure exists.
3. Material can be incinerated for energy recovery.
4. Material is normally land filled.

"Are the materials recyclable?"

Mirra™



PVC-free, all 200 chemicals fully assessed



Design for Disassembly — 96% Recyclable
15 minutes to disassemble



Recycled Content — 42%



C2C Gold Certified



Now What?

- Engage PE Americas to create LCA model of Mirra
- Build internal capacity for LCA within Herman Miller
- Integrate LCA results into DfE scoring



PE AMERICAS

A joint venture of Five Winds and PE

 **Herman Miller**

Creation of LCA model

- Flexible, parameterized LCA model created in GaBi 4 software
- Data from Herman Miller and GaBi databases
- Model assessed baseline of Mirra task chair as well as flexibility to use for alternative produce designs
 - Alternative materials
 - Change energy use
 - Product design modifications

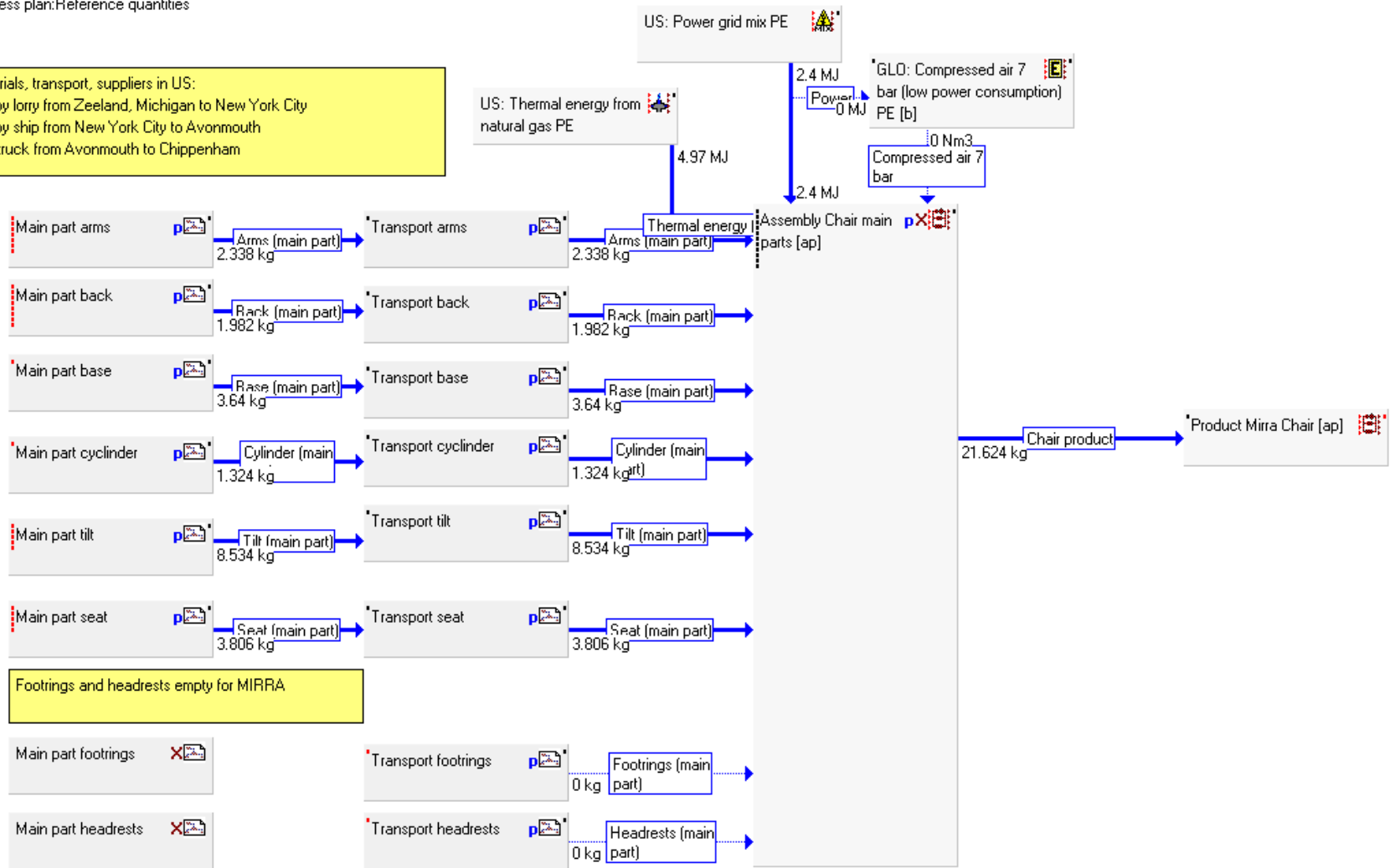


GaBi Software

Mirra Chair Production

GaBi 4 process plan: Reference quantities

Raw materials, transport, suppliers in US:
 1293 km by lorry from Zeeland, Michigan to New York City
 5515 km by ship from New York City to Avonmouth
 55 km by truck from Avonmouth to Chippenham



Model modifications

GaBi Parameter Explorer: Mirra Chair Production

Active scenario group: Scenario group 1 Active scenario: New Calculate now

Scenarios Parameter Plan

Object tree

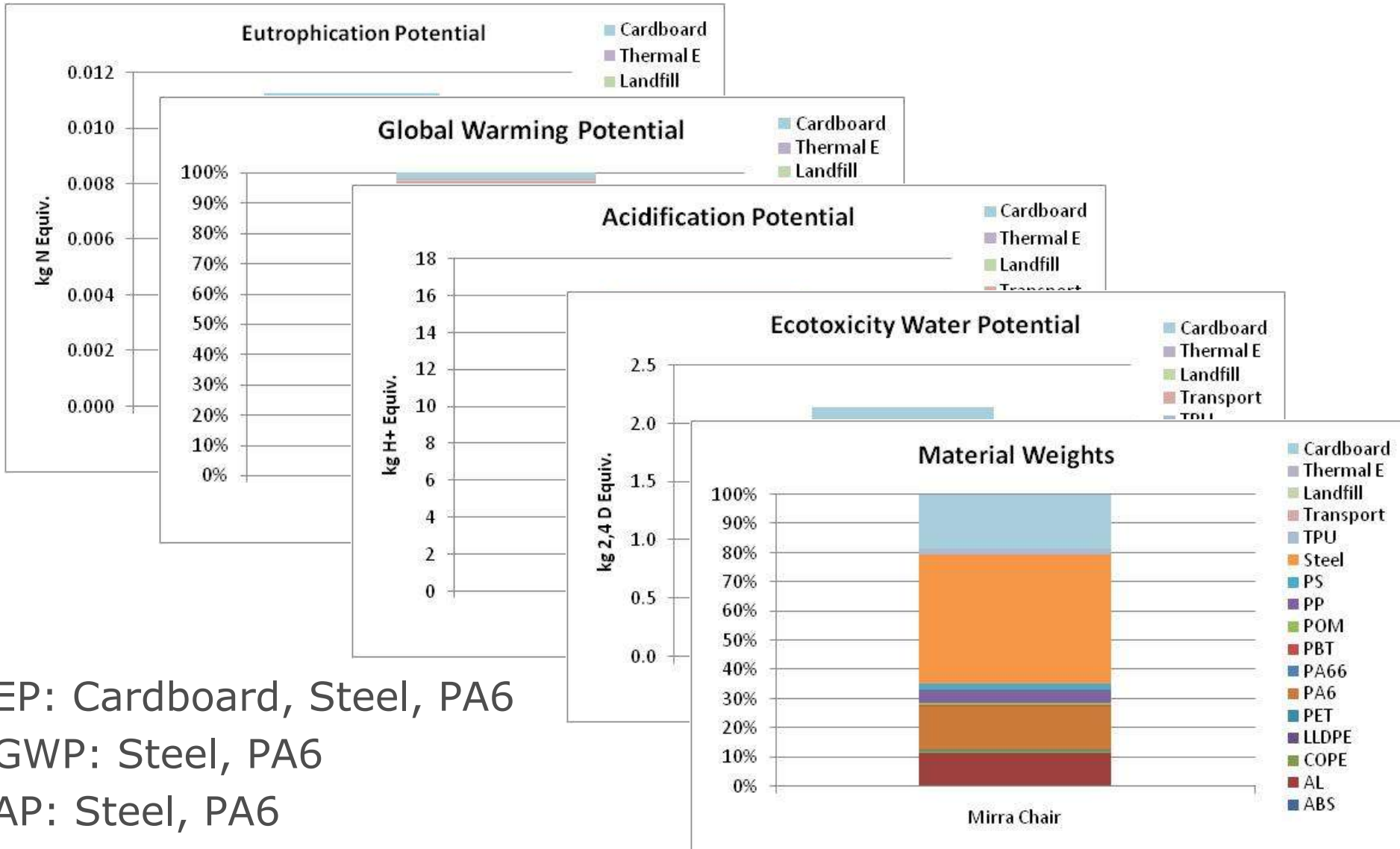
- Database objects (changes remain permanent)
- Global parameter
- Mirra Chair Production
 - Main part arms
 - Main part arms (adjustable)
 - Component adjustable arm p
 - Component arm subassembl
 - Component fabric upholster
 - Component leather upholste
 - Component pad support ass
 - Component sleeves
 - Sleeve L
 - Sleeve R
 - Assembly sleeves (comp)
 - Component vinyl arms
 - Assembly arms (adjustable)
 - Main part arms (fixed)
 - Main part arms (no arms)
 - Assembly arms (main part) [b]
 - Main part back
 - Main part base
 - Main part cylinder
 - Main part footrings
 - Main part headrests

Parameter	Formula	Value	Standard deviation	Comment
Sleeve_L		0.03	0 %	Sleeve Left [kg]
Sleeve_R		0.03	0 %	Sleeve Right [kg]
wt_Sleeves	$Sleeve_R + Sleeve_L$	0.06		Total weight sleeves [kg]

Allocation	
Allocation	(no allocation)

Selection: count subfolders Close

Mirra Chair Results



EP: Cardboard, Steel, PA6
 GWP: Steel, PA6
 AP: Steel, PA6
 EcoTox: POM
 Mass: Cardboard, Steel, PA6

The future...

- Continue to build LCA expertise
- Incorporate LCA results into DfE score card
 - Add a GWP Section
- How to make decisions between possibly conflicting conclusions (chemical score vs. LCA results)